REFORM MODEL TWO OF THE PRESIDENT'S COMMISSION TO STRENGTHEN SOCIAL SECURITY: DISTRIBUTIONAL OUTCOMES UNDER DIFFERENT ECONOMIC AND BEHAVIORAL ASSUMPTIONS

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ABSTRACT

This project uses dynamic microanalytic simulation techniques to explore the distributional consequences of Plan 2 of the President's Commission to Strengthen Social Security. This plan includes a voluntary personal account that would be "carved out" of currently-scheduled benefit contributions, a new minimum benefit, and an increase in widow(er)s benefits. It also shifts the current wage-indexed initial benefit formula to a price-indexed formula to address most of the current system's long-term solvency problem. The analysis begins by adopting the assumptions of the Office of the Chief Actuary (OCACT) regarding portfolio allocation, rates of return, administrative costs, and mandatory annuitization of personal account balances to develop a baseline of Model 2. We compare the distributional results with current-law promised benefits and a current-law scenario adjusted to match the revenues we estimate are required to fund the OCACT baseline in 2050 exclusive of the private account provisions. Subsequently, we test the sensitivity of our baseline estimates to different assumptions about participation in personal accounts, investment patterns, administrative costs, variation in market returns across the life cycle, and rates of return on investments. To simulate likely participation patterns in voluntary private accounts and participants' portfolio allocation choices, we estimate models using recent data from the Survey of Consumer Finances. The results from our core and sensitivity analyses bracket the likely outcomes of the reform plan and demonstrate how this type of reform might affect subgroups of the future elderly population.

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1. Introduction

In December 2001, The President's Commission to Strengthen Social Security (CSSS) released its report outlining three different models for Social Security reform (President's Commission 2001). In each model, workers would be given the option of diverting a portion of their Social Security payroll tax to a personal account. Workers who took advantage of this option would be able to access the account at retirement to supplement their Social Security benefits, although their normal Social Security benefits would be reduced to reflect the earlier payroll tax diversion. The three models differ in the amount of payroll tax that could be diverted, the calculation of the benefit offset triggered by the diversion, and the changes, if any, to the rest of the Social Security benefit package.

The core goal of this project is to use dynamic microsimulation to analyze how Social Security income in particular, and retirement income more generally, might change under Model 2 of the Commission's reform plans. Differences across groups in mortality, disability, work and retirement patterns, family formation and dissolution, and lifetime earnings levels and patterns imply that changes to Social Security necessarily have disparate consequences. It is difficult to anticipate all of these differences, and the problem is made considerably more complex by the voluntary nature of personal account participation in all three of the CSSS plans. Dynamic microsimulation is a tool that researchers can use to integrate complex changes to Social Security rules with differential life-course patterns and voluntary behavior.

We simulate Model 2 provision by provision, and explore sensitivity by simulating outcomes under a range of alternative key assumptions. This model has received considerable attention and largely restores solvency to the system by changing how basic benefits are calculated. It provides a good base against which we can examine the sensitivity of personal account and total benefit outcomes to different assumptions about account participation, administrative costs, and market returns across time.

We find that varying these assumptions can significantly change outcomes under Model 2. In our baseline case, total Model 2 benefits fall between projected benefits assuming the current law benefit formula and projected benefits that would be payable given current payroll tax rates. With changes to our assumptions, benefits vary quite widely, underscoring some of the risks and rewards associated with the plan. Among the more striking findings are those illustrating the effects of market fluctuation.

2. Background

Shortly after President Bush took office in 2001, he formed a Commission to develop a plan that would strengthen Social Security, increase its fiscal sustainability, and meet six general principles. These principles included: 1) holding harmless current or near retirees, 2) ensuring that the Social Security surplus is dedicated to Social Security, 3) prohibiting increases in payroll taxes, 4) prohibiting the government from investing Social Security funds in the stock market, 5) preserving Social Security's disability and survivors' components, and 6) including individually controlled, voluntary personal retirement accounts to augment the Social Security safety net.

The Commission issued a report in December of 2001 that outlined three reform plans for Social Security.[1] Table 1 summarizes the provisions of the Commission's three models. (Appendix table A1 provides a more detailed summary of the three plans.) The first and simplest model allows workers to divert two percentage points of their payroll taxes to personal accounts. At retirement, the monthly Social Security benefits of workers who participated in the personal account option would be reduced by the amount of the annuity that could have been purchased with the diverted payroll taxes. In Model 1, this annuity is based on the amount that would have accumulated had the diverted payroll taxes earned interest each year at a rate equal to 3.5 percent (or 0.5 percentage points above the rate earned on government bonds that year). Workers earning more than that amount in their account would gain from participating, since the balance in their personal account would exceed the value of the benefit offset. The option to create a personal account is the only change to present law in Model 1.

The second model allows workers to divert four percentage points of their Social Security payroll tax, up to a maximum of $1,000 a year. The $1,000 limit is adjusted annually in line with average wage increases. In Model 2, the offset to basic Social Security benefits is calculated as if the diverted taxes earned 2.0 percent each year (or 1.0 percentage point below that year's government bond rate). In effect, the government subsidizes participation in the individual account program under Model 2, since the Social Security benefit reduction is calculated using a lower interest rate than the government would have to pay if it borrowed to cover the revenues lost as a result of the tax diversion.

Model 2 introduces four other changes. First, benefits for long-service, low-wage workers would be increased, providing a worker with at least 30 years of service a benefit equal to 120 percent of the current poverty line. Second, benefits for aged widows and widowers would be increased to 75 percent of the combined retirement benefits of the couple if this were higher than the benefit otherwise provided. This new widow(er)'s benefit would not help higher earners, however, because it would be limited to the amount that the survivor of an average retiree would receive under current law. Third, the general benefit formula would be adjusted annually beginning in 2009 so that the replacement rate in each of the formula brackets (i.e., each "bend point") is reduced by the rate of real wage growth.[2] The reduction for each future retiree would be the cumulative percentage increase in real wages between 2009 and the year the worker turns 60. Finally, in order to cover the costs of the transition to individual accounts, the model provides for regular transfers from the general budget in the amount needed for the Social Security trust funds to maintain a balance of at least 100 percent of outlays.

The Commission's third model allows workers to divert 2.5 percentage points of their payroll tax, again to an annual maximum of $1,000, to a personal account, provided that they also make an additional payment equal to 1.0 percent of their taxable earnings. In this model, the offset at retirement is calculated using 2.5 percent real (or the government bond rate less 0.5

[1] Cogan and Mitchell (2002) describe how the Commission arrived at some of its recommendations, and discuss the role that economic research played in influencing key choices.

[2] The Commission report refers to this as moving to a "price-indexed" benefit formula, but it is implemented by reducing the primary insurance amount (PIA) formula factors (90, 32, and 15) successively starting in 2009 by the measured real wage growth in the second prior year (see Goss and Wade, 2002, page 4). Technically, this is not the same as a price-indexed benefit formula.

percentage points). Refundable income tax credits would be made available to encourage participation by low-wage workers, although the Commission did not specify exact parameters.

Model 3 makes a number of other changes in Social Security benefits. It includes the same widow(er)'s benefit provision found in Model 2 as well as an increase in the benefit paid to long-service, low-wage earners that is similar to (but less generous than) that found in Model 2. This model introduces three additional benefit changes: (a) regular adjustment of the benefit formula to offset the impact of longer life expectancy on aggregate benefit payments, (b) further reductions in the benefits for the highest earners, and (c) further reductions in benefits for those taking early retirement. Finally, the model provides for two kinds of transfers from the general budget to Social Security. First, there would be an ongoing series of transfers in the amount of the revenues that would have come to the Social Security program if (a) the taxable maximum were increased to the level that captured 86 percent of all covered earnings and maintained there in the future and (b) the transfer to the Medicare program of a portion of the income tax receipts derived from taxing Social Security cash benefits were redirected to the Social Security program instead.[3] Second, the model introduces the same guarantee found in Model 2 that Social Security's fund balance will not fall below 100 percent of expenditures.

The Commission recommended a two-tier administrative structure for the personal accounts. Initially, all workers would participate in the first tier, which would be centrally managed and offer the same investment choices as the current Federal Thrift Savings Plan. Once participants' balances reach a specified level (the Commission suggests $5,000), they could move their accounts to a private manager of their choice, as long as their funds remained invested in a broadly diversified set of assets.

Cost Estimates

The Office of the Chief Actuary of the Social Security Administration (OCACT) prepared a comprehensive analysis of each of the Commission's models that was published as an appendix to the Commission report (Goss and Wade, 2002).[4] The analysis included projections of the impact of each model on the financial status of Social Security and on the general government budget over the next 75 years. It also included calculations of the effect of each model on the future Social Security benefits of a number of illustrative workers.

OCACT's cost projections use the intermediate assumptions from the 2001 Trustees' Report (Board of Trustees 2001). That report assumed that government bonds would earn a real rate of return of 3.0 percent per year over the projection period. For the purposes of these estimates, OCACT assumed further that real equity returns would average 6.5 percent per year, that real returns on corporate and government bonds would average 3.5 and 3.0 percent per year, respectively, and that administrative charges would be 0.3 percent of assets per year.

[3] Commission members did not sign off on tax increases but recommended that Congress consider revenue provisions that would provide sufficient funds.

[4] A subsequent memo from the Chief Actuary made some modest corrections to the estimates of the aggregate general revenue transfers required under each of the models owing to an error in the earlier memo in the treatment of the income tax revenue derived from taxing the proceeds of the personal accounts in excess of the offset amount (Goss 2002).

The 2001 Trustees' Report projected a long-range (75-year) actuarial deficit under current law for OASDI of 1.86 percent of payroll. OCACT estimated that if two-thirds of the workers participated in the personal account plan and the money flowing into the personal accounts came from diverted payroll taxes, the adoption of Model 1 would increase the actuarial deficit to 2.54 percent of payroll. If the payments into the personal accounts came from the general budget rather than from diverted payroll taxes, however, the long-range deficit was projected to fall to 0.96 percent of payroll.

OCACT estimated that the benefit changes contained in Model 2 would be sufficient to convert the long-range deficit into a 0.01 percent surplus, provided that no workers participated in personal accounts. If two-thirds of the workers elected the personal account option, program finances would on net deteriorate in the amount of 0.72 percent of payroll because of the payroll tax diversion and subsequent benefit offset. Under the terms of Model 2, however, this would trigger general revenue transfers to the Social Security program, which OCACT estimated would average 0.84 percent of payroll. They concluded that the net effect of the model changes, the tax diversion, the benefit offset, and the general revenue transfer was to leave the program with a long-range surplus of 0.13 percent of payroll.[5]

The benefit changes contained in Model 3 were projected to reduce the long-range trust fund deficit by a total of 1.31 percent of payroll. The general revenue transfer in lieu of a change in the taxable maximum and in the way the taxation of benefits is handled was projected to add another 0.63 percent of payroll. OCACT estimated that, taken together, these changes would produce a long-range surplus of 0.08 percent of payroll. If two-thirds of the workers opted to open personal accounts under the terms specified in Model 3, the net effect of the tax diversion and benefit offset would be a deterioration of 0.44 percent of payroll in program finances. Because the additional general revenue transfers provided in Model 3 to offset transition costs would be worth 0.38 percent of payroll, the total impact of Model 3 would be to leave the program with a long-range surplus of 0.02.[6]

OCACT Estimates of Distributional Impacts

The OCACT estimates of the impact of these plans on illustrative workers focused on workers retiring at age 65 after at least 35 years of steady earnings at one of four different levels (low, average, high and maximum).[7] Separate calculations were made for married couples in which both spouses had the same earnings and for married couples with only one wage earner;

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[5] The estimates of the impact of personal accounts and the size of the general revenue transfer are from Diamond and Orszag (2002, table 16), but are based on the OCACT calculations in Goss and Wade (2002). If all workers participate in the personal account program, the net loss to the program would average 1.08 percent of payroll, but the general revenue transfer would rise to an average of 1.23 percent of payroll, producing a net long-range surplus gain of 0.16 percent.

[6] This estimate is also from Diamond and Orszag (2002). With 100 percent participation, both the net loss to Social Security and the additional general revenue transfer would average 0.65 percent of payroll over the 75-year projection period.

[7] Low earners were assumed to have always earned 45 percent of average Social Security earnings ($15,875 in 2002), average earners were assumed to have always earned the average earnings figure used in the wage index series ($35,277 in 2002), high earners were assumed to have always earned 160 percent of the average ($56,433 in 2002), and maximum earners were assumed to have always earned the taxable maximum ($84,900 in 2002).

for workers reaching age 65 in each of six different years between 2012 and 2075; for three different portfolio allocations; and for two different annuitization strategies. The benefit projected under each Model was compared to the benefit that similar workers would have received: (a) in 2001 (adjusted for inflation), (b) if current benefit promises were met fully, and (c) if future benefits equaled only the amount that could be financed from currently scheduled program revenues. (All of the illustrative retirees received higher benefits than their counterparts retiring in 2001.)

In the OCACT calculations, participating in the personal account program under Models 2 and 3 always produces a higher benefit than not participating, and participating under Model 1 always produces a higher benefit if part of the account is held in equities. Participants always gain because OCACT assumes that the returns on equities exceed the returns on contributions to the current system in every year. Under Models 2 and 3, even a portfolio invested entirely in government bonds grows faster than the benefit offset, because the offsets are calculated using a rate below the government bond rate. Because the offset in Model 1 is calculated at a rate above the government bond rate, personal accounts must contain at least some equities in order to grow faster than the benefit offset.

Under Model 2, the adjustment in the general benefit formula to reflect price indexing rather than wage indexing reduces the basic Social Security benefits of all workers relative to current law. The adjustment reduces benefits by 10 percent for those retiring in 2022 and by increasing amounts for those retiring later. By 2075, the basic Social Security benefit is 46 percent lower under Model 2 than under current law. Among steady low earners retiring in 2012 and 2022, the reduction in the general formula is more than offset by the improvements for long-service, low-wage workers. By 2032, however, this change is no longer enough to offset the general benefit reduction.

If assets are held in a mixed portfolio, participation in the personal accounts program can offset a good portion of the benefit reductions due to price indexing, at least for the first 50 years. In the OCACT calculations, the net gain from the personal account is sufficient to give lower earners retiring before about 2060 a higher total benefit than they are currently scheduled to receive. Among average earners retiring between 2022 and 2052, the gain brings total Model 2 benefits to within 7 to 10 percent of currently scheduled benefits. By 2075, however, the gain from personal accounts is no longer able to keep up with the loss from price indexing, and total Model 2 benefits for average earners fall more than 20 percent below currently scheduled benefits. Participation in personal accounts is less effective in offsetting the effects of price indexing for higher earners because of the $1,000 (indexed) cap on the annual payroll tax diversion. By 2075, the combined Model 2 benefit is 25 percent less than currently scheduled benefits for the high earner and 30 percent less for the worker that always earned the maximum.[8]

[8] The figures cited here refer to examples where benefits are taken as CPI-indexed annuities, mimicking the form in which Social Security benefits are currently paid. As noted, OCACT also calculated the effect of taking benefits as variable annuities. As with the personal accounts of the workers, the calculation assumes that the return earned by the variable annuity does not vary from one year to the next and rises with an increase in the fraction of the portfolio held in equities. Under these assumptions, variable annuities produce somewhat higher benefits than CPI-indexed annuities.

In the baseline OCACT calculations, workers hold half of their portfolios in equities, 30 percent in corporate bonds, and 20 percent in government bonds. A more aggressive portfolio, in which 60 percent of assets are held in equities, produces a modest increase in the Model 2 benefit among those who participate in personal accounts. A less aggressive portfolio, in which all assets are held in government bonds, produces substantially lower total benefits. With the more conservative portfolio, the gain from participating in personal accounts is only about one-fourth as large as in the baseline case. By 2075, total Model 2 benefits would fall some 40 percent below currently scheduled benefits for average and above average earners, if they were conservative investors.

Relative to currently-scheduled benefits, one-earner married couples experience somewhat higher reductions than do two-earner couples (or single workers). Participation in the personal account program can help to offset that portion of the couple's benefit loss caused by the general reduction in the worker's benefit, but there is nothing to offset the reduction in the spouse's benefit.

Although Model 2 produces lower benefits than are scheduled in current law in most of the comparisons, in later years it generally produces more than would be paid if Social Security benefit payments were limited to the level that currently scheduled revenues can finance. Under the 2001 Trustees' Report assumptions, Social Security can afford to pay currently scheduled benefits until 2038, when the trust funds are exhausted. Without additional resources, benefits would have to be cut significantly beginning in 2039. By 2042, the affordable benefit would be 27 percent below the currently scheduled benefit; by 2072, it would be 33 percent below currently scheduled benefits.

In the OCACT calculations, workers can get more than the benefit that is affordable at current tax rates, provided they participate in the personal account program and hold a mixed portfolio, but low earners fare better than higher earners. For example, in 2075 the illustrative low earner who has a personal account gets a third more than the affordable benefit, whereas the illustrative maximum earner gets just five percent more. Model 2 provides less than the current system can afford to workers who do not participate in the personal account program and to most workers who participate but hold conservative portfolios. Among all except the lowest earners, 2075 retirement benefits are lower than the affordable benefit if the portfolio is held entirely in government bonds. In other words, getting more than the benefit provided in the affordable baseline requires both participation in the personal account program and assuming the risk associated with holding at least a portion of the portfolio in equities.

Other Analyses

Other analysts have looked at the likely impact of the Commission's proposals using different approaches or different assumptions. Their work provides a more complete picture of the potential impacts, but also illustrates the challenge in comparing benefits between plans that differ in complex and important ways. These other analyses differ in the way their authors calculate baseline benefits, in how they consider the impact of equity return variance on future benefits, and in how they treat variations in earnings levels and patterns among workers.

Baselines. The baseline provides the counterfactual for assessing the benefits produced by a given alternative for a given retiree. The comparison that is both easiest to make and easiest to understand is to the benefits that are promised under current law. The major objection to using current law as a baseline is that it provides what some would regard as an unreasonably generous standard, because the current law promises cannot be financed from current law taxes. To address this concern, analysts have developed various alternative baselines that incorporate benefit and/or tax changes that eliminate the long-range deficit. A problem with these alternatives is that the contours of the baseline, and therefore the implications of the analysis, depend in part on the particular pattern of adjustment the analyst selects.

As noted, OCACT also compared benefits under the Commission models to the benefit that could be afforded with currently scheduled revenues. Diamond and Orszag (2002) raise two objections to the way affordable benefits were calculated for this comparison. First, since the Commission's models require transfers from the general budget in order to balance Social Security's finances, they argue that a comparable affordable benefits baseline should incorporate similar general budget transfers. Second, they note that the size of the benefit reduction needed in any affordable benefits baseline depends on the timing of the reduction. Future benefits could have been higher than those in the Commission's affordable benefits baseline if the reductions had been started earlier.

Although they used current law as the point of comparison for most of their analysis, Diamond and Orszag suggest an alternative to the OCACT affordable benefits baseline. Their alternative begins with the same aggregate general budget transfer as found in the Commission models, and adds additional transfers to fix a problem that Model 2 causes for disabled workers. The disabled worker problem is that the general benefit reductions introduced in Model 2 affect disabled workers and young survivors as well as retirees and aged survivors, but many of the disabled and young survivors will not have time to accumulate sufficient balances in their personal accounts to offset the benefit reduction. The Commission acknowledged this problem with respect to disabled workers (but not young survivors) and urged the Congress to deal with it before adopting the model.

Diamond and Orszag assume that disabled workers will be exempt from revisions to the benefit formula (the gradual reductions in the bend points), which increases the size of the general budget transfer required to balance the system. Using their estimate of the augmented size of the general budget transfer, they calculate that a one-time benefit reduction of 5.9 percent effective in 2009 would be sufficient to balance the system over 75 years. Alternatively, if benefits were reduced gradually along the same time path as Model 2's adjustment to the benefit formula, the reduction would have to be only about one-third as large as the reduction produced by Model 2. By 2075, the Model 2 adjustment would reduce traditional Social Security benefits by 46 percent, whereas Diamond and Orszag calculate that a 14 percent reduction would be sufficient.

Using the alternative method of calculating affordable benefits allows Diamond and Orszag to offer an alternative conclusion about the impact of Model 2. Whereas most personal account participants could expect more than the affordable benefit as calculated by OCACT, most would get less than the affordable benefit as calculated by Diamond and Orszag. This

allows Diamond and Orszag to observe that using the general budget transfer to help finance current law benefits would produce higher benefits for most workers than using it to finance the transition to personal accounts, at least over the next 75 years.

The weakness of the Diamond-Orszag construction (which they acknowledge) is that the benefit levels are only affordable for the next 75 years. Significant benefit and/or tax adjustments would be needed in the 76th year to keep the system solvent. In contrast, the OCACT affordable benefit construction produces a baseline that continues to be affordable beyond the end of the current projection period.

Bosworth and Burtless (2002) use a different strategy for developing an affordable benefits baseline that avoids the need for large adjustments in the 76th year and leads them to different conclusions about some of the impacts of Model 2. Their baseline, which they call "feasible benefits," is constructed on the assumption that Congress will close Social Security's financial gap through equal adjustments in benefits and taxes, implemented on a time schedule that keeps fund reserves equal to 1.0 to 1.5 times annual outlays. In their baseline, benefit and tax adjustments begin in the late 2030s, when the fund would otherwise be exhausted. By 2075, payroll taxes have risen by 24 percent and average benefits have been reduced by 16 percent. The Bosworth-Burtless benefit reductions affect all beneficiaries alive at the time they are implemented, not just new retirees.

Bosworth and Burtless make the Commission's Model 2 comparable to the feasible benefits baseline by calculating the effect on Model 2 benefits of eliminating the general budget transfer. Their assumption is that all of the adjustment comes through further reductions in traditional Social Security benefits. The reductions occur along the same time path as the general revenue infusions that are being eliminated and are applied in the same manner used to generate the feasible benefits baseline.

After the adjustments to make Model 2 comparable to their feasible benefits baseline, Bosworth and Burtless find that the time pattern of winners and losers is different than implied by the OCACT calculations. Specifically, Bosworth and Burtless find that the benefit cuts required to replace the general fund transfers fall most heavily on the cohorts retiring in the next 25 to 35 years. Cohorts retiring in 2050 and beyond fare slightly better under Model 2 than under their feasible benefits baseline.[9]

Net investment returns. Comparisons of the benefits produced by a personal account and those provided by the traditional Social Security program depend critically on the assumptions made about future wage growth and net investment returns. The returns actually realized on the personal accounts will be determined by the interaction of at least three influences: the average rate of return in financial markets in future years, investor portfolio decisions, and administrative costs.

[9] Because the payroll tax rate is higher under the feasible benefits baseline than under Model 2, Bosworth and Burtless base their analysis on a comparison of lifetime income, defined as the combination of wages after payroll taxes and lifetime benefits. For the 2075 cohort, lifetime benefits are a little lower under Model 2 than under the baseline, but that difference is offset by the impact of the higher payroll taxes in the baseline.

Most analyses assume that future financial market returns will be roughly equal to (or a little lower than) average returns in the past, that participants will hold their accounts in a broad, diversified portfolio that earns gross returns equal to the market as a whole, and that administrative charges will be modest. As noted previously, the OCACT's baseline calculations assume that workers divide personal account assets among broadly-based equity investments, broadly-based corporate bond investments and federal government bonds in such a way that the average gross return each year is 4.9 percent above inflation. Administrative charges are assumed to be 0.3 percent, yielding a net investment return of 4.6 percent, which is well above the assumed rate of growth of future wages.

The OCACT assumes that equities will have real returns averaging 6.5 percent over the next 75 years, some 3.5 percentage points above the government bond rate. The U.S. General Accounting Office (GAO) employs essentially the same assumptions (U.S. GAO 2003a). Bosworth and Burtless assume equities will return 5.9 percent on average, which is slightly more conservative than the OCACT. The difference in their equity returns assumption would produce slightly lower Model 2 benefits than are estimated by OCACT, but probably had no discernable impact on the important conclusions in their report.

The OCACT assumption about future equity returns is somewhat lower than the actual average return over the previous 75 to 100 years, but is consistent with the views of many current market analysts. For example, in papers prepared for the Social Security Advisory Board in 2001, Shoven suggested assuming average growth of 6.0 to 6.5 percent per year and John Campbell suggested assuming that the gap between equities and government bonds would be between 3.0 and 4.0 percentage points (U.S. Social Security Advisory Board, 2001). Diamond criticized earlier OCACT calculations that assumed 7.0 percent real returns (Diamond, 1999), but he and Orszag generally endorsed the OCACT assumptions used in these calculations (Diamond and Orszag, 2002). In 1999, The Committee on Investment of Employee Benefit Assets (CIEBA) asked leading economists at Morgan Stanley, Goldman Sachs, J.P. Morgan Investment management and Invesco Global strategies for their assessment of future equity returns. The consensus was that the gap between equities and government bonds would be between 1.0 and 3.0 percentage points, somewhat lower than the OCACT assumption (CIEBA, 1999).

The OCACT assumption about administrative costs is more controversial.[10] Several recent studies have tried to estimate the cost of operating personal accounts through a centralized model patterned after the Federal Thrift Savings Plan (TSP). The OCACT assumption that administrative costs would average 0.3 percent of assets is consistent with some, but not all of the studies. For example, James et al (2001) conclude that a highly centralized system with limited choice could be run for between 0.2 and 0.8 percent of assets, depending on whether the assets were managed actively or passively. Diamond (2000) reaches a similar conclusion, provided all accounts are managed centrally. On the other hand, Cavanaugh (2002), who helped organize the Federal Thrift Plan and served as its first executive director, believes that the administrative costs of a centralized system would be substantially higher than those of the Federal Thrift Savings Plan. One factor he cites is the difference between dealing with one employer that has a highly automated payroll system and a stable workforce and dealing with

[10] For an additional review, see U.S. Congressional Budget Office (2004).

millions of small employers who lack both. His guess is that it might cost $300 per year per account if the Thrift Plan model were used.

The best current example of a government agency that is actually running a centralized system of individual accounts is the Premium Pension Authority in Sweden. Whitehouse (2000) reports that the cost of simply maintaining the records on the individual accounts in Sweden runs 0.3 percent of assets, and Turner (2002) estimates that investing in the largest and most efficient funds through the Swedish system will involve total administrative charges of 0.75 percent of assets.

Diamond and Orszag (2002) note that the OCACT administrative cost estimate is inconsistent with the Commission's recommendation that holders of accounts over a specified amount (they suggested $5,000) be given the option of shifting their account to a private account manager where they will have access to a wider choice of investment vehicles. Diamond and Orszag note that if most of the larger accounts are shifted to private managers, the average balance of the remaining accounts will be far too small to allow their management for the equivalent of 0.3 percent of assets. Diamond (2000) calculates that centralized management would cost $40 to $50 per account. If the average account balance is only $5,000, Diamond's estimate would imply administrative costs for the centralized portion of the system of about 0.8 percent of assets. Cavanaugh's (2000) much higher estimate of the cost of running a centralized system would be the equivalent of 6.0 percent of assets.

Moreover, if personal account holders do choose private management, the administrative charges will be substantially higher. James et al. (2001) estimate that costs in actively managed mutual funds in the U.S. average about 1.4 percent of assets. Boogle (2003), founder of the Vanguard Group of mutual funds, estimates that the administrative charges in the average equity fund averaged 2.9 percent per year over the period 1984 through 2002. He bases this on a comparison of the theoretical returns earned on the Standard and Poor's 500 Index over that period to the actual returns of all of the equity funds in existence over the same period. If the Boogle estimate of administrative costs is accurate, the net equity returns on the personal accounts would be only 3.6 percent per year, not the 6.2 percent assumed by OCACT, and the gain from participating in personal accounts would be substantially smaller than OCACT estimates.

A final issue is the allocation of personal account portfolios. Most analyses assume that account holders aim for a balanced and diversified portfolio, and that they continuously rebalance their portfolios to maintain that balance. As noted, the OCACT assumes a portfolio composed of 50 percent equities and 50 percent bonds. Bosworth and Burtless make the same assumption.

Dalbar, Inc. (2003), a Boston financial-services market research firm, recently analyzed the actual flows of funds into and out of equity funds over the 1984 to 2002 period, and found that actual investors do not hold balanced portfolios. Instead, investors tend to shift funds into equities after the markets have been rising for some time and to shift out of equities after markets have fallen. The result of this perverse market timing is that, according to Dalbar's calculation,

the average equity investor actually earned a nominal average return of 2.6 percent per year over this time period, 0.5 percent per year less than the average rate of inflation.[11]

Variance in Investment Returns. The assumption of constant annual returns is a useful construct for understanding the likely overall impact of a personal account reform, but it hides the variability that personal accounts introduce into workers' retirement planning. Historically, equity returns have averaged between 6.0 and 9.0 percent per year after inflation, but the standard deviation of the annual rates of return has been around 15.0 to 17.0 percentage points. If annual equity returns follow a simple normal distribution and the past is taken as a guide to future, the standard deviation of the average annual return over an entire 35-year work career will be about 2.5 percentage points.[12] If equities return an average of 6.5 percent per year each year, the average return over an entire 35 years will fall within one standard deviation of the mean, between 4.0 percent and 8.0 percent per year, for two-thirds of the cohorts of retirees. But, that means that one out of every six cohorts will enjoy returns that exceed 8.0 percent per year while one out of every six will experience returns averaging less than 4.0 percent per year. The annuitized benefits from the personal accounts of the lucky cohorts will be over twice as high as those from the personal accounts of the unlucky cohorts.

Both Bosworth and Burtless (2002) and the GAO (2003) explicitly model the impact of year-to-year variation in the returns earned on personal accounts. Bosworth and Burtless analyze the impact of 100 independent iterations of the effect of equity return variance on future benefit income.[13] They find that the standard deviation of the benefits generated by the personal accounts in Model 2 is a little over 40 percent of the mean value of those benefits and about 25 percent of the mean value of the combined retirement benefits produced under Model 2. The variability of the benefits under Model 2 rises gradually with successive cohorts after 2050 because the real wage adjustment gradually reduces the relative size of the traditional Social Security benefit.

The GAO used a similar approach to estimate the distribution of winners and losers among personal account participants. Their analysis of Model 2 suggests that 83 percent of the participants in the cohort reaching retirement age in 2037 and 90 percent of the participants in the cohort reaching retirement age in 2052 would gain from participating in the personal accounts relative to those that did not choose this option. The remainder, 17 percent of the earlier cohort and 10 percent of the later one, would find that their benefit offset was greater than the value of their account balance.

The GAO also compared simulations of the benefits produced under the Commission plans to the benefits provided under current law and to the OCACT definition of affordable benefits. On average, Model 2 benefits for later cohorts are less than the benefits promised by

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[11] Dalbar estimates that the average fixed income investor earned a higher return than the average equity investor, although not as high as OCACT is assuming for future bond investors.

[12] The standard deviation of the average of N independent items drawn from a normal distribution is the standard deviation of the distribution divided by the square root of N.

[13] Bosworth and Burtless assume that workers invest accounts 50 percent in equities and 50 percent in government bonds. They ignore any variation in bond returns, arguing that most of the historic variation in government bond returns can be traced to changes in unanticipated changes inflation and that the introduction of price-indexed government bonds removes this factor.

current law, but the GAO simulation found that 28 percent of personal account participants in the 2037 cohort and 40 percent of the participants in the 2052 cohorts received more under Model 2 than under current law. Similarly, Model 2 produces higher benefits, on average, than the OCACT affordable benefit baseline. The GAO simulation found, however, that 13 percent of the earlier cohort and 20 percent of the later cohort would get less under Model 2 than under the affordable benefit scenario.

Simulations such as those undertaken by Bosworth-Burtless and the GAO show *ex post* calculations of the effect that return variation has on benefit predictability. Diamond and Orszag (2002) address the issue on an *ex ante* basis. They argue that the difference between average equity returns and average government bond returns represents the market's assessment on the value of avoiding the risk associated with equity investment. According to this view, taken as a whole, workers should be indifferent between holding their accounts in government bonds and holding a portion of their accounts in equities. The higher average return to the account held partially in equities is compensation for the greater uncertainty about the value of the benefit it will ultimately produce. The best indicator of the risk-adjusted value of the benefits produced under a personal accounts model is the amount generated when the portfolio is held entirely in government bonds. As noted, the OCACT's calculations suggest that the Model 2 benefits produced when the portfolio is held entirely in government bonds tend to be lower than their affordable benefits baseline.

Variation in Earnings Patterns. The OCACT calculations focus on hypothetical workers that always earn a constant multiple of the average earnings of all workers under Social Security. This construct simplifies the calculation and provides a picture of general trends in relative benefit levels, but is not very effective in conveying how different types of workers are likely to actually fare under the program.

Bosworth and Burtless examine the impact of Model 2 on workers with ten different earnings patterns. They derive these earnings patterns from work that Burtless did in connection with the Social Security Administration's Modeling Income in the Near Term (MINT) data system. [14] These profiles represent average earnings trajectories of actual workers, with the workers divided into nine different groups based on their average lifetime earnings levels and their lifetime earnings trajectories. The groups cover high, average and low lifetime earnings and increasing, decreasing and constant lifetime earnings trajectories. The tenth group is a weighted average of the other nine.

Bosworth and Burtless find that, relative to their feasible benefits baseline, low earners fare better than high earners and those with declining lifetime earnings trajectories fare better than those with increasing lifetime trajectories. The more favorable result for low earners is consistent with the OCACT analysis and seems to reflect the impact of the $1,000 (indexed) cap on annual contributions to personal accounts. The more favorable result for those with declining lifetime earnings trajectories reflects the fact these workers made relatively larger deposits to their individual accounts early in their careers, allowing more time for the invested balances to grow.

[14] See Toder et al. (1999) and Bosworth and Burtless (2000).

The GAO also reports calculations of the impact of the Commission's proposals disaggregated by the quintile of the worker's current law Social Security benefit. They find that the workers in the lowest benefit quintile that participate in personal accounts receive, on average, slightly more under Model 2 than is promised under current law. In contrast, participating workers in the highest benefit quintile receive less than the benefit promised under current law, but more than would be possible under an affordable benefits baseline. These results are consistent with the patterns seen in the OCACT calculations for the illustrative low and high earners.

3. Methods for Analysis

Our analyses focus on the impact of the changes Model 2 outlines. We focus on just one of the Commission models in order to keep the analysis manageable. We selected Model 2 because it is the only one that, in the absence of the optional personal accounts, generally would balance the program over the entire 75-year projection period without the need for transfers from the general budget.[15] Model 2 also appears to be the one referred to most often to illustrate the potential impact of personal accounts.[16]

The analyses follow the procedure adopted by OCACT (and also used in the GAO analysis) that compares Model 2 benefits to both current law promises and an adjusted current-law baseline constructed without general budget transfers. In effect, we adopt one baseline that many would consider to be unreasonably high and another that many would consider to be unreasonably low. This allows us to focus on differences among socio-economic groups without independently assessing the relationship between Model 2 benefits taken as a whole and some reasonable alternative to Model 2.

We use the current version of the Urban Institute's Dynamic Simulation of Income Model *(DYNASIM3*) to simulate the current law baselines, the Commission's Model 2, and Model 2 with alternative assumptions about personal account take up, rates of return, and administrative costs.[17] Before beginning, we enhanced *DYNASIM3* by adding new functions that simulate responses to voluntary account availability and individual portfolio allocation.[18] These functions are optional so that we can simulate the effects of Model 2 with and without these features of individual behavior. *DYNASIM3* produces outcomes as far into the future as 2050, enabling an analysis of benefits in the hybrid system at retirement for most current workers. Rather than examining the impact of personal accounts on a subset of prototypical workers, we examine a large, nationally representative sample of Social Security beneficiaries.[19] In our

[15] As shown below, our estimates predict a shortfall in revenues for 2050 due, in part, to the increased minimum and widow(er)'s benefits.
[16] For example, Council of Economic Advisors (2004), Chapter 6
[17] The specific release of the model that we use is run number 378. This version of the model includes a relatively simplified version of projections of immigrants after model baseline (1992). Subsequent versions of the model include immigrants in more detail. The principle implication of this more simplified immigration model is that near-poverty rates, which are higher among immigrants than among the native born, may be understated. We thus suggest conservative interpretation of our results.
[18] See Favreault and Smith (2004) for a detailed description of the model and its other recent uses.
[19] Numerous reviews have thus identified dynamic microsimulation as an appropriate technique for distributional analysis of this type (see, for example, Burtless, 1996, Citro and Hanushek, 1997, Technical Panel, 1999).

analysis, we disaggregate the beneficiary population along a number of dimensions, including education, marital status, race, and average lifetime earnings.

The current starting database for *DYNASIM3* is a self-weighting sample of about 100,000 individuals from the 1990 to 1993 panels of the Survey of Income and Program Participation (SIPP*). DYNASIM3* ages this starting sample in yearly increments. The annual aging process includes birth, death, disability, leaving home, schooling, marriage and divorce, work/earnings, and wealth accumulation.[20] All core demographic and economic processes in *DYNASIM3* are differentiated along many dimensions, including educational attainment, lifetime earnings, ethnicity/race, marital status, sex, and cohort, allowing for a wide range of distributional analyses. This sequence of processes creates a file with earnings, disability, and marital histories that can be used to compute entitlement to benefits from Social Security. In making these computations, *DYNASIM3* stochastically assigns the timing of Social Security benefit take-up. It bases this decision on individual and, where applicable, spousal characteristics, leading to a distribution of take-up ages that resembles those observed historically, with take-up concentrated at age 62 and differential by sex, education, and lifetime earnings.[21] Appendix table A2 details *DYNASIM3's* modules, including information on the specification of each module and the data on which the parameters were estimated.

Forecast Period and Assumptions

We focus on *DYNASIM* results from the year 2050. By that time, provisions of the Commission's model would have been phased in over 46 years. The very youngest retirees in 2050 would have participated in the program for essentially their entire careers. For example, persons age 62 in 2050 (those who were born in 1988) would have been only age 16 in 2004, the first year that the proposals take effect. Older retirees in 2050 would have participated in the program for fewer years.[22] Because our 2050 population includes people who have been in the reformed Social Security program for varying amounts of time, our aggregate results largely reflect the effects of the phase in of the program. Differences in account balances by age, for example, will reflect differential amount of time that the account had to accrue. Results broken out for retirees at the youngest ages (62 to 64 and 65 to 69) do reflect the fuller effects of the proposed system. We therefore focus our sensitivity analysis of the Model 2 impacts to those ages 62 to 69 in 2050.

Simulating the Current-Law Baselines

We first produce a current-law promised baseline by calibrating future fertility, mortality, labor force participation, and wage and price growth in the *DYNASIM3* model to the intermediate assumptions of the OASDI Trustees (Board of Trustees, 2002). This baseline ignores solvency

[20] Two separate steps comprise the aging process. First, microdynamic equations, usually estimated from family- or individual-level longitudinal data, predict individual or family transitions. Second, alignment ensures that family or individual outcomes meet groupwide targets, usually derived from more aggregated data.

[21] This offers an improvement over other analyses, which assume more uniform behavior (for example, all workers retire at the normal retirement age).

[22] We exclude persons age 101 and older in 2050 from all tables, as they would not have been eligible to participate in the voluntary accounts under the CSSS plans as currently specified.

issues and assumes that there would be sufficient revenues to support currently scheduled benefits.

While current-law promised benefits provide one comparison for Model 2 results, the comparison is somewhat inappropriate because Model 2 contains provisions that attempt to achieve solvency in the system. The most recent Trustees' Report estimates that revenues will be sufficient to finance only 73 percent of scheduled annual benefits by 2042 (Board of Trustees, 2004). The system will require more revenues, benefit reductions, or both. Following OCACT's and GAO's leads, we produced an alternative baseline that reduces all benefits proportionately in 2050 so that total costs match the currently-scheduled revenues (under the 2004 Trustees' Report).[23] We refer to this alternative as the current-law affordable baseline. We also simulated another, current-law adjusted baseline that proportionately adjusts benefits so that total benefits in 2050 would match the simulated cost of Model 2 in 2050 before private accounts are added. As we show below, Model 2 would cost somewhat more than current-law scheduled revenues in 2050 because the move away from a wage-indexing formula in 2009 does not cover the full gap between projected revenues and promised benefits, and because the new minimum and survivors' benefits add some costs to the system.[24] For most of our results, we compare Model 2 with both current-law promised (CLP) and current-law adjusted (CLA) benefits to bracket the most likely scenario.

It is important to note, however, that Congress would not necessarily cover the OASDI trust fund shortfall through a simple, proportional benefit cut. Some alternatives, for example, would fill the gap through a combination of new revenues and benefit cuts, and the benefit cuts may be progressive rather than proportional.

Simulating Model 2

In our baseline Model 2 scenario, we use the OCACT assumption that all workers opt to participate in personal accounts. We further follow OCACT in assuming that personal account contributions are allocated 50 percent to stocks and 50 percent to bonds, that administrative costs equal 0.3 percent of account assets, and that stocks earn a constant 6.5 percent real rate of return and bonds earn a constant 3.3 percent real rate of return. (The 3.3 percent rate of return on bonds is the average of the returns on government and corporate bonds, 3.0 and 3.5, respectively, weighted by the distribution of bond holdings used by OCACT.)

As discussed above, Model 2 attempts to achieve solvency by reducing the wage replacement rates in the benefit formula by the measure of real wage growth in the second prior year beginning in 2009. This change effectively reduces benefits for all future beneficiaries in a roughly proportional way. The change would be phased in gradually, so that older generations will earn higher real benefits relative to their earnings than younger generations.

[23] Specifically, we implement across the board benefit cuts ranging from 27 percent in 2042 to 28.8 percent in 2050.
[24] As discussed in the OCACT's report, Model 2 also would require substantial general revenues to finance the transition to the new system because workers contributions to personal accounts will not be available to finance current benefits. The transition costs, which decline across time, are not taken into account in these simulations because they would mostly be phased out by 2050.

Model 2 also includes a new minimum benefit equal to 120 percent of the poverty line for workers with more than 29 years of covered work (and prorated for workers with 21 to 29 years). It also increases widow(er)'s benefits to 75 percent of a couple's total benefit (rather than 100 percent of the higher earnings spouse) if this provides a higher benefit. The new widow(er)'s benefit is capped at the benefit received by survivors of average-wage workers in order to target the benefit to low- and moderate-income survivors.

In addition to these changes to the basic Social Security benefits, Model 2 allows workers to divert 4 percentage points of the Social Security payroll tax, up to a maximum of $1,000 into a personal account. At the time of retirement, workers with personal accounts would receive a reduced benefit and the annuitized value of their personal account balance.[25] The annuity is calculated assuming indexing, unisex pricing, and mandatory survivor protection. The basic benefit would be reduced by the value of the individual's personal account total contributions assuming that the contributions earned a real annual rate of return two percent.[26] Also key to the results is the assumption that workers would not have access to their personal accounts prior to retirement.

Finally, we make two important assumptions about how account accruals are shared across families in cases where spouses do not reach retirement as a couple. We assume that a spouse inherits the personal account of any married worker who dies prior to retirement. Upon divorce, we assume that couples equally split all personal account accruals made over the course of their marriage (i.e., where spouses earnings are unequal, the spouse with higher earnings transfers part of his/her accruals to the spouse with lower earnings).

Personal Account Sensitivity Analyses

For our core analyses, we simulate six additional scenarios that alter the OCACT assumptions one by one, so that each simulation includes the cumulative effect of the prior assumptions (table 2). All other basic and Model 2 assumptions described above remain constant throughout the scenarios.

Scenario 2 (Variable Participation). Whereas the baseline scenario 1 assumes full participation in the personal accounts, scenario 2 assumes that individuals will choose to participate in personal accounts, based on recent data on investment attitudes. Using this method results in a personal account participation rate of 63 percent among those ages 62 to 69 in 2050.[27]

[25] We do not vary the annuity terms in the sensitivity analyses for this paper. We have considered distributional aspects of varied annuitization parameters in previous work (Uccello et al. 2003), as have other authors (e.g., Liebman 2002).

[26] The President's Commission report states that "in practice, this could be computed in one of several ways, including (a) 2 percent above the realized inflation rate for each year and (b) one percent below the realized market yield on long-term Treasury bonds for each year" (p. 83). We opt for the former method.

[27] OCACT provided two participation assumptions, 100 percent and 67 percent. They argued that under the set of parameters simulated individuals would always do better under personal accounts, and, therefore, most would participate. Their 67 percent scenario is closer to those found in our alternative scenarios. A key difference is that their rate does not vary by an individual's personal characteristics.

In particular, we used measures of risk aversion from the 1995, 1998, and 2001 Survey of Consumer Finances (SCF) to project participation. We assume that individuals who report that they are more risk averse would be less likely to participate in a new personal account system than those who report higher tolerance of risk. We use risk aversion rather than defined contribution pension participation (for example, in 401(k) plans) to model participation because the decision to make any contributions to a defined contribution plan is fully voluntary.[28] It is, essentially, a decision about whether a worker wishes to save using this particular type of financial instrument with particular tax advantages. In contrast, the decision to participate in Social Security is not voluntary. Once workers are in the system, their contributions are defined by law. Under Model 2, Social Security covered employees can choose between a fully-guaranteed benefit under the traditional system or a combination of a smaller guaranteed benefit and the returns from a personal account. Although the personal account is likely to provide a higher benefit, it has a nontrivial probability of being lower. Tolerance for risk, therefore, will play a role in the choice between the two options (though the extent of this role is likely to depend heavily on program defaults and worker education).[29]

We estimated a probit model to predict the probability than an individual is willing to take risks (we include the results of the probit functions in appendix table A3). We defined this outcome as expressing in the survey a willingness to accept average risk for average return, above average risk for above average return, or substantial risk for substantial return, as opposed to expressing unwillingness to take on any risk.[30] We find that willingness to take risks decreases with age and poor health status, but increases with education, private pension coverage, non-retirement wealth, and homeownership. We use these predictive equations in *DYNASIM3* to simulate which individuals will choose to participate in the personal account plan.[31] Consistent with OCACT assumptions, our simulation prohibits participants in the voluntary accounts from subsequently opting out.

Scenario 3 (Variable Allocation). Scenario 3 builds on scenario 2 by also assuming that individuals will allocate their personal account contributions across stocks and bonds in a pattern

[28] Springstead and Wilson (2000) describe and contrast participation patterns in Individual Retirement Accounts (IRAs), 401(k) plans, and the federal government's Thrift Savings Plan. Their results stress the importance of earnings, incentives, investment options available, and investor education as determinants of participation.

[29] Substantial research from behavioral economics suggests that default choices are likely to strongly influence participation (for example, Choi, Laibson, Madrian, and Metrick 2002, and Madrian and Shea 2001). International literature highlights the importance of worker education to choice (U.S. GAO 2003b).

[30] The question in the SCF offered the respondent these four alternative responses. (The actual question wording was: "Which of the statements on this page comes closest to the amount of financial risk that you [and your (spouse/partner)] are willing to take when you save or make investments?"). Interviewers were instructed to read the respsonses only if necessary, and to use the first category that applies if more than one response was given.

[31] We apply the probit model at age 25 or the first start year of the accounts (2004), as appropriate, based on birth cohort. For simplicity, we assume that individuals only get one chance to opt into the program (the first point at which they have positive covered earnings). Because of this simplifying assumption, readers may wish to interpret the results conservatively. (For individuals who opt into the program at age 25, we adjust the start date of personal account accumulation back to age 17, or the first year that accounts exist, so that earnings over a full lifetime career accumulate in the account.)

similar to that observed for individuals participating in 401(k) accounts.[32] Using recent data from the SCF, we estimated an ordered probit model to predict each personal account participant's broad asset allocation strategy (e.g., mostly stocks, mostly bonds, or evenly split between stocks and bonds).[33] Individuals' investment decisions vary by their demographic and economic characteristics (see appendix table A4 for the actual parameters of the equation). The results show that in the estimation sample nonmarried women, blacks, and Hispanics are significantly less likely than their counterparts to follow an aggressive investment strategy with more than half of their assets invested in stocks, even net of age, education, family earnings, and family pension coverage. In the simulation, an individual's personal account contribution allocation strategy can change year by year, as age, earnings, marital status, or other factors change that have a bearing on investment attitudes.[34]

Scenario 4 (High Administrative Costs). Scenario 4 assumes that private account returns would require higher administrative costs. As discussed earlier, OCACT's assumption that the cost of administering private accounts would be 0.3 percent of assets is controversial. Some experts expect costs as high as 6 percent. This simulation assumes that administrative costs would be 1.4 percent, following the average suggested by the historic costs of all mutual funds (James et. al. 2001). This administrative cost estimate would be more consistent with a system that allows workers to choose private, decentralized management if their accounts are above a certain size. As discussed earlier, if current experience among 401(k) and mutual funds is any guide, those who opt out will experience higher administrative costs. Opting out also will increase the costs (relative to assets) of the accounts that remain by reducing the asset base across which fixed costs must be spread.

Scenario 5 (Rate of Return Variations). Scenarios 1 through 4 assume an average rate of return on personal accounts that remains constant over time. Under this scenario, we allow for variations in the rates of return in two ways. First, we modify the rates of return to simulate the effects of higher and lower rates of return across time. Second, rather than assuming constant rates of return over time, we build in variation around the average rates of return using historic market performance.

We test two alternative rate of return scenarios. Under our higher return scenario, real rates of returns for stocks and bonds are assumed to increase by 1.0 percentage point, to 7.5 percent and 4.3 percent respectively. Under our lower return scenario, stock and bond returns are assumed to decrease by these same amounts, to 5.5 percent for stocks and 2.3 percent for bonds.

We also test two alternative scenarios regarding variations in returns over time. The first applies historic variations in returns to corporate stocks, corporate bonds, and government bonds over the period from 1957 to 2003 to the assumed average rates projected for the years 2004 to

[32] There is certainly some selectivity among 401(k) participants (relative to the population of workers more generally), so we must interpret the results that we derive from applying this model on a broader population conservatively.

[33] We assume that those simulated as holding mostly stocks allocate two-thirds of their account portfolio into stocks and one one-third into bonds, while those holding mostly bonds do the reverse.

[34] We do not assume that individuals rebalance their portfolios (i.e., all assets remain in the class to which they were initially allocated until retirement).

2050.[35] For instance, the variation from the historic average in the year 1957 is used to predict rates of return in 2004, variations in 1958 are used to predict rates of return in 2005, and so on. The average return over the projection period still matches the one provided by OCACT, but an individuals' account returns will be affected by the rate of return achieved through the year benefits begin.[36] Our second variation applies the historic variations in returns over the period from 1957 to 2003 to the assumed average rates projected for the years 2004 to 2050 in reverse order. That is, the variation from the historic average in 1957 is used to predict rates of return in 2050, variations in 1958 are used to predict rates of return in 2049, and so on. (Appendix table A5 presents the rates of return assumed under these two alternatives.) These trends provide two hypothetical scenarios to demonstrate how trends in market performance could affect personal account balances and Social Security benefits.[37] It is not that we expect history to repeat itself; no one can reliably predict future market performance.

The three alternatives for the rates of return (average, low, high) combined with the three alternatives for variations in returns over time (none, historical market variations, historical market variations reversed) result in eight additional scenarios. (The scenario assuming average rates of return with no market variations over time and transaction costs of 1.4 percent is already presented as scenario 4). The tables we discuss in the results section below include only two of these combinations—the high rate of return with historical market variation (scenario 5a) and the low rate of return with market variations reversed (scenario 5b). These reflect the highest and lowest average private account values, respectively, and thus provide a reasonable bound for the range of potential results when take-up is not full. An appendix table (Appendix table A6) displays the full results for each of the eight alternatives.

Scenario 5a shows that higher returns could offset the effects of some of the other assumptions (such as the higher administrative costs). On the other hand, scenario 5b provides the least favorable set of assumptions regarding private accounts compared with the OCACT results. Scenario 5b could also provide a proxy of the results for investors who suffer from perverse market timing when they allocate their account contributions (i.e., they tend to "buy high" and "sell low").

4. The Results

Our results begin with the comparison of *DYNASIM3* Model 2 projections assuming full participation to several baselines (including current law promised and current law payable), and then turn to the sensitivity analyses. The outcomes we examine include average total benefits, average personal account annuities, winners and losers (and average gains and losses) relative to baselines, and near poverty rates. We examine these outcomes by a wide array of characteristics, including age, education, lifetime earnings quintile, marital status, race, and work history.

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[35] We draw historical rates primarily from Ibbotson Associates (2003). To match the assumed rates, we apply a simple scalar adjustment so that the arithmetic means match the OCACT targets.

[36] OCACT assumes that annuitization would occur at the time of benefit entitlement, and additional accruals are immediately annuitized. The DYNASIM3 simulations do not account for additional, post-retirement accruals.

[37] We do not attempt to incorporate these changes into a more sophisticated model of the macro-economy or into complex behavioral models. Rather, our claims are more modest and focus on what would happen if a series of changes to returns were to occur in a context in which other OASDI Trustees' assumptions remained constant.

The Baselines: Model Two Compared with Current Law

Under current-law promised (CLP) benefits, annual benefits for persons age 62 and older in 2050 who are receiving Social Security would average $18,817 (2004 dollars, in table 3). Our estimates also show that currently scheduled revenues, given the intermediate economic assumptions, can only support an average annual benefit of $13,393 in 2050 (71.2 percent of CLP). The current-law adjusted (CLA) benefits scenario, however, would provide an average annual benefit of $14,432 (76.7 percent of CLP). We derived this estimate by matching the simulated basic system costs of Model 2 in 2050, excluding the costs of establishing personal accounts. The new minimum and widow's benefits in Model 2 would increase 2050 costs relative to CLP by small fractional amounts (only 0.1 and 0.5 percent of the average benefit, respectively, as shown in table 3). Moving to a price-indexed benefit formula beginning in 2009 would reduce costs to 75.7 percent of CLP by 2050 ($14,242), somewhat higher than the estimated affordable benefits. Combining the price-indexed formula with the new minimum and widows' benefits would require revenues equal to 76.7 percent of CLP benefits.

Using OCACT's assumptions regarding Model 2, the *DYNASIM3* estimates for 2050 show that individuals' average annual basic benefit would be 63.2 percent of CLP and the personal account annuity would provide 24.9 percent of CLP. The total benefit including the annuitized personal account would thus average 88.1 percent of CLP, significantly higher than the CLA benefit ($16,571 compared with $14,432).

Benefits in 2050, by Age and Benefit Type. As expected, average annual benefits in Model 2 (the basic benefit plus the annuitized personal account) fall below current-law promised benefits and above current-law adjusted benefits for nearly all beneficiary groups and cohorts age 62 and older in 2050 (table 4). Disabled beneficiaries age 62 to 64 provide the one exception, with estimated benefits of 71.4 percent of CLP compared with the CLA 76.7 percent benchmark. The less favorable benefits for the younger disabled beneficiaries under Model 2 reflect the assumption (drawn from Commission plan language) that disabled beneficiaries cannot annuitize their personal accounts prior to the normal retirement age. (Although not included in this analysis, disabled beneficiaries younger than age 62 would also fare worse under Model 2.) Also as expected, older cohorts receive benefits closer to current-law promised in Model 2 because the transition to the price-indexed formula, which decreases benefits, phases in over time.

The total average benefit for retirees age 65 to 69 in 2050 (workers affected by the new system for most of their career) would be 85.8 percent of CLP, including a basic benefit of 48.9 percent of CLP and a personal account annuity of 36.8 percent of CLP.[38] The personal account annuity becomes a larger share of the total benefit over time. The importance of the personal account annuity in determining the total Social Security benefit underscores the need to make sure that assets in individual accounts are preserved for retirement. If workers were allowed to cash out part or all of their personal accounts prior to retirement, the personal account annuity and total benefit would be lower.

[38] In this table, we include dual entitlees with spouses and survivors, rather than retirees. Alternative tabulations are available upon request

The results also show that total benefits fall closest to those promised under current law for survivors, on average, given the assumptions about inheritance of a spouses' private account accumulations and Model 2's new widow(er)s' protections. This group receives 92.5 percent of CLP benefits in 2050, on average. Since adult survivors inherit their spouse's personal account balance, their benefit levels are relatively protected. (The analysis does not include child survivor beneficiaries who would represent a significant challenge for a system with personal accounts if, for example, balances would be divided across all surviving dependent beneficiaries. This type of rule also would leave a smaller balance for some surviving spouses.)

Table 5 shows the share of winners and losers by age and beneficiary type. As noted, most beneficiaries do not get as much under the Model 2 baseline as is promised under current law. Some, however, will have higher benefits in Model 2 than in CLP, primarily because of the new minimum and widow(er)'s benefits. For example, nearly one in five spouses/survivors receive higher benefits in Model 2 than in CLP, with an average gain of 9.8 percent. The new minimum benefit affects older cohorts more than younger ones because it provides a benefit that is 120 percent of poverty, and poverty is indexed to prices. As many workers have real gains in earnings, the minimum benefit will be higher than they would receive otherwise for fewer workers over time. In addition, the phasing in of the new lower benefit formula means that this change will impact older retired workers less. Taken together, these two factors imply greater fractions gaining at older ages in 2050. For example, 11.3 percent of retirees ages 85 and older would do better in Model 2 than CLP compared with just 5.5 percent of those ages 80 to 84.

As we also noted earlier, most beneficiaries get more under Model 2 than under the current law adjusted scenario. Focusing on all retired workers, 96 percent win relative to CLA, and, on average, their total benefits are about 14 percent higher. Results for survivors are also quite favorable relative to CLA. As expected, disabled beneficiaries age 62 to 64 tend to be losers relative to CLA, mostly because they cannot annuitize their personal account balances before the full benefit age, and because they have not had as many years to build their personal account balances. As noted in the Commission report, Congress would need to consider adjustments to disability benefits and treatment of their personal accounts before implementing Model 2.

Benefits for Cohort Age 62 to 69. Members of the cohort ages 62 to 69 in 2050, who were ages 21 to 27 in 2009 when the wage-indexed benefit formula begins to phase out, represent a group affected by the new system for most of their lives. Their basic benefits would be substantially reduced relative to the current-law wage-indexed formula, but they also have most of their careers to build up their personal accounts. Excluding disabled beneficiaries, the personal account annuity for this age group ($7,009) comprises 44.9 percent of their total benefit in 2050 (table 6).[39] The base benefit and the annuitized personal account benefit combined provide 86.2 percent of CLP and 112.4 percent of the CLA baselines, respectively.

Also, some subgroups within the age 62 to 69 population fare better than others. Average benefits (basic plus personal account annuity) for widowers and widows, for example, exceed CLA benefits by 22.9 and 25.4 percent, respectively, compared with benefits that are about 9 and

[39] For technical reasons, we also exclude persons with significantly younger spouses (spouses who are less than 50 at the time of the worker's benefit claiming) from these analyses.

12 percent higher for their married counterparts. The personal account annuity benefits for widowers' and widows are higher for two reasons. First, individuals whose spouses had already begun collecting personal account benefits at the time of their death will receive a two-thirds survivor benefit. Second, individuals whose spouses had not already begun collecting personal account benefits at the time of their death will receive a transfer of their spouses' account balances.

In contrast, married women receive lower average benefits than never married women (in part reflecting uncompensated reductions in spousal benefits). However, these benefits reflect an individual's own benefits only, and thus understate the total benefits paid to a married couple. Also, benefits are higher in absolute terms for the college educated, those with more years of work experience and higher shared lifetime earnings (defined as shared husband and wife earnings over the duration of a marriage and individual earnings for intervals over which one is not married) than for other groups, more or less perpetuating the distributions found in the current-law system.

Interestingly, ratios of Model 2 both to Current Law Adjusted and scheduled Current Law benefits are higher for those in the lowest shared lifetime earnings quintile than for those in higher quintiles.[40] This relatively favorable treatment at the bottom of the earnings distribution reflects several elements of the Model 2 design, including the cap on personal account contributions (initially $1,000 annually, indexed for wage inflation), plus the minimum benefit and enhanced survivor benefits.

Sensitivity of Personal Account Benefits to Assumptions

Personal account balances and annuities are highly sensitive to assumptions about individual take up, portfolio allocation, administrative costs, and market returns. It is easiest to see these effects by focusing on personal account participants age 62 to 69 in 2050, because this age group would be under a personal account system throughout their working lives.[41] Also, this analysis excludes disabled beneficiaries because, as the Commission acknowledged, Model 2 does not work for them. Table 7 compares the average annuitized personal account balances for each of five scenarios to those for Model 2 using OCACT's assumptions (Table A6 provides results for the six additional scenarios).

Under scenario 2, we alter the assumption regarding full participation and instead assume that individuals decide whether to participate in personal accounts based on their preference for risk. Under this scenario, 63.1 percent of 62 to 69 year olds participate in personal accounts.[42] Average personal account benefits of participants are just slightly lower under this scenario ($6,954) compared with the Model 2 scenario that assumes full participation ($7,009). This

[40] This result is broadly consistent with the other distributional studies we cited earlier.

[41] Again, we also exclude those with much younger spouses (i.e., spouses under age 50) from the tabulation.

[42] This is significantly lower than the fraction reporting willingness to take financial risks in the SCF (as reported in appendix table A3). This results in part from the way in which we simulate who participates in the accounts. Individuals choose whether to participate at the first point at which they have Social Security covered earnings at or after age 25, with participation subsequently backfilled to age of first earnings. At this age, many are still unmarried, which leads them to start from a lower probability. Many also do not yet own homes or hold significant assets, further depressing the probability of reporting willingness to take financial risks.

trend holds true across nearly all characteristics, with the exception of widowed and divorced individuals who experience more significant declines compared with the baseline Model 2. The personal account annuity benefit for widowed men, for example, declines from $10,146 under the Model 2 baseline to $9,381 under the risk-avoidance participation scenario. Personal account annuity benefits are lower for widowed individuals in scenario 2 compared with baseline Model 2 because some spouses chose not to participate in a personal account. Therefore, they are less likely to receive personal account survivor benefits or personal account balance transfers. Similarly, divorced individuals will receive personal account transfers upon divorce only if their spouses participated in personal accounts.

Under scenario 3, we alter not only the participation assumption, but also the asset allocation assumptions. We assume that individuals allocate their new personal account contributions by individual characteristics, including age, gender, marital status, education, and earnings.[43] In this scenario, average personal account annuity benefits increase to $7,242 from $6,954 in scenario two and $7,009 in the Model 2 baseline scenario. This increase is due primarily to a higher average allocation of personal account contributions into stocks. Although average benefits increase across all subgroups, benefits increase more for those more likely to allocate their contributions to stocks, especially those with a college degree, whites and members of "other" racial/ethnic groups (predominantly Asian Americans and Native Americans), and those with higher shared lifetime earnings. As a result, the differences in average benefits by education, race, and earnings widen somewhat under this scenario. The results reflect both the coefficients of the portfolio allocation model (shown in Appendix Table A4) and higher average education levels in the older population across time.

Scenario 4 builds on scenario 3 by incorporating administrative costs that reflect a system in which management of private accounts is decentralized. Whereas scenarios 1 through 3 assume administrative costs of 0.3 percent of assets, scenario 4 assumes administrative costs of 1.4 percent of assets. In effect, this reduces portfolio returns by 1.1 percentage points. Not surprisingly, this scenario results in a substantial decrease in average personal account benefits, to $5,583, just 77 percent of the average benefit in scenario 3 and 80 percent of the annuity in the Model 2 baseline scenario. Each subgroup would experience the same declines in average benefits in percentage terms. As a result, subgroups with higher average benefits would experience larger increases in absolute (dollar) terms.

Scenarios 1 through 4 assume that real stock and bond returns are constant over time, at 6.5 percent for stocks and 3.3 percent, respectively. Scenarios 5a and 5b alter those assumptions by assuming alternative average rates of return and by incorporating variation in market returns over time. Under scenario 5a, we assume that real rates of return increase to 7.5 percent for stocks and 4.3 percent for bonds, and that the variation in market returns mirror the rates realized over the past 50 years. Under scenario 5b, we assume that real rates of return decrease to 5.3 percent for stocks and 2.3 percent for bonds, and that the variation in market returns is reversed

[43] For example, in 2040, a decade before we examine these retirees, about 40.1 percent of persons ages 60 and older are projected to allocate their account contributions mostly to stocks, compared to 47.6 percent of those less than age 30. Likewise, that same year about 40.2 percent of those with less than a high school education were simulated to allocate contributions mostly to stocks, compared to 44.6 percent for college graduates.

from that over the past 50 years.[44] These scenarios attempt to bracket the range of feasible scenarios in the context of incomplete participation. (Appendix table A6 contains results for other combinations of market returns and market variations.)

Under scenario 5a, the average personal account annuity of participants would increase to $8,196, or nearly 50 percent more than the annuity in scenario 4. The average personal account annuity under this scenario also exceeds the average value in the Model 2 baseline, by 17 percent. Except for differences by age, the differences in average benefits by subgroup would be fairly similar on percentage point terms. Also, the increase in average annuities relative to scenario 4 (partial participation, historical portfolio allocations and higher administrative costs) is due to the assumed market returns just prior to retirement for 62 to 69 year olds in 2050. The market variations in 1995-1999, a period of higher than average returns, were used to simulate the market returns in 2042-2046. As a result, assumed stock returns for 2042-2046 ranged between 16 and 19 percent (appendix table 5a). Such high returns applied to personal account balances just prior to retirement increased these balances considerably.

If instead a period of negative returns directly preceded retirement, average benefits could be much lower. This factor helps explain why individuals age 62 to 64 in 2050 experience smaller gains in this scenario relative to scenario 4. This younger age group is more likely to retire in 2047-2049, when, in accordance with actual returns earned in 2000-2002, average stock returns are assumed to range from negative 10 percent to negative 21 percent. As a result, their gains in scenario 5a relative to scenario 4 are 33 percent, compared with 52 percent for those ages 65 to 69. Their gains would have been lower, perhaps even negative, if the periods of negative returns were not directly preceded by several years of very high returns. Also, there is a small selection effect present at these ages. On average, those who claim benefits at ages 62 to 64 have left the labor force earlier than the members of cohort as a whole, and are disproportionately female.

This scenario (5a) clearly highlights how market volatility could affect personal account balances and annuities.[45] Results by retirement year in table 7 show that individuals retiring in 2043 would have an annuity that is quite close to that estimated in the Model 2 baseline ($6,018 compared with $5,968). In contrast, individuals retiring in 2045-2047 have annuities averaging about one-third greater than those estimated in the Model 2 baseline. Of course, some individuals affected by the lower market returns would delay retirement until a more favorable time. (This effect was not included in these simulations, in part because many current empirical models show that this response would be relatively small.[46]) Proposals to force more gradual

[44] Of course, readers can also use estimates fromthese two simulations to combine different levels of transaction costs and returns totaling the same amount (for example, combing a higher average return with lower transaction costs).

[45] This finding is consistent with the economic analysis presented by Thompson (1998) and earlier empirical work by Burtless (1999).

[46] Gustman and Steinmeier (2003) have done much work in this area, and may be an exception. They present a detailed analysis of Presidents' Commission provisions on retirement behavior. While they find that delays in retirement in response to benefit reductions implicit in Model 2 could be quite substantial (on the order of 4 to 5 percent at age 62 in 2050), they identify a simultaneous trend toward earlier retirement could offset some of these changes. In subsequent work (2004), these authors consider the possible retirement effects of a larger personal

annuitization of personal account assets (for example, daily annuitization over a ten-year period, as suggested by Kotlikoff, 2003) could also impact these outcomes.

Under scenario 5b, average personal account annuities would decrease considerably to $2,997, or just 54 percent of those in scenario 4 and 43 percent of those in the Model 2 baseline scenario. Similar to scenario 5a, the changes in average benefits by subgroup would be fairly similar on percentage point terms, except for age and retirement year. Although the differences by age and retirement year are lower than those in scenario 5a, retirement timing can nevertheless substantially affect personal account benefit levels. For instance, individuals retiring in 2043 would have an annuity that is 41 percent of that estimated in the Model 2 baseline ($2,415 compared with $5,968). In contrast, individuals retiring in 2049 would have an annuity that is 47 percent of that estimated in the Model 2 baseline ($3,585 compared to $7,557).

The wide range in results between scenarios 5a and 5b illustrate the sensitivity of personal account benefits to market returns. Although higher than average returns and favorable market variations can result in benefits greater than those simulated in the Model 2 baseline, the downside potential due to low market returns and less favorable market variations can be considerable. As shown by the bottom rows in table 7, differences in retirement timing can impact these ranges even further.

Appendix table A6 provides additional details on the size of personal account annuities for persons ages 60 to 69 under a range of alternatives that fall between 5a and 5b. It reveals a number of interesting patterns. For example, average annuitized personal account benefits with average stock/bond returns under reverse market timing actually are lower than the corresponding benefits with lower average stock and bond returns and no market variation ($3,756 compared to $4,448). Put another way, unlucky timing can have a greater effect than a full percentage point reduction in returns.

Effects on Total Social Security Incomes

Average total Social Security benefits—including both the basic benefit plus the annuitized personal account benefit— vary from the baseline as they reflect the annuitized private account balance and the Social Security benefit offset across the scenarios (table 8). Note that this table includes projections for all Social Security beneficiaries, not just personal account participants and again focuses exclusively on non-DI beneficiaries ages 62 to 69. As noted above, average baseline Model 2 benefits ($15,623) are considerably lower than promised under current law ($18,126), and higher than current-law adjusted benefits ($13,902). Because the personal accounts achieve real investment returns greater than 2 percent (the rate of return assumed for the offset to the basic benefit) and participation is universal, the annuitized personal account benefits exceed the offsets to the basic Social Security benefits.

By design, a scenario with less than full participation will always produce lower average benefits relative to a full participation assumption as long as private accounts always earn more

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account system, and project that the availability of lump sums under such a system could have particularly large effects (leading to accelerated retirement).

than the benefit offset. This explains the reduction in average total benefits between scenario 2 and scenario 1, from $15,623 to $14,399.

Total benefits under scenario 4, which include the cumulative impacts of altering the OCACT assumptions regarding personal account participation, investment allocation, and administrative costs, as well as changes to the traditional Social Security benefit, average $13,491, falling slightly below current-law adjusted benefits. A number of factors contribute to this difference. A first critical factor is that failure to participate in the individual accounts despite the relatively favorable returns leads to lower total income for some beneficiaries. A second key issue is the differing nature of how cuts to traditional Social Security benefits are implemented across the reforms. In the case of current law adjusted, reductions to Social Security benefits occur across the board (i.e., all living beneficiaries receive a fixed percentage reduction). In the case of Model 2, the magnitudes of cuts increase by cohort (because of the compounding of the adjustment to the benefit formula) and thus impact these relatively young beneficiaries more than their older counterparts (and more than an across the board cut at this point in time would).

Assuming higher average rates of return and more favorable market variation under scenario 5a results in an average benefit of $15,290, which would exceed current-law adjusted benefits, but falls just short of that using the OCACT assumptions. Although the average personal account benefit in scenario 5a exceeds that using the OCACT assumptions, the personal account participation is, again, not universal in scenario 5a. Therefore, not all beneficiaries gain from having personal accounts with these favorable returns. Assuming lower rates of return and less favorable market variation in scenario 5b would result in an average benefit of $11,707, falling considerably below the average current law adjusted benefit.

Winners and Losers. Scenarios 5a (high markets return with partial participation, individual allocations, higher administrative costs, and variation in market returns that replicates the past 46 years) and 5b (low market returns combined with partial participation, individual allocations, higher administrative costs, and variation in market returns that is reversed from that over the past 46 years) perhaps bracket the likely outcomes of a new system with partial participation in private accounts, new minimum and widows' benefits, and a price-indexed benefit formula.[47] When examining personal account participants in particular, comparing the winners and losers under these two scenarios to the current-law adjusted benefits scenarios shows almost a mirror image of the likely outcomes for those age 62 to 69 in 2050, the group most fully affected by the new system (table 9). Among beneficiaries with personal accounts age 62 to 69 in 2050, 93.7 percent gain relative to CLA under the 5a scenario, and 96.8 percent of beneficiaries lose relative to CLA under the 5b assumptions. Of course, the reader should remember that the CLA simulation already represents significant reductions relative to benefits promised under current law for most beneficiaries (table 5). The additional losses possible under the personal accounts system highlight the potential risk that would be introduced into the Social Security system.

[47] To bracket the even broader spectrum of outcomes, readers can compare scenario 5b to scenario 1 (the OCACT assumptions with full participation). (Recall that Table 5 presents the winner and losers for scenario 1 relative to current law adjusted.) As already noted, the full participation assumption incorporated into that scenario has important (and highly favorable) implications for average outcomes when returns exceed the offset.

Under the more optimistic scenario (5a), widowed beneficiaries, college graduates, and those with work careers of more than 19 years are more likely to gain relative to CLA. The opposite occurs with respect to education and work years under the assumptions in scenario 5b because college graduates and those with longer work histories have more at risk in the personal account balances. Those in the lower two shared lifetime earnings quintiles are less likely to gain under scenario 5a than those in higher quintiles, but when they do win, the gains are higher in percentage terms than they are in the higher quintiles. Results by racial group show more winners among whites and members of other racial groups (predominantly Asian Americans and Native Americans) when scenario 5a benefits are compared with CLA, probably reflecting the fact that white and other retirees are more likely to than blacks or Hispanics both to participate in the personal accounts and to invest account assets in an aggressive portfolio. In scenario 5b, in contrast, none of the results indicate that one racial group would gain (lose) to a greater degree than another.

Effects on Near Poverty. The effects on near poverty rates, defined as the share of individuals with total household cash income less than 150 percent of the federal poverty line, also vary dramatically depending on the assumptions about behavior, market returns, and administrative costs (table 10). Social Security will remain a large part of individuals' future retirement incomes, and changes in their benefits will affect their total incomes. Under currently promised Social Security benefits, near poverty rates are projected to be 2.2 percent for non-disabled 62 to 69 year old beneficiaries in 2050.[48] These rates would nearly double to 4.2 percent under current-law adjusted benefits. The trends in near poverty rates by personal account scenario reflect the trends in total Social Security benefits discussed earlier, while emphasizing effects at the bottom. Using the OCACT assumptions in scenario 1, the introduction of personal accounts would increase near poverty rates to 2.9 percent, greater than the rates under currently promised benefits, but lower than those under current-law adjusted benefits.

Near poverty rates under scenario 4, which alter several of the OCACT assumptions, would increase to 4.3 percent, greater than those assuming current-law adjusted benefits (which may be significant because of the general revenue transfers implied in the former). Assuming higher average investment returns and favorable market variation in scenario 5a would decrease near poverty rates to 3.5 percent, but assuming lower average returns and less favorable market variation in scenario 5b would increase near poverty rates to 5.7 percent.

Notably, widowed men and women have near poverty rates under Model 2 less than or equal to those under the current-law adjusted scenario, regardless which personal account assumptions are used. The enhanced widow benefits and inheritance of spouses' personal

[48] Such low near poverty rates (relative to current levels) may be somewhat surprising, but a number of factors help to explain this reduction. First, the table universe is restricted to persons receiving Social Security. As a consequence, it does not include some of the highest poverty/near-poverty groups (e.g., SSI-only recipients). Also, the growth of many resources (including, under current law, Social Security benefits) with wages is expected to outpace change in the poverty/near poverty thresholds, which grow only with prices. (Because the OASDI Trustees' project an annual real wage of differential of 1.1 percent, this difference compounds rapidly.) Finally, as mentioned earlier, this particular run of DYNASIM does not include post-baseline immigrants, who typically have higher near poverty rates than those who are native born (or who immigrated relatively early in life), in a sophisticated way.

account balances under Model 2 indeed appear to help keep more widows out of poverty. *DYNASIM3* projects a near-poverty rate for both widows and widowers of 6.2 percent when current-law benefits are simply adjusted to meet projected revenues, compared with half that rate for widowed men under Model 2 baseline assumptions and only 1.8 percent for widows. Even scenario 5b near-poverty rates for women that are widowed fall below those projected in CLA (5.7 percent compared with 6.2 percent).

Model 2 also produces lower near poverty rates for beneficiaries with fewer than 20 years of work experience compared with current-law adjusted benefits. This group has too few years experience to benefit from the minimum benefit or personal account provisions. Instead, this group includes a disproportionate share of widows with relatively little work experience, who benefit from the enhanced survivor benefits. Near-poverty rates for this group range from 9.0 to 12.9 percent in scenarios 2 through 5b, reflecting differences in personal account balances and annuity values.

Model 2's minimum benefit provisions help to lower poverty rates for some particularly vulnerable subgroups, at least compared to the current-law adjusted scenario. Near-poverty rates for beneficiaries in the lowest quintile of lifetime earnings are equal to or less than those in the current law adjusted baseline in all but scenario 4 (higher administrative costs) and scenario 5b (low returns market variation that reverses the experience of the last 46 years). Nonetheless, near poverty rates for this group are about four times the average for all persons. Near-poverty rates for other vulnerable groups, including divorced or never married individuals, blacks, and individuals without a high school diploma, are also higher than average in all simulations.

The scenario least favorable to Model 2 also produces near-poverty rates in excess of the current-law adjusted rates for a few vulnerable groups. For example, rates for divorced men and women, 12 and 14 percent, respectively, exceed the 10 percent rates estimated in the current-law adjusted simulation. Also, the near-poverty rates are higher for blacks – 12.1 percent compared with 9.4 percent in the current-law adjusted baseline.

5. Summary and Implications

In this analysis, we use the Urban Institute's *DYNASIM3* model to examine the potential distributional impacts of Model 2 of the President's Commission to Strengthen Social Security. Model 2 would establish a new minimum benefit, provide enhanced widow(er) benefits, and phase out the wage-indexed benefit formula to help restore solvency to the system. Enacting these changes would reduce the projected average benefit in 2050 to 77 percent of that promised under current law, with the transition away from a wage-indexed benefit formula responsible for the benefit reductions.

Model 2 also would allow workers to divert four percentage points of their payroll taxes (up to $1,000 annually, indexed to wages) to a personal account. Basic Social Security benefits would be reduced by the annuitized value of these contributions, assuming they earn a two percent real rate of return annually. Therefore, as long as the actual net returns to the personal accounts exceed two percent, workers would be better off by participating in the personal accounts. Under simulations that incorporate OCACT personal account assumptions, we find

that the average total benefit in 2050 under Model 2, including the annuitized benefits from personal accounts, would be 88 percent of promised current law benefits, 11 percentage points higher than the benefit achieved through incorporating changes only to the basic benefit. In other words, the personal accounts are expected to achieve net investment returns that more than make up for the offset to the basic benefit (though this occurs in part because of sizable transfers from general revenues to finance creation of the personal accounts). Nonetheless, benefits would still fall below those promised under current law. Of course, comparing benefits under Model 2 to those promised under current law sets the standard too high because the Social Security trust fund is out of long-term actuarial balance, and currently scheduled revenues will fund only about 71 percent of benefits in 2050.

We alter the OCACT assumptions regarding personal account participation, asset allocation, administrative costs, and investment returns to provide a range of potential outcomes under Model 2. It is possible, for example, that individuals will not all choose to participate in a voluntary system of personal accounts. Also, those that do participate may not invest their portfolios half in equities and half in bonds throughout their careers. It is likely that administrative costs will exceed the 0.3 percent assumed by OCACT if account management is decentralized and likely that markets will be volatile during workers' careers and return more (or less) than the returns assumed in the OCACT analyses. We focus our sensitivity analysis on non-disabled beneficiaries age 62 to 69 in 2050, because they would be under the personal account system throughout their working lives. The disabled are excluded because Model 2 does not address their particular circumstances.

We find that varying personal account assumptions, especially those regarding administrative costs and investment returns, can significantly change outcomes under Model 2. For instance, higher administrative costs would reduce the average expected personal account benefit by about 20 percent, from $7,009 to $5,583.[49] Variation in market returns also will affect personal account annuity benefits. For example, increasing real returns to 7.5 percent for stocks and 4.3 percent for bonds, along with assuming that these rates will vary in the next 50 years in the same way they have varied over the past 50 years suggest that personal account benefits could reach $8,196 for individuals age 62 to 69 in 2050. On the other hand, assuming real returns of 5.5 percent for stocks and 2.3 percent for bonds, along with less favorable market variation patterns could reduce personal account benefits to $2,997 (less than half that reached in the baseline Model 2 assumptions). Balances for those retiring right after a poor performance in the market would reduce these benefits even further.

Total Social Security benefits, including the basic benefit plus the personal account benefit, also would vary based on the personal account assumptions. Regardless of which assumptions we used, total Social Security benefits would fall below those promised under current law. Examining the results by particular subgroups also provides insights into the potential impacts of Model 2. The enhanced widow benefit in Model 2 and inheritance of spouses' personal account balances improves the outcomes for widows, and the minimum benefit helps those in the lowest lifetime earnings quintile.

[49] This alternative scenario also assumes that workers would decide whether to participate in personal accounts according to their simulated risk preferences and participants would allocate their personal account contributions according to current allocation patterns in 401(k) plans.

Comparing winners and losers under Model 2 using a scenario that uses less favorable assumptions about individual behavior, administrative costs, and market returns with a scenario that has the same assumptions except higher market returns can bracket the possible outcomes under the proposed system given less than full participation. About 94 percent of participants (and 63 percent of beneficiaries) age 62 to 69 in 2050 would gain relative to current-law adjusted benefits using the favorable rates of return. This result reverses under the less favorable returns with over 96 percent losing compared with current-law adjusted benefits (with results similar only slightly more favorable for non-participants than for participants). The swing in these results highlights the risks and rewards inherent in a system of personal accounts. They also highlight the likely importance of participation in personal accounts with an offset of this size (two percent, or one percent below the government bond rate).

Changes in Social Security benefits will necessarily affect poverty rates among older adults, many of whom will rely on Social Security for a large share of their income even in 2050. In particular, near poverty rates (family income below 150 percent of the federal poverty line) for particularly vulnerable groups, including divorced or never married individuals, blacks, and individuals without a high school diploma, will be higher if Social Security benefits are reduced to reflect projected revenues and even under the more optimistic personal account scenarios. If the more pessimistic assumptions regarding Model 2 outcomes prove to be true, near poverty rates could be even higher for these vulnerable beneficiaries than under a simple uniform downward adjustment in benefits.

Also, Model 2 does not meet the needs of young disabled beneficiaries, because they may not have time to build up large personal account balance, especially if they are prohibited from annuitizing their accounts until they reach the normal retirement age. As the President's Commission acknowledged, the establishment of any personal account system would need to address these problems related to disabled beneficiaries. Our analyses also did not consider children who are dependent beneficiaries of deceased, retired, or disabled workers. A system with personal accounts will need to consider the disposition of account balances in these cases. While children could be held harmless, this obviously would increase system costs.

Our analysis assumes that all personal account participants annuitize their balances at retirement to guarantee a lifetime benefit for themselves and their spouse (if married). This assumption is key to our findings. If participants are allowed to forego annuitization, their retirement well-being could be compromised if they withdraw from their account too quickly, leaving them (or their surviving spouses) with low or no benefits in their later retirement years. In addition, we assume that pre-retirement withdrawals are prohibited. Some may object to mandatory annuitization and this decision must be made with considerable care because it will affect participation (under a voluntary system) and benefit levels. One option would be to require annuitization at least to the point at which the annuity and traditional benefits would provide a poverty level of income. Our analysis also suggests that timing of annuitization can have very important distributional effects, and that gradual conversion of personal account portfolios into annuities could have substantial merit.

The analyses also assume that pre-retirement withdrawals, loans, or lump-sum distributions from personal accounts would not be permitted. Under our baseline personal account scenario, the average annuitized personal account benefit among 62 to 69 year old beneficiaries in 2050 is 45 percent of their total Social Security benefit. Allowing pre-retirement withdrawals or lump-sum distributions from these accounts would reduce Social Security benefits, potentially reducing total incomes and increase poverty.

Finally, the analyses assume splitting of account accruals over the course of marriage for persons who divorce prior to retirement and spousal inheritance of the accounts of workers who die prior to retirement. As Perun (2002) points out, property rights issues surrounding personal accounts could be quite complex. A personal account system would require clearly defined rights and remedies to minimize disputes (and thus to reduce litigation that could deplete account balances and thus retirement security).

Social Security reform that includes personal accounts carved out of the current contributions present numerous challenges. This paper shows the sensitivity of results to a few key assumptions. A more complete analysis would need to consider, for example, the effect of market returns on interest rates that determine annuity benefits and effects on employment (including retirement timing) and wage growth. The current Social Security program includes numerous protections against risk (such as disability and young survivorship), and designers of a Social Security reform of this nature must carefully consider trade-offs among beneficiary groups. Our results illustrate the usefulness of dynamic microsimulation techniques for exploring these trade-offs.

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Table 1
President's Commission Reform Proposals

Provision	Model One	Model Two	Model Three
Contribution to Private Account (all voluntary)	2 percent of payroll	4 percent of payroll to maximum of $1,000 (\wage Indexed) after 2009	1 percent of payroll new contribution (subsidized) required for participants, plus 2.5 percent of payroll to maximum of $1,000 (wage indexed)
Benefit Adjustment at Retirement	3.5 percent real offset (or 0.05 percent above realized or expected market yield on long-term treasury bonds)	2 percent real offset (or 1.0 percent below realized or expected market yield on long-term treasury bonds)	2.5 percent real offset (or 0.5 percent below realized or expected market yield on long-term treasury bonds)
Initial Benefit Calculation	No Change	Modify primary insurance amount (PIA) formula factors (90, 32, and 15) starting in 2009, reducing them successively by the measured real wage growth in the second year.	Index benefit growth to life expectancy gains; also reduce highest bend point to 10 percent from 15.
New Minimum Benefit	None	120 percent of poverty for minimum wage workers with 30 years of service (prorate if 21-29 years)	100 percent of poverty for minimum wage workers with 30 years of service (prorate if 21-29 years)
Increased widow(er)s benefit	None	Pay 75 percent of couples (if higher) for low-wage couples	Same as Model Two
Change in retirement age	None	None	Reduce early retirement benefit; Increase delayed retirement benefit.
New Revenue	General revenue assumed for transition costs	General revenues for transition costs and whenever funds fall below costs	General revenues for transition; Congress should consider a number of revenue-generating proposals such as increasing the percent of wages subject to payroll taxes and redirecting taxes on benefits.

Source: President's Commission (2001) and Goss and Wade (2002).

Table 2
Simulation Assumptions

Scenarios		Personal Account Participation	Personal Account Portfolio Allocation	Administrative Costs	Real returns
Core Scenarios					
1	OCACT-Model 2 Baseline	100%	Constant by age: 50/50% stock/bonds	0.30%	Stock: 6.5% Bond: 3.3%
2	Variable Participation	Risk Aversion (SCF, average of 63%)	OCACT	OCACT	OCACT
3	Variable Allocation	Risk Aversion (SCF, average of 63%)	401(k) Investment Patterns (SCF)	OCACT	OCACT
4	High Costs for Administration	Risk Aversion (SCF, average of 63%)	401(k) Investment Patterns (SCF)	High (1.4%)	OCACT
5a	Market Variation; High Returns	Risk Aversion (SCF, average of 63%)	401(k) Investment Patterns (SCF)	High (1.4%)	Market Variation; Stock: 7.5% Bond: 4.3%
5b	Market Variation (Reversed); Low Returns	Risk Aversion (SCF, average of 63%)	401(k) Investment Patterns (SCF)	High (1.4%)	Market Variation (Reversed Historical Series); Stock: 5.5% Bond: 2.3%
Additional Sensitivity Tests (see Appendix Table A6)					
5d	Market Variation; Average Returns	Risk Aversion (SCF, average of 63%)	401(k) Investment Patterns (SCF)	High (1.4%)	Market Variation; Stock: 6.5% Bond: 3.3%
5e	Market Variation (Reversed); Average Returns	Risk Aversion (SCF, average of 63%)	401(k) Investment Patterns (SCF)	High (1.4%)	Market Variation (Reversed Historical Series); Stock: 6.5% Bond: 3.3%
5f	No Market Variation; High Returns	Risk Aversion (SCF, average of 63%)	401(k) Investment Patterns (SCF)	High (1.4%)	Stock: 7.5% Bond: 4.3%
5g	Market Variation (Reversed); High Returns	Risk Aversion (SCF, average of 63%)	401(k) Investment Patterns (SCF)	High (1.4%)	Market Variation (Reversed Historical Series); Stock: 7.5% Bond: 4.3%
5h	Market Variation; Low Returns	Risk Aversion (SCF, average of 63%)	401(k) Investment Patterns (SCF)	High (1.4%)	Market Variation; Stock: 5.5% Bond: 2.3%
5i	No Market Variation; Low Returns	Risk Aversion (SCF, average of 63%)	401(k) Investment Patterns (SCF)	High (1.4%)	Stock: 5.5% Bond: 2.3%

Notes:

1. OCACT baseline follows the assumptions used by the Office of the Chief Actuary (OCACT) in its analysis of the President's Commission to Strengthen Social Security, Model 2, and its 100 percent participation option. The Survey of Consumer Finances (SCF) was used to estimate participation in voluntary personal account plans and recent investment behavior of individuals (see text and Appendix Tables A2 and A3).
2. Scenarios 5a through 5i show the cumulative effects of the variations from OCACT assumptions in core option 4.

Table 3

Average Annual Benefits Paid in 2050:
Current Law Compared with Commission Model 2 ($2004)

Scenario	Average Benefit	Ratio to Current Law Promised
Current Law[1]		
Promised (CLP)	$18,817	
Affordable	13,393	0.712
Adjusted (CLA)	14,432	0.767
Commission Model 2[2]		
Excluding Establishment of Personal Accounts		
New Minimum Only	18,828	1.001
New Widow's Benefit Only	18,906	1.005
Price Indexing Only	14,242	0.757
All Provisions Combined	14,432	0.767
Commission Model 2		
Including Establishment of Personal Accounts		
Basic Benefit	11,886	0.632
Annuitized Personal Account[3]	4,685	0.249
Total	16,571	0.881

Source: Authors' calculations from DYNASIM3 (Runid: 378)
Note: Sample includes current law Social Security beneficiaries age 62 to 100 in 2050. Persons with spouses under age 50 are excluded.

[1] Current law structure of Social Security benefit: Promised (CLP) benefits exceeds available projected projected revenues; affordable benefit shows the level of benefit that could be paid in 2050 with no additional revenues; adjusted benefit (CLA) shows the benefit level that could be paid if the system had enough additional revenue to pay for benefits included in Commission Model 2 without personal accounts.

[2] Commission Model 2 simulated using the assumptions of the Office of the Chief Actuary (see text).

[3] Annuities are indexed, based on unisex pricing, and include mandatory survivor protection.

Table 4
Total Annual Benefits for Beneficiaries Age 62 and Older in 2050 (2004$):
Ratio of Model 2 Benefits to Current Law Promised Benefits

		Current Law	Ratio to Current-Law Promised			
		Promised	Current Law	Commission Model Two		
	N	(Mean)	Adjusted	Total	Basic	PA
All	**27,680**	**$18,817**	**0.767**	**0.881**	**0.632**	**0.249**
62-64	2,872	16,815	0.767	0.811	0.509	0.302
65-69	6,052	19,650	0.767	0.863	0.530	0.332
70-74	5,531	19,837	0.767	0.884	0.585	0.299
75-79	4,605	19,400	0.767	0.881	0.648	0.233
80-84	3,944	18,579	0.767	0.893	0.712	0.181
85+	4,676	17,391	0.767	0.931	0.824	0.107
Retirees	**17,499**	**19,056**	**0.767**	**0.867**	**0.586**	**0.281**
62-64	1,833	15,426	0.767	0.850	0.391	0.459
65-69	4,226	19,808	0.767	0.858	0.489	0.368
70-74	3,734	20,306	0.767	0.861	0.563	0.298
75-79	3,032	19,877	0.767	0.860	0.627	0.233
80-84	2,530	18,842	0.767	0.874	0.692	0.182
85+	2,144	17,592	0.767	0.911	0.793	0.118
Survivors and Aged Spouses	**4,898**	**17,178**	**0.767**	**0.925**	**0.717**	**0.208**
62-64	298	14,184	0.767	0.913	0.533	0.380
65-69	625	16,555	0.767	0.909	0.569	0.340
70-74	773	16,852	0.767	0.912	0.631	0.281
75-79	785	17,600	0.767	0.916	0.681	0.235
80-84	819	17,925	0.767	0.921	0.743	0.179
85+	1,598	17,548	0.767	0.945	0.843	0.103
Disabled Workers	**5,283**	**19,546**	**0.767**	**0.890**	**0.710**	**0.180**
62-64	741	21,308	0.767	0.714	0.714	-
65-69	1,201	20,702	0.767	0.861	0.653	0.208
70-74	1,024	20,382	0.767	0.951	0.639	0.312
75-79	788	19,356	0.767	0.934	0.703	0.231
80-84	595	18,363	0.767	0.939	0.759	0.180
85+	934	16,661	0.767	0.955	0.866	0.089

Source: Authors' calculations from DYNASIM3 (Runid: 378).
Notes:
1. Sample includes Social Security beneficiaries age 62 to 100 in 2050. Persons with spouses under age 50 are excluded.
2. Commission Model 2 is simulated using the assumptions of the Office of the Chief Actuary (see text). The personal account (PA) portion of the benefit is calculated assuming the account balance is converted into an indexed annuity, based on unsex pricing and including mandatory survivor protection.
3. Dually entitled spouses and survivors are classified as survivors and spouses (rather than as retirees, as is conventional) in this table. We classify them this way to better illustrate the effects of survivor protections under Model 2. Alternative tabulations are available from the authors upon request.

Table 5
Winners and Losers in 2050, by Beneficiary Status:
Commission Model 2 (OCACT Assumptions) Compared with Current Law

	Current Law Adjusted Compared with Current Law Promised				Model 2 Comparison With Current Law Adjusted			
	% Winners	% Gain	% Losers	% Loss	% Winners	% Gain	% Losers	% Loss
All	11.0	8.2	88.5	-14.5	92.8	16.7	7.2	-9.8
62-64	5.5	12.3	94.4	-20.8	69.2	13.6	30.8	-12.1
65-69	8.7	8.4	91.1	-15.9	87.7	15.5	12.3	-9.2
70-74	10.7	7.6	89.0	-13.9	96.9	15.9	3.1	-4.9
75-79	10.5	7.2	89.1	-14.2	97.8	15.4	2.2	-5.7
80-84	11.1	8.8	88.4	-13.2	99.0	16.8	1.0	-12.8
85+	18.3	8.1	80.5	-10.4	99.1	21.8	0.9	-19.9
Retirees								
All	4.8	10.4	95.2	-14.5	96.3	13.8	3.7	-9.0
62-64	5.0	13.7	95.0	-16.5	86.0	14.1	14.0	-9.5
65-69	2.9	11.5	97.1	-15.0	94.1	13.1	5.9	-9.0
70-74	3.0	9.6	97.0	-14.6	98.2	12.6	1.9	-6.6
75-79	4.2	9.0	95.8	-15.0	98.9	12.3	1.1	-7.1
80-84	5.5	11.4	94.5	-14.0	99.3	14.2	0.8	-14.9
85+	11.3	10.2	88.7	-11.3	99.1	19.2	0.9	-27.4
Survivors and Aged Spouses								
All	22.3	9.8	77.6	-12.5	92.9	22.6	7.1	-5.4
62-64	20.8	15.2	79.2	-15.0	78.9	25.5	21.1	-5.1
65-69	22.9	11.1	77.1	-15.1	84.0	23.0	16.0	-5.1
70-74	20.3	11.2	79.7	-13.9	88.1	22.0	11.9	-4.0
75-79	22.2	9.6	77.8	-13.5	92.9	21.4	7.1	-5.8
80-84	22.3	9.2	77.5	-12.8	97.7	20.9	2.3	-10.5
85+	23.3	8.4	76.5	-9.7	98.8	23.7	1.2	-11.5
Disabled Workers (with annuitization at Age of Retirement)								
All	21.4	5.4	76.3	-16.0	81.3	22.4	18.7	-11.5
62-64	0.7	0.3	99.1	-28.9	23.9	7.6	76.1	-11.5
65-69	21.7	6.0	77.0	-19.8	67.2	23.0	32.8	-9.9
70-74	31.5	5.7	67.2	-9.9	98.9	24.4	1.1	-5.0
75-79	23.2	4.4	74.2	-10.3	98.2	22.2	1.8	-3.7
80-84	19.7	5.5	77.3	-9.3	99.7	22.6	0.3	-16.7
85+	25.9	5.7	68.6	-8.7	99.5	24.8	0.5	-20.8

Source: Authors' calculations from DYNASIM3 (Runid: 378).
Notes:
1. Sample includes Social Security beneficiaries ages 62 to 100 in 2050. Persons with spouses under age 50 are excluded.

2. Commission Model 2 is simulated using the assumptions of the Office of the Chief Actuary (see text). It includes the basic benefit plus the personal account benefit, which is calculated assuming the account balance is converted into an indexed annuity, based on unisex pricing and including mandatory survivor protection.

3. Dually entitled spouses and survivors are classified as survivors and spouses (rather than as retirees, as is conventional) in this table. We classify them this way to better illustrate the effects of the survivor protections under Model 2. Alternative tabulations are available from the authors upon request.

Table 6
Total Annual Benefit (Basic Benefit Plus Annuitized Personal Account Benefit) at Ages 62 to 69 in 2050 (2004$)
Commission Model 2 (OCACT Assumptions) Compared with Current Law

	Current Law Promised (CLP) (Mean)	Current Law Adjusted (CLA) (Mean)	Means for Model 2			Ratio of Model 2 To:	
			Total	Base Benefit	PA Benefit	CLP	CLA
All	$18,126	$13,902	$15,623	$8,614	$7,009	0.862	1.124
Men							
Married	20,514	15,733	17,084	9,855	7,229	0.833	1.086
Widowed	21,415	16,424	20,179	10,033	10,146	0.942	1.229
Divorced	18,852	14,459	15,705	8,855	6,850	0.833	1.086
Never Married	17,607	13,504	15,717	7,584	8,133	0.893	1.164
All	19,874	15,243	16,803	9,378	7,425	0.845	1.102
Women							
Married	15,359	11,780	13,198	7,184	6,014	0.859	1.120
Widowed	20,276	15,551	19,507	10,801	8,706	0.962	1.254
Divorced	17,993	13,800	15,311	8,456	6,855	0.851	1.109
Never Married	16,842	12,917	14,600	7,515	7,085	0.867	1.130
All	16,635	12,758	14,616	7,962	6,654	0.879	1.146
Age							
62-64	15,252	11,698	13,084	6,242	6,842	0.858	1.118
65-69	19,389	14,871	16,739	9,657	7,082	0.863	1.126
Education							
Less than HS graduate	13,714	10,518	12,044	6,706	5,338	0.878	1.145
High school graduate	16,203	12,427	14,139	7,748	6,391	0.873	1.138
College graduate	20,252	15,533	17,283	9,563	7,720	0.853	1.113
Race							
White	18,435	14,139	15,866	8,794	7,072	0.861	1.122
Black	16,190	12,417	14,006	7,472	6,534	0.865	1.128
Hispanic	18,185	13,947	15,744	8,716	7,028	0.866	1.129
Other	18,175	13,940	15,708	8,489	7,219	0.864	1.127
Work Years							
0-19	11,881	9,112	9,915	7,024	2,891	0.835	1.088
20-29	14,870	11,405	12,822	7,675	5,147	0.862	1.124
30-34	17,191	13,185	14,834	8,376	6,458	0.863	1.125
35+	19,796	15,183	17,102	9,062	8,040	0.864	1.126
Shared AIME Quintile							
1	12,196	9,354	10,981	6,206	4,775	0.900	1.174
2	15,389	11,803	13,611	7,075	6,536	0.884	1.153
3	18,185	13,948	15,752	8,416	7,336	0.866	1.129
4	20,497	15,721	17,425	9,538	7,887	0.850	1.108
5	24,368	18,690	20,351	11,840	8,511	0.835	1.089

Source: Authors' calculations from DYNASIM3 (Runid: 378).
Notes:
1. Sample includes Social Security beneficiaries ages 62 to 69 in 2050. Persons with spouses under age 50 and DI beneficiaries are excluded.
2. Commission Model 2 is simulated using the assumptions of the Office of the Chief Actuary (see text). The personal account (PA) benefit is calculated assuming the account balance is converted into an indexed annuity, based on unisex pricing and including mandatory survivor protection.

Table 7
Annual Personal Account Benefits in 2050 among Personal Account Participants Age 62 to 69 ($2004)
Under Different Assumptions about Personal Account Participation and Returns

	Scenarios					
	1 OCACT-Full Participation	2 SCF-Based Participation	3 SCF-Based Allocation	4 1.4% Admin Costs	5a High Returns Mkt Var	5b Low Returns Mkt Var (Rev)
All	$7,009	$6,954	$7,242	$5,583	$8,196	$2,997
Men						
Married	7,229	7,262	7,589	5,825	8,536	3,134
Widowed	10,146	9,381	9,793	7,555	11,286	3,921
Divorced	6,850	6,645	6,930	5,402	7,927	3,016
Never Married	8,133	8,241	8,579	6,538	9,380	3,489
All	7,425	7,413	7,740	5,947	8,694	3,205
Women						
Married	6,014	6,031	6,283	4,843	7,118	2,585
Widowed	8,706	8,416	8,792	6,807	10,039	3,553
Divorced	6,855	6,405	6,628	5,209	7,803	2,907
Never Married	7,085	7,160	7,257	5,598	8,193	2,992
All	6,654	6,540	6,794	5,256	7,747	2,811
Age						
62-64	6,842	6,754	7,033	5,394	7,185	3,001
65-69	7,082	7,037	7,330	5,662	8,621	2,996
Education						
Less than HS graduate	5,338	5,290	5,481	4,192	6,063	2,204
High school graduate	6,391	6,228	6,481	4,991	7,288	2,661
College graduate	7,720	7,554	7,874	6,075	8,951	3,278
Race						
White	7,072	6,971	7,298	5,625	8,276	3,021
Black	6,534	6,429	6,561	5,072	7,505	2,697
Hispanic	7,028	7,316	7,464	5,747	8,306	3,087
Other	7,219	7,112	7,433	5,718	8,234	3,105
Work Years						
0-19	2,891	2,775	2,895	2,218	3,284	1,112
20-29	5,147	4,981	5,178	3,993	5,929	2,033
30-34	6,458	6,320	6,567	5,072	7,544	2,642
35+	8,040	7,937	8,271	6,375	9,325	3,467
Shared AIME Quintile						
1	4,775	4,686	4,860	3,746	5,495	1,945
2	6,536	6,297	6,548	5,055	7,411	2,703
3	7,336	7,159	7,458	5,756	8,426	3,088
4	7,887	7,748	8,078	6,231	9,182	3,364
5	8,511	8,339	8,702	6,691	9,826	3,639
Benefit Type						
Retired	7,231	7,192	7,490	5,769	8,458	3,107
Spouse or Survivor	5,550	5,254	5,481	4,260	6,328	2,217
Retirement Year						
2043	5,968	5,839	6,068	4,764	6,018	2,415
2044	6,179	5,944	6,176	4,821	7,112	2,592
2045	6,591	6,465	6,739	5,240	8,797	2,570
2046	7,090	7,193	7,500	5,790	10,062	3,147
2047	7,202	7,277	7,579	5,836	9,177	3,061
2048	7,391	7,521	7,835	6,004	8,411	3,151
2049	7,557	7,293	7,589	5,800	6,991	3,585
2050	7,470	7,172	7,481	5,702	7,570	3,053

Source: Authors' calculations from DYNASIM3 (Runid: 378).
Notes:
1. Sample includes persons ages 62 to 69 in 2050. Persons with spouses under age 50 and DI beneficiaries are excluded.
2. The personal account (PA) benefit is calculated assuming the account balance is converted into an indexed annuity, based on unisex pricing and including mandatory survivor protection.
3. See table 2 for details about alternative assumptions. Scenarios are cummulative through numbers 5a and 5b. For example, scenario 4 includes assumptions 2 and 3.
4. To better illustrate the effects of the Model 2 survivor protections, this table classifies dually entitled spouses and survivors as survivors and spouses (rather than retired, as is conventional). Alternative tabulations are available from the authors upon request.
5. Results by retirement year not shown for early beneficiaries (those claiming at 60 or 61) in the oldest (1981) cohort because of small cell sizes.

Table 8
Total Annual Benefit (Basic Benefit Plus Personal Account Benefit) in 2050 (2004$) among Non-DI Beneficiaries Age 62 to 69 Under Different Assumptions about Personal Account Participation and Returns

			Model 2 Scenarios					
			1	2	3	4	5a	5b
	Current Law Promised	Current Law Adjusted	OCACT-Full Participation	SCF-Based Participation	SCF-Based Allocation	1.4% Admin Costs	High Returns Mkt Var	Low Returns Mkt Var (Rev)
All	$18,126	$13,902	$15,623	$14,399	$14,591	$13,491	$15,290	$11,707
Men								
Married	20,514	15,733	17,084	15,831	16,046	14,880	16,742	13,032
Widowed	21,415	16,424	20,179	18,562	18,864	17,229	20,100	14,439
Divorced	18,852	14,459	15,705	14,553	14,746	13,712	15,514	12,018
Never Married	17,607	13,504	15,717	14,419	14,650	13,246	15,291	11,070
All	19,874	15,243	16,803	15,543	15,761	14,560	16,481	12,648
Women								
Married	15,359	11,780	13,198	12,130	12,295	11,353	12,889	9,824
Widowed	20,276	15,551	19,507	18,042	18,301	16,931	19,220	14,588
Divorced	17,993	13,800	15,311	14,123	14,283	13,292	15,145	11,624
Never Married	16,842	12,917	14,600	13,031	13,085	12,165	13,666	10,664
All	16,635	12,758	14,616	13,423	13,592	12,578	14,274	10,903
Age								
62-64	15,252	11,698	13,084	11,787	11,967	10,914	12,142	9,311
65-69	19,389	14,871	16,739	15,547	15,744	14,623	16,673	12,759
Education								
Less than HS graduate	13,714	10,518	12,044	10,704	10,800	10,139	11,155	9,069
High school graduate	16,203	12,427	14,139	12,774	12,924	12,041	13,457	10,603
College graduate	20,252	15,533	17,283	16,192	16,430	15,096	17,309	12,938
Race								
White	18,435	14,139	15,866	14,734	14,963	13,795	15,714	11,905
Black	16,190	12,417	14,006	12,657	12,738	11,850	13,365	10,371
Hispanic	18,185	13,947	15,744	14,122	14,201	13,304	14,705	11,853
Other	18,175	13,940	15,708	14,467	14,684	13,521	15,293	11,675
Work Years								
0-19	11,881	9,112	9,915	9,364	9,443	8,998	9,716	8,244
20-29	14,870	11,405	12,822	11,812	11,938	11,181	12,463	9,881
30-34	17,191	13,185	14,834	13,658	13,822	12,838	14,516	11,179
35+	19,796	15,183	17,102	15,736	15,961	14,682	16,753	12,638
Shared AIME Quintile								
1	12,196	9,354	10,981	9,952	10,053	9,401	10,469	8,305
2	15,389	11,803	13,611	12,348	12,509	11,552	13,126	9,982
3	18,185	13,948	15,752	14,513	14,718	13,550	15,448	11,647
4	20,497	15,721	17,425	16,137	16,366	15,086	17,203	13,018
5	24,368	18,690	20,351	19,051	19,312	17,867	20,209	15,585

Source: Authors' calculations from DYNASIM3 (Runid: 378).
Notes:
1. Sample includes Social Security beneficiaries ages 62 to 69 in 2050. Persons with spouses under age 50 and DI beneficiaries are excluded.
2. The personal account (PA) benefit is calculated assuming the account balance is converted into an indexed annuity, based on unisex pricing and including mandatory survivor protection.
3. See table 2 for details about alternative assumptions. Scenarios are cummulative through numbers 5a and 5b. For example, scenario 4 includes assumptions 2 and 3.

Table 9
High and Low Returns Winners and Losers in 2050 among Non-DI Beneficiaries Age 62 to 69

	Scenario 5a Compared With Current Law Adjusted				Scenario 5b Compared With Current Law Adjusted			
	% Winners	% Gain	% Losers	% Loss	% Winners	% Gain	% Losers	% Loss
All	63.2	23.3	36.8	-12.8	4.0	12.1	96.0	-17.0
PA Participants								
No	18.9	20.4	81.1	-13.7	5.1	14.0	95.0	-15.0
Yes	93.7	23.1	6.3	-9.3	3.2	10.5	96.8	-18.2
Men								
Married	57.9	20.9	42.1	-13.5	0.1	8.9	100.0	-17.2
Widowed	81.5	29.7	18.5	-9.8	18.5	11.3	81.5	-17.4
Divorced	62.2	18.9	37.8	-11.8	0.6	11.1	99.4	-17.1
Never Married	67.1	26.2	32.9	-13.2	0.0	.	100.0	-18.0
All	60.9	21.8	39.1	-13.2	0.9	11.8	99.1	-17.3
Women								
Married	62.0	23.1	38.0	-13.0	1.6	8.7	98.4	-17.0
Widowed	82.4	30.8	17.6	-10.3	32.6	11.9	67.4	-14.9
Divorced	66.5	20.1	33.5	-10.7	3.7	8.4	96.3	-16.7
Never Married	54.4	22.5	45.6	-14.1	0.0	.	100.0	-17.4
All	65.2	24.8	34.8	-12.2	6.6	13.1	93.4	-16.5
Age								
62-64	58.3	18.8	41.7	-17.2	3.6	14.8	96.4	-21.7
65-69	65.3	24.5	34.7	-11.1	4.2	11.2	95.8	-15.3
Education								
Less than HS graduate	49.7	24.7	50.3	-12.4	6.2	12.4	93.9	-15.5
High school graduate	57.4	23.9	42.7	-12.7	5.4	13.3	94.6	-16.3
College graduate	69.7	22.3	30.3	-13.6	2.5	11.9	97.5	-17.4
Race								
White	66.1	23.5	33.9	-12.9	4.0	12.2	96.0	-17.0
Black	57.4	23.2	42.6	-13.3	3.1	14.1	96.9	-17.5
Hispanic	52.1	21.7	48.0	-12.3	4.6	11.1	95.5	-16.3
Other	64.3	22.1	35.7	-12.7	4.7	10.5	95.3	-17.6
Work Years								
0-19	57.0	19.1	43.0	-10.0	12.2	17.9	87.8	-13.4
20-29	63.2	21.5	36.8	-11.8	7.7	15.3	92.3	-15.8
30-34	64.2	22.6	35.8	-12.3	3.3	13.7	96.7	-16.2
35+	63.8	23.8	36.2	-13.4	2.3	10.9	97.8	-17.4
Shared AIME Quintile								
1	59.7	27.9	40.3	-11.8	12.0	19.9	88.0	-15.5
2	61.3	26.1	38.7	-12.4	4.9	13.0	95.1	-16.9
3	65.1	23.6	34.9	-13.2	1.9	9.2	98.1	-17.0
4	64.5	22.2	35.5	-13.8	0.7	8.4	99.3	-17.4
5	65.3	19.5	34.7	-13.2	0.3	4.0	99.7	-16.7

Source: Authors' calculations from DYNASIM3 (Runid: 378).
Notes:
1. Sample includes persons ages 62 to 69 in 2050. Persons with spouses under age 50 and DI beneficiaries are excluded.
2. The personal account (PA) benefit is calculated assuming the account balance is converted into an indexed annuity, based on unisex pricing and including mandatory survivor protection.

Table 10
Near Poverty Rates in 2050 among Non-DI Beneficiaries Age 62 to 69 under Different Assumptions about Personal Account Participation and Returns

			Model 2 Scenarios					
	Current Law Promised	Current Law Adjusted	1 OCACT-Full Participation	2 SCF-Based Participation	3 SCF-Based Allocation	4 1.4% Admin Costs	5a High Returns Mkt Var	5b Low Returns Mkt Var (Rev)
All	2.2	4.2	2.9	3.8	3.7	4.3	3.5	5.7
Men								
Married	1.0	2.0	1.5	2.2	2.2	2.5	2.1	3.4
Widowed	3.1	6.2	3.1	3.1	3.1	3.8	3.1	6.2
Divorced	3.6	9.7	6.8	8.6	8.2	9.9	7.2	12.2
Never Married	5.5	10.1	6.9	8.4	8.2	9.6	7.8	12.8
All	2.1	4.5	3.2	4.1	4.0	4.7	3.7	6.2
Women								
Married	0.3	1.0	0.5	0.9	0.9	1.1	0.7	1.7
Widowed	2.0	6.2	1.8	3.7	3.7	4.3	3.5	5.7
Divorced	7.4	10.1	8.3	10.7	10.5	11.2	9.7	14.0
Never Married	7.6	10.8	9.1	10.8	10.8	11.4	10.5	14.9
All	2.2	3.9	2.6	3.6	3.5	4.0	3.3	5.2
Age								
62-64	3.0	5.7	3.8	5.3	5.2	5.9	5.0	7.8
65-69	1.8	3.5	2.4	3.2	3.1	3.6	2.8	4.7
Education								
Less than HS graduate	6.4	11.3	8.5	10.8	10.5	11.8	10.0	14.1
High school graduate	3.7	6.9	4.8	6.3	6.2	7.1	5.7	8.8
College graduate	0.4	1.1	0.6	0.9	0.9	1.1	0.8	2.1
Race								
White	1.3	3.2	1.9	2.6	2.5	3.1	2.3	4.4
Black	6.0	9.4	7.2	9.1	9.1	9.7	8.6	12.1
Hispanic	2.8	5.1	3.8	5.3	5.2	6.1	5.1	6.6
Other	3.3	4.3	3.7	4.7	4.7	4.7	4.7	5.7
Work Years								
0-19	6.7	11.2	7.8	9.6	9.6	10.9	9.0	12.9
20-29	4.4	9.7	6.6	8.7	8.6	10.0	7.6	12.5
30-34	3.9	6.1	4.7	6.3	6.3	6.9	6.2	8.4
35+	0.8	1.8	1.1	1.6	1.5	1.8	1.4	2.8
Shared AIME Quintile								
1	9.9	17.3	12.2	15.5	15.3	17.3	14.3	20.2
2	0.9	3.3	1.8	2.9	2.7	3.4	2.4	5.9
3	0.0	0.4	0.2	0.6	0.5	0.7	0.4	1.6
4	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.6
5	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1

Source: Authors' calculations from DYNASIM3 (Runid: 378).
Notes:
1. Sample includes Social Security beneficiaries ages 62 to 69 in 2050. Persons with spouses under age 50 and DI beneficiaries are excluded.
2. The personal account (PA) benefit is calculated assuming the account balance is converted into an indexed annuity, based on unisex pricing and including mandatory survivor protection.
3. See table 2 for details about alternative assumptions. Scenarios are cummulative through numbers 5a and 5b. For example, scenario 4 includes assumptions 2 and 3.
4. Near poverty is defined as total family cash income of less than 150 percent of the poverty threshold.

Appendix Table A1:
Social Security Reform Option Specifics

Key Reform Components	Effective year, phase-in provisions, other details from Commission report	Details assumed by OCACT and/or UI
Model 1		
A 2.0% of payroll voluntary individual account	2004; limited to workers who have not attained 55 at beginning of 2002; access to account at entitlement as retired worker/aged spouse/aged surviving spouse; disabled workers get access at conversion; transferred to surviving spouse (or estate if none).	All annuitize at retirement (joint and 2/3 survivor if married); no lump sum distributions; individuals who opt into voluntary account cannot opt out subsequently; OCACT estimates 3 versions of financing (all payroll, ½ payoll/½ gr, all GR)
B 3.5% real offset (or 0.5 % **above** realized or expected market yield on long-term treasury bonds)	Based on CPI-indexed annuity (unisex); must be joint and 2/3 survivor if married at retirement (based on both spouses ages)	Retirement assumed at OASI take-up (DI worker benefits not offset until conversion); use cohort-specific mortality
C Program (like current law) not in fiscal balance.	General Revenue infusion required during phase in.	Not simulated.
Model 2		
A 4.0% of payroll (equal employer/ employee) voluntary individual account, to maximum of $1,000 (wage indexed)	Phase-in same as Model 1.	Annuitize same as Model 1.
B 2.0% real offset (or 1.0% **below** realized or expected market yield on long-term treasury bonds)	Based on CPI-indexed annuity (unisex); must be joint and 2/3 survivor if married at retirement (based on both spouses ages)	Retirement response same as Model 1.
C Change general benefit formula by reducing the replacement rate factors (bend points) by the real rate of real wage growth beginning in 2009.	2009; implemented by multiplying bend percentages by the ratio of price increase to wage increase (for year one, 1.033/1.0433=.994).	Adjustments are based on age of initial eligibility (age 62, so persons taking up later are not penalized).
D Minimum benefit 120% of poverty (inflation indexed) to 30-year minimum wage worker[1]; partial benefit if 21-29 work years	2009; if Average Indexed Monthly Earnings (AIME) < 2*AIME | 35-years at minimum wage, then: PIA= PIA * (1+ applicable percentage[2] *AIME factor3* coverage factor4)	
E Increase widow(er)s' benefit to 75 percent of a couple's benefit (if higher) for low-wage couples	2009; Capped at benefit received by survivor of average wage worker[5]	
F General Revenue transfers	Transfers made when combined OASDI Trust funds fall below 100% annual costs.	
Model 3		
A 1.0% new contribution (progressive subsidy) plus 2.5% of payroll (equal employee/employer shares) voluntary individual account, to maximum of $1,000 (wage indexed)	Phase-in same as Model 1	Distribution same as model 1.

Appendix Table A1 (Continued)

B	2.5% real offset (or 0.5% **below** realized or expected market yield on long-term treasury bonds)	Based on CPI-indexed annuity (unisex); must be joint and 2/3 survivor if married at retirement (based on both spouses ages)	
C	Index benefit growth to life expectancy gains (price inflation + 0.5%)	2009; multiply bend percentages by a successive multiplier of 0.995 (equivalent to indexing using 2001 Trustees)	0.995 factor is updated every 10 years to reflect new OASDI assumptions; *in addition to* current law NRA increase
D	Minimum benefit of 100% of poverty (inflation indexed) to 30 year minimum wage worker[6]; partial benefit if 21-29 work years	2009; if AIME < 2*AIME | 35-years at minimum wage, then: PIA= PIA * (1+ applicable percentage[7] *AIME factor [8]* coverage factor[9])	

[1] Defined as 2000 hours/year at $5.15 in 2000, wage indexed, stopping after calendar year in which 60 is attained.

[2] Applicable percentage=4.04% if eligible in 2009, 8.08% if eligible in 2009…. to 40.4% if eligible 2018 and later

[3] AIME factor = 1 if AIME <=M
= (A-AIME)/(A-M) if M < AIME < A
= 0 if AIME >= A
Where A = 2*AIME | 35 years at minimum wage and M= AIME | 30 years at minimum wage.

[4] Coverage factor = 0 if QCs <=2*elapsed years
= 1+ (QCs-3*elapsed years)/elapsed years if 2*elapsed years < QCs < 3*elapsed years
= 1 if QCs >=3*elapsed years
Where elapsed years represents years from age 22 through year prior to eligibility (excluding years with DI worker benefits).

[5] Actuarial reduction of this limitation would be computed as if the survivor had been receiving retired worker benefits on the earliest of the actual ages upon which benefits began as an aged spouse, an aged surviving spouse, or a retired worker beneficiary, but not before 62.

[6] Defined as above (under model 2).

[7] Applicable percentage=1.2% if eligible in 2009, 2.4% if eligible in 2010…. to 12.0% if eligible 2018 and later

[8] AIME factor = 1 if AIME <=M
= (A-AIME)/(A-M) if M < AIME < A
= 0 if AIME >= A
Where A =AWI for second year before eligibility/12 (noted that this differs from under model 2) and M= AIME | 30 years at minimum wage.

[9] Coverage factor =max(0, 1+B*(QCs -3*elapsed years)/elapsed years)
where B = 1 if QCs < 3*elapsed years
= 1/2 otherwise
Where elapsed years represents years from age 22 through year prior to eligibility (excluding years with DI worker benefits).

Appendix Table A2
Summary of Core Processes Modeled in *DYNASIM3*

Process	Data	Form and predictors
Demographic sector		
Birth	NLSY (1979–94), VS, OCACT	Seven-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	NLMS (1979–81), VS, OCACT	Three equations; time trend from Vital Statistics 1982–97; includes socioeconomic differentials; separate process for the disabled based on age, sex, and disability duration derived from Zayatz (1999).
Immigration	Vital Statistics	Simple reweighting procedures.
First marriage	NLSY (1979–93), NCHS	Eight discrete-time logistic hazard models for persons age 15 to 34; depends on age, education, race, earnings, presence of children (for females); uses Vital Statistics rates at ages outside this range.
Remarriage	NCHS	Table lookups; separate by sex for widowed and divorced.
Mate matching	NA	Closed marriage market (spouse must be selected from among unmarried, opposite-sex persons in the population); match likelihood depends on age, race, education.
Divorce	PSID (1985–93)	Couple-level outcome; discrete-time logistic hazard model depends on marriage duration, age and presence of children, earnings of both spouses. (Also includes a separate model to predict separation.)
Leaving home	NLSY (1979–94)	Three equations; family size, parental resources, and school and work status are important predictors.
Living arrangements	SIPP (1990–93)	Projected at age 62 and older; predictors include number of children ever born, income sources, demographic characteristics.
Education	NLSY (1979–94), CPS (1995–98)	Ten cross-tabulations based on age, race, sex, and parents' education.
Disability	SIPP (1990–93)	Discrete-time logistic hazard model incorporates various socioeconomic differences (age, education, lifetime earnings, race/ethnicity, marital status and nativity).
Economic sector		
Labor supply and earnings	PSID (1980–93), NLSY (1979–89)	Separate participation, hours decisions, wage rates for 16 age-race-sex groups; all equations have permanent and transitory error components; key predictors include marital status, education level, age splines, region of residence, disability status, whether currently in school, birth cohort, job tenure, and education level interacted with age splines; also number and ages of children. Model forms vary by outcomes.
Job change	SIPP, PENSIM	Assigned from PENSIM to DYNASIM population to age 50 through a statistical match (based on age, gender, education, industry, tenure, pension coverage and type of plan).
Pension coverage	SIPP, PIMS	Accumulation of defined contribution plans based on self-reports; assignment of replacement rates for defined benefit plans with reductions in replacement rates based on number of job changes.
Saving/Consumption	SIPP, PSID (1984–94), HRS, SIPP 1990–93 matched with SSA administrative data (1951–99)	Separate models estimated for housing and nonhousing wealth based on income and demographic characteristics using random effects and annual hazard models; each model includes an individual-specific error term.

Appendix Table A2 (Continued)

Process	Data	Form and predictors
Benefits sector		
OASI	SIPP (1990–93) matched to SSA administrative data (1951–99)	Benefit claiming simulated beginning at age 62; model uses discrete-time hazard models to determine age at take-up based on age, benefit amount, spousal characteristics, and Social Security policy parameters.
DI	SIPP (1990–93) matched to SSA administrative data (1951–99)	Benefit claiming predicted through discrete-time hazard model including age, education, lifetime earnings, race, ethnicity, marital status, nativity, and disability status in t - 1.
SSI	SIPP (1990–93)	Uses program rules (income and asset tests) to determine eligibility and a participation function based on potential benefit and demographic and economic characteristics including age, education, race, family structure, home ownership, and sources of income.

Notes:
CPS = Current Population Survey; HRS = Health and Retirement Survey; NA = Not Applicable; NCHS = National Center for Health Statistics; NLMS = National Longitudinal Mortality Study; NLSY = National Longitudinal Survey of Youth; OASI = Old-Age and Survivors Insurance (Social Security); DI = Disability Insurance (Social Security); OCACT = Intermediate assumptions of the OASDI Trustees; PENSIM = Pension Simulation Model; PIMS = Pension Insurance Modeling System from the Pension Benefit Guaranty Corporation; PSID = Panel Study of Income Dynamics; SIPP = Survey of Income and Program Participation; VS = Vital Statistics.

Appendix Table A3. Probit Coefficients in the Participation Model Based on Risk Aversion

Variable	Coefficient		Standard Error
Married Couples (N=7,203)			
Intercept	0.1685	**	0.0604
Maximum Age in Couple is < 35 (omitted)			
Maximum Age in Couple is 35 to 44	-0.1485	**	0.0561
Maximum Age in Couple is 45 to 54	-0.2726	***	0.0589
Maximum Age in Couple is 55 to 64	-0.3450	***	0.0675
Maximum Age in Couple is 65 or more	-0.5707	***	0.0805
Neither Black nor Hispanic (omitted)			
Black	-0.2894	***	0.0715
Hispanic	-0.3796	***	0.074
Maximum Education in Couple is Less than High School	-0.2839	**	0.0874
Maximum Education in Couple is High School (omitted)			
Maximum Education in Couple is Some College	0.2953	***	0.0508
Maximum Education in Couple is College Graduate	0.6741	***	0.0489
Fair or Poor Health	-0.1792	***	0.0443
Homeowner	0.1588	**	0.0494
Log of Wage-indexed Non-retirement Wealth	0.1633	***	0.0098
DB Pension Coverage	0.0530		0.0463
DC Pension Coverage	0.3599	***	0.0386
% who report willingness to take risk		**76.5**	
Nonmarried Individuals (N=2,716)			
Intercept	0.0567		0.62
Age is < 35 (omitted)			
Age is 35 to 44	-0.1447		0.076
Age is 45 to 54	-0.2536	**	0.0865
Age is 55 to 64	-0.2031		0.1126
Age is 65 or more	-0.6363	***	0.1479
Never Married Men	0.4878	***	0.087
Widowed Men	0.0584		0.1863
Divorced or Separated Men	0.3147	***	0.083
Never Married Women	0.0059		0.0799
Widowed Women	-0.0942		0.1279
Divorced or Separated Women (omitted)			
Neither Black nor Hispanic (omitted)			
Black	-0.0660		0.072
Hispanic	-0.4637	***	0.1112
Education is Less than High School	-0.1896		0.0977
Education is High School (omitted)			
Education is Some College	0.4042	***	0.0701
Education is College Graduate	0.6770	***	0.0735
Fair or Poor Health	-0.0815		0.0737
Homeowner	0.1023		0.0639
Log of Wage-indexed Non-retirement Wealth	0.1716	***	0.0195
DB Pension Coverage	0.1884	*	0.0841
DC Pension Coverage	0.3095	***	0.0614
% who report willingness to take risk		**66.5**	

Source: Urban Institute tabulations from SCF (1995,1998,2001)

Sample: Married couples must have at least one spouse with non-zero earnings; nonmarried individuals must have non-zero earnings. Persons must be at least age 17 in both cases.

Notes: Dependent variable is defined as willing to accept average, above average, or substantial risk. Due to the multiple replicate structure of the SCF, sample sizes and participation percents are based on the median values.

*** indicates p<.001; ** indicates p<.01; * indicates p<.05

Appendix Table A4: Ordered Probit Coefficients in the Portfolio Allocation Model

	401(k) Account Allocation		
Variable	Coefficient		Standard Error
Intercept 1	-1.0975	***	0.1709
Intercept 2	-0.0760		0.1684
Age	-0.0024		0.0031
Married	0.0478		0.1182
Women	-0.2879	*	0.1469
Married Women	0.3580	*	0.1637
Unmarried Men (omitted)			
Neither Black nor Hispanic (omitted)			
Black	-0.2686	*	0.1049
Hispanic	-0.3098	*	0.1465
Education is Less than High School	-0.0244		0.1576
Education is High School (omitted)			
Education is Some College	0.0826		0.0943
Education is College Graduate	0.0437		0.0805
Wage-Indexed Family Earnings	0.0054		0.0043
Head has DB Pension Coverage	0.0782		0.0835
Spouse has DB Pension Coverage	0.1069		0.1102
Allocation Distribution (Estimation Sample)			
% Mostly Bonds		**14.5**	
% Even		**33.6**	
% Mostly Stocks		**51.9**	
(N = 1,513)			

Source: Urban Institute tabulations from SCF (2001)
Sample includes 1513 individuals ages 16 to 64 who report having a 401(k) account.
Notes: The dependent variable can have values of 0, 1, or 2. These values correspond to responses of "mostly bonds," "even," and "mostly stocks" in the estimation. In the simulation, these values correspond to a portfolio allocation of 33 percent stocks, 50 percent stocks, or 66 percent stocks, respectively. Given the multiple replicate structure of the SCF, we report the median sample size along with the allocation distribution in this case.
*** indicates p<.001; ** indicates p<.01; * indicates p<.05

Appendix Table A5
Projected Rates of Return Based on Historical Market Variation

Projection	Alternative 1				Alternative 2			
Year	Ref Yr	Stocks	Corp Bonds	Gov't Bonds	Ref Yr	Stocks	Corp Bonds	Gov't Bonds
2004	1957	-0.12	0.05	0.04	2003	0.21	0.03	0.04
2005	1958	0.35	-0.04	-0.07	2002	-0.21	0.13	0.14
2006	1959	0.09	-0.02	-0.04	2001	-0.11	0.09	0.02
2007	1960	-0.01	0.07	0.12	2000	-0.10	0.09	0.17
2008	1961	0.22	0.04	0.00	1999	0.15	-0.09	-0.11
2009	1962	-0.08	0.06	0.05	1998	0.23	0.09	0.11
2010	1963	0.18	0.01	0.00	1997	0.27	0.11	0.13
2011	1964	0.13	0.03	0.02	1996	0.16	-0.02	-0.04
2012	1965	0.09	-0.02	-0.01	1995	0.29	0.23	0.27
2013	1966	-0.11	-0.03	0.00	1994	-0.01	-0.08	-0.10
2014	1967	0.17	-0.07	-0.11	1993	0.06	0.10	0.14
2015	1968	0.05	-0.02	-0.05	1992	0.04	0.06	0.05
2016	1969	-0.12	-0.13	-0.10	1991	0.23	0.16	0.15
2017	1970	-0.01	0.12	0.06	1990	-0.08	0.01	0.00
2018	1971	0.09	0.07	0.09	1989	0.22	0.11	0.12
2019	1972	0.13	0.04	0.02	1988	0.10	0.06	0.05
2020	1973	-0.19	-0.07	-0.09	1987	0.01	-0.04	-0.07
2021	1974	-0.30	-0.13	-0.07	1986	0.15	0.18	0.22
2022	1975	0.24	0.07	0.02	1985	0.24	0.24	0.25
2023	1976	0.16	0.13	0.11	1984	0.02	0.12	0.11
2024	1977	-0.11	-0.05	-0.07	1983	0.15	0.02	-0.03
2025	1978	-0.02	-0.08	-0.09	1982	0.15	0.36	0.34
2026	1979	0.04	-0.15	-0.12	1981	-0.11	-0.09	-0.06
2027	1980	0.15	-0.13	-0.14	1980	0.15	-0.13	-0.14
2028	1981	-0.11	-0.09	-0.06	1979	0.04	-0.15	-0.12
2029	1982	0.15	0.36	0.34	1978	-0.02	-0.08	-0.09
2030	1983	0.15	0.02	-0.03	1977	-0.11	-0.05	-0.07
2031	1984	0.02	0.12	0.11	1976	0.16	0.13	0.11
2032	1985	0.24	0.24	0.25	1975	0.24	0.07	0.02
2033	1986	0.15	0.18	0.22	1974	-0.30	-0.13	-0.07
2034	1987	0.01	-0.04	-0.07	1973	-0.19	-0.07	-0.09
2035	1988	0.10	0.06	0.05	1972	0.13	0.04	0.02
2036	1989	0.22	0.11	0.12	1971	0.09	0.07	0.09
2037	1990	-0.08	0.01	0.00	1970	-0.01	0.12	0.06
2038	1991	0.23	0.16	0.15	1969	-0.12	-0.13	-0.10
2039	1992	0.04	0.06	0.05	1968	0.05	-0.02	-0.05
2040	1993	0.06	0.10	0.14	1967	0.17	-0.07	-0.11
2041	1994	-0.01	-0.08	-0.10	1966	-0.11	-0.03	0.00
2042	1995	0.29	0.23	0.27	1965	0.09	-0.02	-0.01
2043	1996	0.16	-0.02	-0.04	1964	0.13	0.03	0.02
2044	1997	0.27	0.11	0.13	1963	0.18	0.01	0.00
2045	1998	0.23	0.09	0.11	1962	-0.08	0.06	0.05
2046	1999	0.15	-0.09	-0.11	1961	0.22	0.04	0.00
2047	2000	-0.10	0.09	0.17	1960	-0.01	0.07	0.12
2048	2001	-0.11	0.09	0.02	1959	0.09	-0.02	-0.04
2049	2002	-0.21	0.13	0.14	1958	0.35	-0.04	-0.07
2050	2003	0.21	0.03	0.04	1957	-0.12	0.05	0.04

Sources: Ibbotson Associates 2003 SBBI Yearbook for historic period through 2002, corresponding to projection years 2004 through 2049; Standard and Poor's for equity returns in 2003; and Moody's for corporate bond returns in 2003 (adjusted to CPI).

Notes:

1. Projected rates of return shown assume average rates of return of 6.5 percent for stocks and 3.3 percent for bonds. Adjustments to achieve this average were made using the arithmetic mean and a single scalar adjustment factor.

2. The reference year (Ref Yr) reflects the year of the historical variation.

Appendix Table A6
Annual Personal Account Benefits in 2050 among Personal Account Participants Age 62 to 69 ($2004)
Under Different Assumptions about Personal Account Participation and Returns

	Scenarios							
	Average Returns		High Returns			Low Returns		
	Mkt Var	Mkt Var (Rev)	No Mtk Var	Mkt Var 5a	Mkt Var (Rev)	No Mtk Var	Mkt Var	Mkt Var (Rev) 5b
All	$6,623	$3,756	$7,070	$8,196	$4,763	$4,448	$5,395	$2,997
Men								
Married	6,873	3,938	7,406	8,536	5,012	4,624	5,581	3,134
Widowed	9,123	4,920	9,561	11,286	6,243	6,022	7,434	3,921
Divorced	6,455	3,733	6,772	7,927	4,673	4,348	5,297	3,016
Never Married	7,510	4,428	8,366	9,380	5,685	5,154	6,062	3,489
All	7,005	4,025	7,553	8,694	5,119	4,725	5,692	3,205
Women								
Married	5,753	3,243	6,134	7,118	4,116	3,856	4,686	2,585
Widowed	8,142	4,452	8,586	10,039	5,640	5,440	6,654	3,553
Divorced	6,396	3,562	6,482	7,803	4,419	4,224	5,284	2,907
Never Married	6,623	3,746	7,085	8,193	4,746	4,462	5,397	2,992
All	6,278	3,513	6,635	7,747	4,442	4,199	5,128	2,811
Age								
62-64	5,758	3,759	6,863	7,185	4,766	4,278	4,650	3,001
65-69	6,986	3,755	7,157	8,621	4,761	4,520	5,708	2,996
Education								
Less than HS graduate	4,868	2,796	5,347	6,063	3,585	3,314	3,938	2,204
High school graduate	5,885	3,341	6,326	7,288	4,245	3,972	4,791	2,661
College graduate	7,238	4,100	7,687	8,951	5,191	4,845	5,901	3,278
Race								
White	6,687	3,786	7,124	8,276	4,802	4,481	5,448	3,021
Black	6,074	3,370	6,407	7,505	4,259	4,051	4,955	2,697
Hispanic	6,705	3,872	7,285	8,306	4,915	4,575	5,457	3,087
Other	6,642	3,898	7,255	8,234	4,953	4,548	5,402	3,105
Work Years								
0-19	2,645	1,418	2,825	3,284	1,822	1,754	2,144	1,112
20-29	4,791	2,565	5,055	5,929	3,264	3,175	3,896	2,033
30-34	6,107	3,320	6,413	7,544	4,213	4,042	4,978	2,642
35+	7,534	4,337	8,074	9,325	5,494	5,082	6,140	3,467
Shared AIME Quintile								
1	4,437	2,446	4,745	5,495	3,109	2,980	3,609	1,945
2	5,995	3,386	6,393	7,411	4,291	4,031	4,887	2,703
3	6,814	3,865	7,281	8,426	4,896	4,591	5,556	3,088
4	7,423	4,206	7,886	9,182	5,325	4,969	6,051	3,364
5	7,927	4,564	8,493	9,826	5,799	5,323	6,452	3,639
Benefit Type								
Retired	6,830	3,894	7,311	8,458	4,941	4,593	5,560	3,107
Spouse or Survivor	5,148	2,770	5,355	6,328	3,497	3,415	4,219	2,217
Retirement Year								
2043	4,957	3,009	5,933	6,018	3,784	3,854	4,114	2,415
2044	5,828	3,241	6,036	7,112	4,093	3,879	4,812	2,592
2045	7,184	3,211	6,584	8,797	4,057	4,204	5,913	2,570
2046	8,151	3,944	7,323	10,062	5,003	4,620	6,657	3,147
2047	7,403	3,832	7,398	9,177	4,857	4,645	6,021	3,061
2048	6,746	3,954	7,644	8,411	5,026	4,761	5,456	3,151
2049	5,588	4,504	7,403	6,991	5,730	4,587	4,503	3,585
2050	6,025	3,838	7,296	7,570	4,888	4,498	4,833	3,053

Source: Authors' calculations from DYNASIM3 (Runid: 378).
Notes:
1. Sample includes persons ages 62 to 100 in 2050. Persons with spouses under age 50 and DI beneficiaries are excluded.
2. The personal account (PA) benefit is calculated assuming the account balance is converted into an indexed annuity, based on unisex pricing and including mandatory survivor protection.
3. See table 2 for details about alternative assumptions. Scenarios are cummulative through numbers 5a and 5i. For example, scenario 5a includes assumptions 2 and 3 and scenario 6 includes assumptions 2, 3, and 4.
4. Results by retirement year not shown for early beneficiaries (those claiming at 60 or 61) in the oldest (1981) cohort because of small cell sizes.

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