RETIREMENT SECURITY AND THE STOCK MARKET CRASH: WHAT ARE THE POSSIBLE OUTCOMES?

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Abstract

This paper simulates the impact of the 2008 stock market crash on future retirement savings under alternative scenarios. If stocks remain depressed as after the 1974 crash, 20 percent of pre-boomers born 1941-45 and 22 percent of late boomers born 1961-65 would see their retirement incomes drop 10 percent or more. Working another year would reduce the share of these big losers to 14 percent for late boomers. Because most pre-boomers were already retired, their share of big losers would decline slightly, to 19 percent. Delaying retirement would disproportionately benefit low-income people because their additional earnings exceed their stock market losses.

Introduction

The sharp decline in the stock market in 2008 placed the retirement security of many Americans at risk. Although the market has rebounded sharply since its trough in March 2009, as of mid-October 2009, the Standard & Poor's 500 Index (S&P 500) remained 29.8 percent below its peak level two years earlier.

In a previous paper (Butrica, Smith, and Toder 2009), we estimated the effects of the decline in the value of financial assets on incomes at age 67 for pre-boomers (born between 1941 and 1945), middle boomers (born between 1951 and 1955), and late boomers (born between 1961 and 1965). We examined the effects of the stock market crash assuming three scenarios about what would happen to stock prices in the future, compared with a no-crash scenario in which stock prices would have continued to rise at their long run historical rate from December 2007. Under the no-recovery scenario, we assumed stock prices resumed their long-run growth rate from their depressed level as of October 2008, so they permanently remained 42 percent below projected values under the no-crash scenario. Under the full-recovery scenario, we assumed that stock prices would grow at a steady rate that was faster than the historical average between 2008 and 2017, so that they would return to their no-crash projected level by 2017. In the partial-recovery scenario, we assumed stock prices would recover to a level halfway between the no-crash and full-recovery projected values by 2017.

Any combination of market decline and subsequent recovery has offsetting effects on the future retirement income of the current working age population. The immediate reduction in asset values following a market decline reduces wealth and future retirement income. Under the full- and partial-recovery scenarios, however, the combination of lower asset prices from the

crash and faster stock price growth afterwards raises the retirement income of some future retirees in later birth cohorts by enabling them to invest at bargain prices and reap larger capital gains.

We found that the effect of the market crash on retirement incomes varies by age, income level, and assumptions about future market performance. About 63 percent of boomers are estimated to have owned stocks in 2008, but those in the higher income quintiles are affected much more than others because they are more likely to have retirement accounts and other financial assets and hold larger shares of their financial wealth in equities. Those farthest from retirement age fare better than their older counterparts because they have less wealth when the market crashed than earlier cohorts (due to fewer years of accruals, even though they are more likely to have retirement accounts and invest in equities) and more time to restore their lost wealth through new stock purchases and future appreciation before retirement. Pre-boomers lose in all scenarios and all cohorts lose under the no-recovery scenario. Middle boomers and late boomers experience net income losses under the no-recovery scenario, but retirement income gains under the full-recovery scenario. For example, the highest income quintile of middle boomers experiences on average a 14 percent loss in income at age 67 if the market fails to recover, but a 4 percent gain on average if the market fully recovers to its previous path by 2017. Gains and losses vary considerably within cohort, income, and demographic groups, depending on individuals' portfolio allocations and the market performance of their investments.

In this paper, we perform additional simulations using revised data, different assumptions about the path of future stock market returns, and alternative assumptions about the behavior of individuals. We examine a scenario in which stock prices not only fail to rebound to their original projected levels, but stagnate for years as they did in the 1970s and early 1980s. We also

examine the effects of varying assumptions about how individuals adjust their portfolios in response to asset price changes and whether they attempt to recover their financial losses by working longer.

In the following sections of the paper, we discuss our methodology and alternative simulations. We then discuss the simulation results and how they affect our earlier conclusions about the effects of the market crash on future retirement incomes.

The Urban Institute's DYNASIM3 Model

We project retirement incomes using the Urban Institute's Dynamic Simulation of Income Model (DYNASIM3). Since our previous paper, we have made minor improvements in how DYNASIM3 models pension income and have updated some of DYNASIM3's assumptions to account for new data and revised projections by the Federal Old-Age and Survivors Insurance and Disability Insurance (OASDI) Trustees.

DYNASIM3 starts with a self-weighting sample of 103,072 individuals from the 1990 to 1993 panels of the Survey of Income and Program Participation (SIPP) of the U.S. Census Bureau and ages this starting sample in yearly increments to 2080, using parameters estimated from longitudinal data sources. The model integrates many important trends and differences among groups in life course processes, including birth, death, schooling, leaving home, first marriage, remarriage, divorce, disability, work, and earnings. DYNASIM3 projections for individuals are aligned to be consistent with 2009 OASDI Trustees projections of aggregate projections of fertility, net immigration, earnings, price changes, and mortality. For a fuller description of DYNASIM3, see Favreault and Smith (2004).

DYNASIM3 projects the major sources of wealth and income at retirement age. In this paper, we define household income as the sum of income from retirement accounts (defined contribution (DC) pensions, IRAs, and Keoghs) and other financial assets, Social Security benefits, benefits from employer-sponsored defined benefit (DB) plans, earnings, Supplemental Security Income (SSI), and imputed rental income. Asset balances in retirement accounts and financial assets outside of retirement accounts in DYNASIM3's starting SIPP sample are adjusted to align with totals in the Survey of Consumer Finances (SCF).[1] For the purpose of this paper, it is especially relevant how DYNASIM3 projects pensions and income from retirement accounts and financial assets.

Projecting Pensions

DYNASIM3 projects pensions from employer-sponsored DB plans, cash balance (CB) plans, and retirement accounts.[2] Baseline information about pension coverage on current and past jobs, contribution rates, and account balances come from SIPP self-reported information. The baseline DB pension information reflects pension plan structures through December 2006, including DB pension plan freezes and conversions to CB plans. Various data sources and models, as described below, are used to project job changes, pension coverage, participation, and contributions into the future.

[1] Researchers commonly regard the SCF as one of the best sources of wealth data, and superior to wealth data in the SIPP.

[2] CB plans are a hybrid type of pension plan in which employers guarantee rates of return, as in a DB plan, but the employee receives a separate account that increases in value from both employer contributions and the plan rate of return, as in a DC account.

DYNASIM3 uses data on synthetic work histories from the PENSIM[3] model to impute future job changes and pension coverage on future jobs from the time of the SIPP interview through age 50. The DYNASIM3 pension module assumes that no further job changes take place after age 50.

DYNASIM3 projects future DC pension participation using logit models estimated on the 1996 SIPP matched to the Social Security Administration's Detailed Earnings Records (DER).[4] Separate models of the probability of participation are estimated for those who contributed to a plan in the previous year and those who did not contribute. DYNASIM3 projects future DC pension contributions using a random effects Tobit model. This model incorporates individual-level permanent and random error effects. It also controls for the statutory annual contribution limits to IRAs, Keogh plans, and employer-sponsored salary reduction plans.[5] DYNASIM3 separately projects IRA, Keogh, and DC contributions, but it pools the balances.[6] DC and IRA/Keogh accounts are invested in stock and bond portfolios that vary by age and risk tolerance according to SCF data on asset allocations.[7] Every year, DYNASIM3 rebalances the portfolios,

[3] PENSIM is a microsimulation model developed by Martin Holmer of the Policy Simulation Group. PENSIM is used to analyze the retirement income implications of government policies affecting employer-sponsored pensions. The PENSIM projections of employee pension coverage are calibrated by worker age, broad industry group, union status, and firm size to the 2008 National Compensation Survey.

[4] The DER includes longitudinal values for taxable and deferred earnings based on IRS W-2 forms from 1990 to 2004.

[5] DYNASIM3 uses the methodology developed for the Social Security Administration's Model of Income in the Near Term (MINT) to project pensions and assets. See Toder et al. (2002) and Smith et al. (2007) for more details on MINT.

[6] Cash balance plan balances are rolled over into the workers' IRAs at job separation.

[7] DYNASIM3 assigns asset allocations to individual observations into five groups (0 percent stocks, 20 percent stocks, 50 percent stocks, 80 percent stocks, and 100 percent stocks) according to patterns by age and risk tolerance observed in pooled 1998 to 2007 SCF data. In earlier versions of DYNASIM3, portfolio allocations varied only by age group, according to averages from EBRI/ICI data. The new allocations better represent the diversity of portfolio allocations among individuals.

according to the allocation strategy for the individual's attained age and risk tolerance category.

DYNASIM3 uses actual historical price changes and returns for stocks, long-term corporate bonds, and long-term government bonds to grow portfolios in retirement accounts through 2008 and assumptions based on long-term historical experience to project asset returns after 2009. DYNASIM3 sets rates of return for each individual stochastically, using historical means and standard deviations, so that any individual's return on assets may differ from the average. In projecting future asset growth, DYNASIM3 assumes the consumer price index (CPI) will increase by 2.8 percent per year; mean real rates of return will be 6.5 percent for stocks, 3.5 percent for corporate bonds, and 3.0 percent for government bonds; and the standard deviations of returns will be 17.28 percent for stocks and 2.14 percent for bonds.[8] The 6.5 percent real return on stocks reflects a capital appreciation of about 3.5 percent and a dividend yield of around 2.9 percent, which are in line with the long-term performance of the S&P 500 and historical dividend yields. The model subtracts one percentage point from annual stock and bond returns to reflect administrative costs.

DYNASIM3 projects DB pensions using the Pension Benefit Guaranty Corporation's (PBGC) Pension Insurance Modeling System (PIMS) DB plan formulas, which are randomly assigned to DB participants based on broad industry, union status, and firm size categories, and

[8] The CPI growth assumption is based on the intermediate assumptions of the 2009 OASDI Trustees (Board of Trustees 2009). The rates of return assumptions are those recommended by the Social Security Administration's Office of the Chief Actuary for the President's Commission to Strengthen Social Security (President's Commission to Strengthen Social Security 2001). The standard deviations are derived from real returns over the 50-year period between 1952 and 2001 for large company stocks and Treasury bills reported in Ibbotson Associates (2008). Projected CPI is negative for 2009.

an indicator of whether the firm offers dual (DB and DC) coverage.[9] DYNASIM3 uses actual benefit formulas to calculate benefits for federal government workers and military personnel, and uses tables of replacement rates from the U.S. Bureau of Labor Statistics (BLS) to calculate replacement rates for state and local government workers. DYNASIM3 varies the probability of selecting a joint and survivor annuity by gender, education, family health status, wealth, and expected pension income. It also varies DB cost-of-living adjustments by employment sector (i.e., private, federal, state). The model projects conversions of pension plan type (from DB to CB or DB to DC) using actual plan change information for plans included in the PIMS data.[10]

Measuring Income from Retirement Accounts, Financial Assets, and Housing

DYNASIM3 measures income from retirement accounts and financial assets in any year as the real (price-indexed), actuarially fair, annuity income a family would receive if it annuitized 80 percent of its total wealth. The annuity value calculated is used for that year's imputation of income from retirement accounts and financial assets only. The annuity is recalculated each year to reflect changes in wealth as individuals age, based on projections in DYNASIM3 of wealth spend-down and changes in life expectancy as individuals survive to older ages. For married couples, DYNASIM3 assumes a 50 percent survivor annuity.

We measure income from financial wealth and retirement accounts as potential annuities in order to ensure comparability with DB pension and Social Security benefits, which are also annuities. Without this adjustment, DYNASIM3 would overstate the loss in retirement well-

[9] PIMS contains data for a sample of DB plans but lacks CB plans. The PBGC uses the PIMS data to estimate future pension costs that must be borne by PBGC due to the bankruptcies of firms with DB plans.

[10] CB plans conversions are based on Form 5500 summary plan descriptions among PIMS plans that have converted to CB over the historic period. DC conversions are based on employer press releases announcing conversion details. DYNASIM3 assumes no additional DB plan freezes or CB conversions after 2008.

being from the shift from DB pension income to DC assets because one dollar in DB pension wealth produces more income by standard measures than one dollar in DC wealth. This happens because measured DB income counts both a return on accumulated assets and some return of principal, while measured income from financial wealth and DC retirement accounts includes only the return on accumulated assets.

The income measure we use therefore differs conceptually from asset income as measured by the U.S. Census Bureau and other analysts, which includes only the rate of return on assets (interest, dividends, and rental income) and excludes the potential consumption of capital that could be realized if a person spent down his or her wealth. The U.S. Census Bureau and many analysts include consumption of capital from retirement accounts only if people choose regularly to withdraw money from the accounts through receipt of an annuity, rather than estimating the potential stream of income as we do in DYNASIM3.

To capture the amount by which homeowners are better off than non-homeowners, DYNASIM3 imputes a rate of return (3 percent) to housing equity (imputed rent), which represents the saving in rent from owning a home, net of costs of interest, and home maintenance. In these scenarios, we do not attempt to include the recent run-up or downturn in house values.

Our assumptions aim to estimate the potential income from assets at retirement and compare relative differences by income quintile and other characteristics across birth cohorts.

Changes in DYNASIM3 for this Paper

We have made several changes in DYNASIM3 since our earlier paper (Butrica, Smith, and Toder 2009).

- We updated the model to use demographic and economic assumptions of the 2009 OASDI Trustees report. This includes lower short-term price and wage growth due to the current recession.

- We added several additional months of stock and bond returns, and changed the 2008 stock market decline from 42.0 percent (based on the year prior to October 2008) to 37.1 percent (based on the year prior to December 2008).

- We made small improvements to the DYNASIM3 starting sample, historic earnings, and immigrant flows to better match historic and projected data.

- We inflated the DB pension income of baseline pension beneficiaries to align with historic tax data and match actual cost-of-living adjustments over the historic period.

Simulating the Effect of the Stock Market Collapse

Between January 2, 2008 and December 31, 2008, the S&P 500 index fell by about 37.1 percent (Ibbotson 2008). It had partially recovered by October 15, 2009, rising 21.4 percent since the end of 2008, but remained 29.8 percent below its peak 2007 level. We assess the impact of the 2008 stock market decline on individuals' retirement resources by comparing DYNASIM3 projections under alternative scenarios that vary assumptions about recent past and future stock market returns:

(1). The "no crash" scenario assumes the stock market had not collapsed in 2008, but instead had increased at its long-term historical real return of 6.5 percent (less a 1 percent administrative fee) from the 2007 level. Under this scenario and the assumption that all dividends are reinvested, investors can expect their stock portfolios to increase by about 5.5 percent per year and to be worth about 71 percent more in 2017 than they were in 2007 (figure 1). We compare all other scenarios to the no-crash scenario.

(2). The "no recovery" scenario captures the market decline in 2008 and then assumes that it does not rebound, but instead resumes its long-term real return of 6.5 percent after 2008,

so that investors' portfolios grow at 5.5 percent per year on average. In 2017, stock portfolios will be about the same as their pre-crash 2007 level, but still only 59 percent of the projected level had the market not crashed. In other words, the projected real value of $100 invested in the S&P 500 in 2007 with reinvested dividends, less administrative fees, is $100 in 2017 under the no-recovery scenario.

(3). The "repeat 70s" scenario assumes that stock market returns between 2009 and 2017 will be the same as those experienced between 1974 and 1982. The no-recovery scenario is somewhat a misnomer because it assumes individuals' stock market portfolios rise by 5.5 percent from 2009 onward. However, the stock market might experience relatively little growth for a number of years after the 2008 crash. For example, following the stock market crash between 1973 and 1974, the real value of the S&P 500 index continued to decline on average until the early 1980s. The repeat-70s scenario assumes a repeat of the historic annual real returns on equity (including dividends and appreciation) of only 0.7 percent between 2009 and 2017, consistent with the annual real decline in the S&P index of slightly over 2 percent per year. Because of the assumed 1 percent administrative charge, investors will lose 0.3 percent per year in their portfolio values under this scenario, reducing their 2017 stock portfolios to about 60 percent of their pre-crash 2007 level and about 35 percent of the projected 2017 level had the market not crashed. After 2017, individuals' stock portfolios will again resume growth of 5.5 percent per year.

(4). The "full recovery" scenario assumes it takes the stock market 10 years to rebound fully to where it would have been if real returns had continued to average 6.5 percent per year after 2007. Under this scenario, as with the no-crash scenario, investors can expect their stock

portfolios to be about 71 percent higher in 2017 than they were in 2007.[11] Getting back to the no-crash level from the recent depressed levels will require an annual real growth rate of 11.9 percent in individuals' equity values (including reinvested dividends but subtracting administrative fees) between 2009 and 2017. Although this growth rate is very high compared with long-term historical growth, the implied 9.4 percent average growth in the S&P index is less than the average real growth in the S&P 500 index between 1990 and 1999 (about 12.9 percent).[12] After returning to the level projected under the no-crash scenario in 2017, individuals' equity values will then return to growing at the baseline 5.5 percent rate.

For each of the stock market performance scenarios, we vary some assumptions about individuals' behavior (table 1). The baseline behavioral simulations use the assumptions in Butrica, Smith, and Toder (2009) that individuals continue to retire at the same age and rebalance their portfolios annually. We also compare projected retirement income under the no-crash, repeat-70s, no-recovery, and full-recovery scenarios assuming that individuals with unexpected retirement income losses due to the stock market crash delay retirement and that individuals do not rebalance their portfolios. The following paragraphs describe our three different assumptions regarding individual behavior.

Assumption A (Baseline): Under the "baseline" simulations, workers do not change their retirement plans in the face of changing market prices (first row of table 1). DYNASIM3 defines

[11] While 10 years may seem like a long recovery period, stock market rebounds from some past downturns have been even slower. For example, the S&P 500 in constant (inflation-adjusted) dollars peaked in 1968 and then declined sharply, recovered a bit, and declined again, reaching a low point in 1982. It did not return to its 1968 real value until December 1991. More recently, the stock market peaked in 2000 and then suffered a serious decline with the dot-com bust. Although stock values rose sharply after 2002, they were still lower in 2007 than in 2000 (in constant dollars).

[12] The 11.9 percent real growth rate includes reinvested dividends. Excluding dividends lowers the average growth rate to 9.4 percent.

retirement as substantial, but not necessarily complete, withdrawal from the labor force. Retirement for men is the age at which a male worker experiences at least an 85 percent drop in earnings compared with average earnings between ages 45 and 50, and retirement for women represents the age at which a female worker experiences at least an 85 percent drop in earnings compared with her earnings in the previous year. (For men and women, the drop in earnings must last at least two years.) Defining retirement age this way allows DYNASIM3 to simulate more gradual transitions to full retirement.[13]

The baseline simulations (A) also assume that people rebalance their portfolios every year according to the allocation strategy for the individual's attained age and risk tolerance category. Doing this implicitly assumes that individuals take account of stock prices, their assets, and their time horizon to retirement and rebalance their asset portfolios optimally. For these simulations, it means that individuals respond to the stock market crash by selling bonds and purchasing equities to maintain their desired portfolio allocation.

Assumption B (Delay Retirement)*:* In the "delay retirement" simulations, we increase the DYNASIM3 baseline retirement and Social Security take-up ages by one year to simulate delayed retirement and benefit take-up in response to the stock market crash (second row of table 1). If workers respond to the stock market crash by working longer they can partly offset the losses in income from assets. These simulations increase the retirement age of those who: 1) are not disabled, 2) did not die before the model predicted their retirement or Social Security take-up, 3) retired or took up Social Security benefits before age 70, but between 2008 and the end of the projection period, and 4) lost assets due to the stock market crash. For example, if

[13] A separate DYNASIM3 module projects Social Security take-up age using discrete-time hazard models based on age, expected benefit amount, spousal characteristics, and Social Security policy parameters.

DYNASIM3 projects a worker to retire at age 60 and to begin receiving Social Security benefits at age 62, these simulations force the worker to retire at age 61 and to take-up Social Security benefits at age 63. They then insert the worker's pre-retirement earnings, indexed by wage growth, in the simulated extra year of work. They also shift the worker's original post-retirement earnings to reflect his or her additional work effort. After adjusting earnings and the benefit take-up age, the model re-estimates wealth accumulation, pension benefits, and Social Security benefits.

Assumption C (No Rebalance): In the "no rebalance" simulations, we test the DYNASIM3 baseline assumption about rebalancing and its impact on retirement account assets by not rebalancing individuals' portfolios in response to market fluctuations (third row of table 1). Only new contributions are allocated according to age appropriate targets. As a result, individuals will end up with a smaller share of their portfolio in stocks after the crash. Because people will lock in their losses from the stock market crash and then get lower rates of return in the future, the no-rebalance simulations will produce fewer winners under the full-recovery scenario and fewer losers under the repeat-70s and no-recovery scenarios.

Aside from the assumptions described above, each scenario assumes that people will continue making the same total contributions to retirement accounts and continue working at the same jobs for the same pay as predicted under the no-crash scenario. We analyze the characteristics and household income of individuals born between 1941 and 1965 when they reach age 67 (the age by which most people will have retired). We assume husbands and wives share resources within the household. We report all income projections in annual per capita 2008 dollars. Since our sample sizes are large (20,182 records), differences between most variables in the simulations are statistically significant. We report results separately for those born from 1941

to 1945 (pre-boomers), from 1951 to 1955 (middle boomers), and from 1961 to 1965 (late boomers). When the stock market crashed in 2008, the pre-boomers were between ages 63 and 67, the middle boomers were between ages 53 and 57, and the late boomers were between ages 43 and 47.[14]

Results

In this section, we present results from the four stock market performance scenarios discussed above—the no-crash scenario, the no-recovery scenario, the repeat-70s scenario, and the full-recovery scenario. We begin with the results that use our baseline behavioral assumptions, then show the results that assume workers with wealth losses delay retirement, and finally show the results that assume workers do not rebalance their investment portfolios.

Baseline Simulations

In the baseline simulations, the only components of income at age 67 that change are income from retirement accounts and income from other financial assets because we limit our analyses to the effects of changes in equity prices and assume no change in housing values, no additional terminations of DB plans resulting from the stock market instability, no change in labor market behavior, and no effect of the recession on earnings. Future earnings, Social Security benefits, DB pension income, and imputed income from homes are the same in all four stock market performance scenarios, as are SSI benefits.

As in our earlier paper, we find that the effects of the stock market crash on retirement incomes vary by stock market performance scenario and by birth cohort. Relative to the no-crash

[14] These individuals turn age 67 over a range of years: between 2008 and 2012 for pre-boomers, between 2018 and 2022 for middle boomers, and between 2028 and 2032 for late boomers.

scenario, average income at age 67 falls under all scenarios for pre-boomers, who turn 67 between 2008 and 2012 (table 2). For middle and late boomers, retirement incomes fall under the no-recovery and repeat-70s scenarios, but increase under the full-recovery scenario.

Middle and late boomers have larger shares of their projected income at age 67 from retirement accounts and other financial assets than pre-boomers. Pre-boomers will receive 36 percent of their retirement income from retirement accounts and other assets, compared with 42 percent for middle boomers and 43 percent for late boomers (table 3). But late boomers had lower total equity assets at the beginning of 2008 than pre-boomers because they did not have time to accumulate all the wealth they will have by the time they reach retirement age.

The stock market crash has varying effects on the different cohorts depending on assumptions about future equity prices (table 2). Under the no-recovery scenario, there is a one time hit to wealth, but the percentage decline in asset values compared with the no-crash scenario is the same in all future years. Earlier cohorts have a larger share of their lifetime wealth accruals hit by the crash, but later cohorts depend more on wealth as a source of retirement income. These effects partially offset each other. On balance, pre-boomers and middle boomers suffer a larger percentage reduction in retirement income (8 percent) than late boomers (6 percent). Middle boomers are hit the most under the repeat-70s scenario because in addition to their initial losses, they suffer further losses on new asset purchases as the market continues to decline, albeit only moderately. Middle and late boomers are net winners, however, under the full-recovery scenario because they have the opportunity to purchase equities at discount prices, which will experience a decade of rapid appreciation. Pre-boomers, in contrast, have no time before age 67 to benefit from a recovery in stock prices and will not benefit much from a recovery after age 67 either because they will no longer be purchasing assets.

The importance of retirement accounts and assets as a source of retirement income at age 67 varies greatly by income group (table 3). In all cohorts, income from assets is the leading source of income for the top quintile, but is much less important for other quintiles. Retirement accounts are relatively more important as a source of income in the 4th quintile, but the sum of all sources directly affected by the stock market (retirement accounts and income from assets) is a much larger share of income in the top quintile than for other income groups.

The bottom two quintiles will receive the majority of their income at age 67 from Social Security benefits and are least reliant on income sources affected by stock prices. But they are becoming somewhat more dependent on the market over time; the share of total income from retirement accounts and income from assets in the bottom two quintiles is projected to rise from 10 and 18 percent for pre-boomers to 14 and 22 percent for late boomers.

Because of their greater asset holding and exposure to the stock market, changes in the stock market will affect retirees with higher incomes and education more than others (table 4). The no-recovery and repeat-70s scenarios are projected to reduce income at age 67 for middle boomers in the top quintile by 11 percent and 20 percent, respectively, relative to the no-crash scenario, compared with income losses of only 1 percent and 2 percent for those in the bottom quintile. College graduates are expected to see their incomes fall by 10 percent under the no-recovery scenario and 18 percent under the repeat-70s scenario, while the comparable reductions for high school dropouts are only 3 percent (no-recovery) and 6 percent (repeat-70s). But high-income middle boomers and college graduates fare better under the full-recovery scenario than those with less income and education. Individuals in the top quintile are projected to see their incomes increase by 3 percent, compared with no change for those in the bottom quintile. College graduates will see their incomes increase by 3 percent, compared with only 1 percent for

those without college degrees. Minority groups are also affected less than others by the stock market change, again because they own relatively little wealth in equities. Non-Hispanic whites are projected to lose more under the no-recovery and repeat-70s scenarios than blacks and Hispanics, but will gain more under the full-recovery scenario.

Married people fare slightly worse than unmarried adults under the no-recovery and repeat-70s scenarios, while the market crash and subsequent equity price changes have about the same effects on the retirement incomes of both females and males.

Overall, the market crash and its aftermath will have either no effect or a minor negative effect on most people in all three birth cohorts because most have little or no exposure to equities (table 5). Among those with equities, there are no winners in either the no-recovery or repeat-70s scenarios, because the market remains below its pre-crash level permanently and no one's yield on new investments increases compared with the no-crash scenario. There are no winners among pre-boomers under the full-recovery scenario either because almost all subsequent large market gains occur after they reach age 67.

A significant share of retirees in all birth cohorts will see their incomes fall under the no-recovery and repeat-70s scenarios. In the worst case we simulated, over a fifth of individuals in all three cohorts are expected to experience a 10 percent or more loss in income under the repeat-70s scenario, with middle boomers being the hardest hit (28 percent). A significant share of pre-boomers (38 percent), however, will also see their income fall by 2 percent or more under the full-recovery scenario, with 11 percent experiencing a drop of 10 percent or more.

Significant minorities of middle and late boomers (22 and 25 percent) will see their incomes at age 67 increase by 2 percent or more under the full-recovery scenario, but few will

receive large gains. Overall, just 1 percent of middle and late boomers will experience income gains of 10 percent or more; these are individuals with a high tolerance for risk (i.e. they hold large shares of financial wealth in equities), large shares of retirement income from DC retirement accounts and other financial assets, and higher than average yields on their stock portfolios.

Big winners and losers are most prevalent in the highest income quintile. For example, 54 percent of middle boomers in the top quintile will experience an income decline of 10 percent or more under the repeat-70s scenario, compared with only about 22 percent in the bottom four quintiles (table 6). Large winners are also most prevalent in the top quintile under the full-recovery scenario, the only scenario with winners (table 7). Among middle boomers, 5 percent in the top quintile will see their incomes increase at least 10 percent, compared with less than 1 percent in the bottom four quintiles.

Effects of Delayed Retirement

In the delayed retirement simulations, we assume non-disabled workers with lower retirement income due to the stock market crash will spend an additional year working. The share of workers who delay retirement varies by cohort and stock market performance scenario depending on individuals' labor force attachment at the time of the stock market crash and the extent to which the crash lowers their expected retirement incomes. Even though 43 percent of pre-boomers are projected to lose 2 percent or more income under the no-recovery scenario, only 6 percent were still in the labor force when the stock market crashed and are eligible to delay retirement (table 8). While about an equal share of pre-boomers and late boomers are projected to lose under the no-recovery scenario, a much larger share of late boomers (29 percent) will

delay retirement because they were relatively young and still working when the market crashed and have many more opportunities to delay. Under the full-recovery scenario, few middle and late boomers will delay retirement (2 and 1 percent respectively) because relatively few are projected to lose income if the stock market fully recovers.

Compared with the no-crash scenario, delaying retirement by one year raises incomes at retirement from a number of sources (table 9). First, those who would otherwise have retired at the end of their 66th year now have earnings. Second, those covered by employment-based DB plans in their current job will see their annual pension income increase because benefit formulas provide credit for additional years of service. Third, Social Security benefits for many will also rise with more years of earnings and delayed retirement. Finally, everyone who delays retirement will have an additional year of contributions to retirement plans and savings outside of retirement plans, so that their net income from these sources will increase, compared with the no-crash scenario.[15]

The additional income from working longer in some cases reduces the net loss from the stock market crash, in other cases raises income more than enough to offset all of the loss from the market crash. The stock market crash reduces average income at age 67 for pre-boomers by almost as much as when we assume no labor market response since most of these people were already retired in 2008 (table 9 compared with table 2). The average income loss at age 67 when those pre-boomers still employed work another year is 7 percent under the no-recovery scenario (compared with 8 percent assuming no labor market response), 10 percent under the repeat-70s

[15] Earnings will also influence individuals' eligibility for SSI benefits. However, virtually no SSI beneficiaries have assets in stocks and we assume that SSI benefits do not change when retirement is delayed.

scenario (compared with 11 percent assuming no labor market response) and remains at 6 percent under the full-recovery scenario in the baseline and delay retirement simulations.

Middle boomers continue to see their average incomes at age 67 decline under the no-recovery and repeat-70s scenarios and increase under the full-recovery scenario, but the additional year of work significantly reduces their average income loss in the first two scenarios. Their average income loss declines from 8 to 5 percent under the no-recovery scenario and from 15 to 11 percent under the repeat-70s scenario (table 2 compared with table 9). Their simulated average income gain remains about the same under the full-recovery scenario, however, because we assume that only workers losing asset income at retirement relative to the no-crash scenario will delay retirement.

Working longer reduces average income losses under the no-recovery and repeat-70s scenarios for all sub-groups of middle boomers, classified by gender, marital status, race/ethnicity, education, and level of income (table 10 compared with table 4). Under these two scenarios, middle boomers with high income and education levels and who are non-Hispanic white continue to experience larger income losses than those with lower income and less education and who are minority (table 10). For those in the bottom three quintiles, working an additional year on average offsets most or all income losses from falling stock prices. For example, under the repeat-70s scenario, delaying retirement reduces income losses by 80 percent (from 5 to 1 percent) in the second quintile compared with only 15 percent (from 20 to 17 percent) in the top quintile. Low-income workers gain less retirement income in absolute terms than high-income workers by working longer, but they recover a higher percentage of their stock losses because their additional income from working longer is larger relative to their stock market losses. Under the full-recovery scenario, the simulated effects of working longer are

small (gains are almost the same as when there is no labor supply response) because many middle boomers will see their income from assets increase when the market fully recovers and therefore we assume they will not delay retirement.

Working longer substantially lowers the numbers of big losers under the no-recovery and repeat-70s simulations, but has little effect on the numbers of winners under the full-recovery scenario (table 11 compared with table 5). Working another year reduces the shares of middle and late boomers who see their income at age 67 drop by 10 percent or more from 15 and 11 percent, respectively, to 12 and 7 percent under the no-recovery scenario and from 28 and 22 percent to 23 and 14 percent under the repeat-70s scenario. Even with another year of work, there are still many big losers, especially under the repeat-70s scenario. The big losers remain concentrated among high-income groups (table 12). For example, even with an additional year of work, 30 percent of middle boomers in the top income quintile will lose more than 10 percent of their income at age 67 under the no-recovery scenario and 47 percent of them will lose more than 10 percent of their income under the repeat-70s scenario. These figures are lower than if workers did not delay retirement in response to their stock market losses. In that case, 36 percent of middle boomers in the top income quintile would be big losers under the no-recovery scenario and 54 percent of them would be big losers under the repeat-70s scenario (table 6). Still, one more year of work will leave many in the top income group with big income losses at age 67 if the stock market does not recover.

Finally, it is possible that working another year could offset more than 100 percent of stock market losses. However, the presence of income gains for some people who work longer in response to the market crash does not necessarily mean they are better off due to the crash. Had their wealth not fallen, many would have chosen to retire earlier. The stock market crash induces

them to sacrifice some of the leisure they may have enjoyed in retirement. It is possible, of course, that people over-estimate the pleasures of retired life or under-estimate the economic gains from working more, but we cannot pass judgment on that. What the simulations do show is the extent to which people can recoup their financial losses from the market crash by working just one more year. While many will be able to recoup a substantial share of their losses, others, particularly among high-income retirees, will end up worse off if the market does not bounce back even with an additional year of earnings and the added saving from those earnings.

Effects of Rebalancing Portfolios

In the baseline simulations, we assume that people annually rebalance their portfolios to achieve age-specific targets for the allocation of their investment portfolios between stocks and bonds. (The age-specific targets vary among individuals according to their assigned risk preferences, as discussed above, but are fixed for any individual.) This means that, in the model, people were assumed to sell bonds and buy equities at the end of 2008 in response to the stock market crash to restore their desired portfolio ratios.

Buying stocks may have been the optimal response to the crash (buy low, sell high), but is not necessarily how people actually behave. An alternative assumption is that people vary their *new asset purchases* according to age specific targets, buying relatively more equity when young and more fixed-income assets when older, but do not adjust existing asset stocks in response to unanticipated changes in market values.

To test how the rebalance and no rebalance assumptions impact our results, we simulate retirement income under the assumption that individuals do not rebalance their investment portfolios, though they do vary the composition of new asset purchases over time. Comparing

total retirement income under the no-crash scenario in the baseline simulation (table 2) and the no-rebalance simulation (table 13), we find very slight differences in average income from retirement accounts—$200 for pre-boomers, less than $100 for middle boomers, and $100 for late boomers. The pattern of average gains and losses with no rebalancing is the same as when annual rebalancing is assumed. Pre-boomers will see their average incomes decline in all three scenarios, middle-boomers and late boomers will experience declines in average income under the no-recovery and repeat-70s scenarios and very modest average income gains under the full-recovery scenario. The magnitudes of average gains and losses in all three scenarios are close to those when annual rebalancing is assumed. The shares of winners and losers are also similar. (The tables showing these results are included in the appendix.) While rebalancing alone creates some additional winners and losers in the different scenarios, these changes are small and do not seem to vary systematically among birth cohorts.

Conclusions

In a previous paper, we examined the effects of the 2008 stock market crash on incomes at retirement (age 67) for adults born between the early 1940s and the early 1960s under alternative assumptions about the path of recovery in stock prices. We found substantial variation in outcomes for the different stock price recovery scenarios among cohorts and among income and demographic groups within cohorts. Those near retirement (pre-boomers born between 1941 and 1945) will end up worse off under all stock price recovery scenarios, many of them substantially worse off. Mid-career workers will fare better if the stock market gradually rebounds to its pre-crash growth path because they can earn high returns on future asset purchases and rebuild their wealth. Many middle boomers (born between 1951 and 1955) and late boomers (born between

1961 and 1965) will see their incomes at retirement age increase compared with their incomes absent the crash if stock prices recover within 10 years to their projected pre-crash levels. Within cohorts, high income groups will experience bigger losses and, in the recovery scenarios, bigger gains than others because they are most likely to have substantial holdings of equities.

This paper extends the previous work by exploring the consequences of alternative assumptions about future stock prices and behavioral responses of individuals. Assuming that stock prices continue on the same path they did following the 1973-74 market crash makes simulated outcomes for all cohort groups substantially worse than under the worst case scenario in our previous paper. In Butrica, Smith, and Toder (2009), the worst case "no recovery" scenario assumed that real stock prices would immediately start growing at the long-run historical rates (about 3.5 percent per year), but never recover relative to their projected levels before the crash. Under our new worst case "repeat 70s" scenario, real stock prices do not start growing until 2017 as was the case between 1974 and 1982 when the real value of the S&P index declined by about 2 percent per year. As a result, incomes at age 67 are projected to decline on average by 11 percent, 15 percent, and 10 percent for pre-boomers, middle boomers, and late boomers, respectively, compared with average declines of 8 percent, 8 percent, and 6 percent under the no-recovery scenario. The shares of individuals who will see their incomes decline by 10 percent or more (big losers) increase substantially, especially among higher income people. For example, among middle boomers in the top income quintile, the share of big losers increases from 36 percent under the no-recovery scenario to 54 percent under the repeat-70s scenarios and among late boomers in the top quintile, the share of big losers increases from 26 to 44 percent between the two scenarios. Middle and late career workers, especially among the relatively well-off, better hope that the history of the 1970s does not repeat itself.

Delaying retirement for a year offsets a significant share of losses, but still leaves many big losers among high-income individuals, even in the later cohorts. Another year of work, however, virtually eliminates any big losers among individuals in the bottom three quintiles in the middle and late boomer cohorts. Because low-income individuals receive a relatively small share of their retirement income from DC plans assets and other financial wealth, working another year wipes out most of any losses that they might have sustained, even if the market fails to recover or continues to decline as it did after 1974.

We also examined what would happen if, instead of re-balancing portfolios annually to hit pre-determined ratios of stock values to total wealth, as we previously assumed, investors follow a passive strategy and allow their share of financial assets in stocks to decline as market values drop. We found substituting this no rebalancing strategy for annual rebalancing has little effect on simulated retirement incomes. Average incomes at age 67 differ under the no-crash scenario between the two investment strategies because re-balancing affects the build-up of wealth prior to the crash. But the resulting income changes are relatively minor, with average incomes from retirement accounts changing by only $200 for pre-boomers, less than $100 for middle boomers, and $100 for late boomers when the assumed investment strategy changes. Income changes as a result of the crash also change little in all three post-crash scenarios. Pre-boomers continue to see their average incomes decline relative to the no-crash scenario in all three post-crash scenarios, while middle boomers and late boomers continue to experience declines in average income under the no-recovery and repeat-70s scenarios and very modest average income gains under the full-recovery scenario.

Ultimately, the effect of the stock market crash on retirement incomes is very uncertain, owing to the huge uncertainty about the future path of market prices, and more broadly about the

path of employment and economic output in the next decade and beyond. Nonetheless, the main conclusions of our research appear robust to variations in assumptions about behavioral responses and a range of market outcomes. Major income losses from the crash are concentrated among high income groups who own the most stocks. Pre-boomers will on average be worse off, regardless of whether or not the market recovers. Middle and late boomers will also be worse off on average if the market fails to rebound to its previous growth path, but may be net winners if the market drop is temporary and they can benefit from the opportunity to buy low and sell high.

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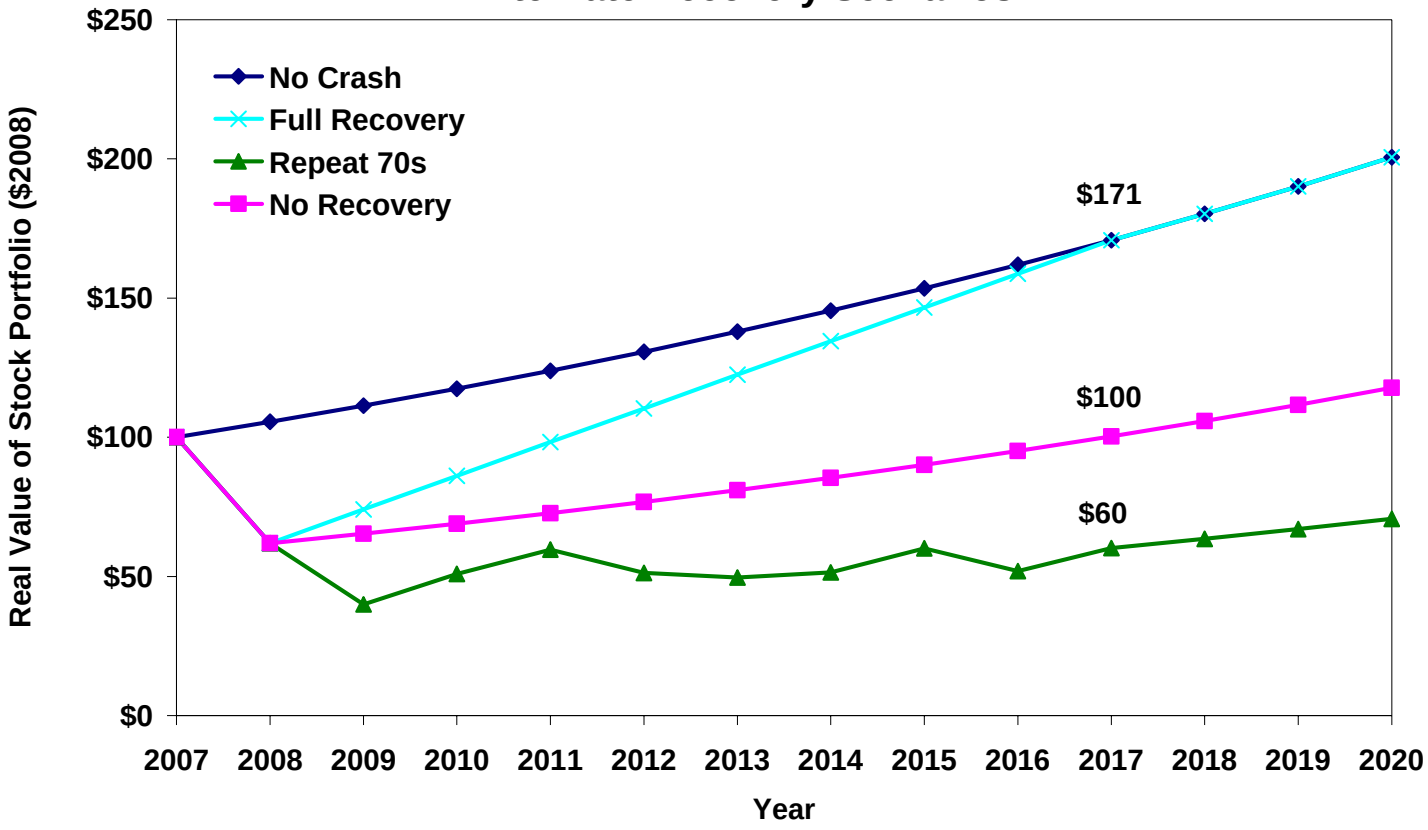
Figure 1. Real Value of $100 Invested in S&P 500 in 2007 with Reinvested Dividends (Less an Administrative Fee) Under Alternate Recovery Scenarios



Source: Authors' computations based on historic market returns and alternate simulations (see text for details).

Note: The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. The repeat-70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982.

Table 1. Simulations Modeled

	Stock Price Scenarios			
	No Crash	**No Recovery**	**Repeat 70s**	**Full Recovery**
	(1)	**(2)**	**(3)**	**(4)**
(A)	Baseline	Baseline	Baseline	Baseline
(B)	Delay Retirement	Delay Retirement	Delay Retirement	Delay Retirement
(C)	No Rebalance	No Rebalance	No Rebalance	No Rebalance

Table 2. Sources of Mean Household Income Per Person at Age 67 by Birth Cohort (thousands, $2008) - Baseline Simulations

	No Crash	No Recovery	Repeat 70s	Full Recovery
Pre-Boomers (1941-45)				
Retirement Accounts	$5.1	$4.1	$3.7	$4.3
Income from Assets	13.3	10.4	9.2	11.0
Social Security Benefits	12.1	12.1	12.1	12.1
DB Pension Benefits	5.0	5.0	5.0	5.0
Earnings	11.6	11.6	11.6	11.6
SSI	0.1	0.1	0.1	0.1
Imputed Rent	3.1	3.1	3.1	3.1
Total Income	50.4	46.4	44.9	47.2
%Change Total Income Relative to No Crash Scenario		-8%	-11%	-6%
Middle Boomers (1951-55)				
Retirement Accounts	$7.0	$5.6	$4.7	$7.4
Income from Assets	17.9	14.4	11.6	18.8
Social Security Benefits	13.5	13.5	13.5	13.5
DB Pension Benefits	4.7	4.7	4.7	4.7
Earnings	12.5	12.5	12.5	12.5
SSI	0.1	0.1	0.1	0.1
Imputed Rent	3.5	3.5	3.5	3.5
Total Income	59.3	54.4	50.6	60.5
%Change Total Income Relative to No Crash Scenario		-8%	-15%	2%
Late Boomers (1961-65)				
Retirement Accounts	$8.5	$7.3	$6.4	$9.1
Income from Assets	17.6	15.0	13.4	18.4
Social Security Benefits	14.4	14.4	14.4	14.4
DB Pension Benefits	3.3	3.3	3.3	3.3
Earnings	14.1	14.1	14.1	14.1
SSI	0.1	0.1	0.1	0.1
Imputed Rent	3.1	3.1	3.1	3.1
Total Income	61.0	57.2	54.7	62.5
%Change Total Income Relative to No Crash Scenario		-6%	-10%	2%

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The baseline simulations all assume that individuals continue to retire at the same age and rebalance their portfolios annually after the stock market crash. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Income from retirement accounts includes the annuity value of 80 percent of investment assets in DC pensions, IRAs, and Keogh accounts. Income from assets includes the annuity value of 80 percent of non-retirement accounts including stocks, bonds, saving, checking, money market, non-residential real estate, business assets, and vehicles, less debt. Imputed rent is 3 percent of housing equity. Income is in thousands of annual per capita 2008 dollars.

Table 3. Source Share of Mean Household Income Per Person at Age 67 Under the No-Crash Scenario by Birth Cohort and Retirement Income Quintile (%) - Baseline Simulation

	Bottom Quintile	2nd Quintile	3rd Quintile	4th Quintile	Top Quintile	All
Pre-Boomers (1941-45)						
Retirement Accounts	3	6	11	13	10	10
Income from Assets	7	12	14	17	37	26
Social Security Benefits	65	55	39	26	12	24
DB Pension Benefits	4	7	10	12	10	10
Earnings	7	11	17	25	27	23
SSI	7	0	0	0	0	0
Imputed Rent	8	10	9	7	4	6
Total Income	100	100	100	100	100	100
Middle Boomers (1951-55)						
Retirement Accounts	5	8	13	15	11	12
Income from Assets	8	12	15	16	43	30
Social Security Benefits	66	54	39	27	11	23
DB Pension Benefits	4	7	8	9	8	8
Earnings	6	11	18	25	23	21
SSI	5	0	0	0	0	0
Imputed Rent	7	8	8	7	4	6
Total Income	100	100	100	100	100	100
Late Boomers (1961-65)						
Retirement Accounts	4	9	13	17	14	14
Income from Assets	10	13	15	16	40	29
Social Security Benefits	66	55	39	27	12	24
DB Pension Benefits	3	4	6	7	5	5
Earnings	5	12	21	27	25	23
SSI	4	0	0	0	0	0
Imputed Rent	7	7	7	6	4	5
Total Income	100	100	100	100	100	100

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The baseline simulations all assume that individuals continue to retire at the same age and rebalance their portfolios annually after the stock market crash. The no-crash scenario assumes that the stock market had not crashed in 2008. Income from retirement accounts includes the annuity value of 80 percent of investment assets in DC pensions, IRAs, and Keogh accounts. Income from assets includes the annuity value of 80 percent of non-retirement accounts including stocks, bonds, saving, checking, money market, non-residential real estate, business assets, and vehicles, less debt. Imputed rent is 3 percent of housing equity. Income is in thousands of annual per capita 2008 dollars.

Table 4. Percent Change in Mean Household Income Per Person at Age 67 Relative to the No-Crash Scenario for Middle Boomers Born 1951-55 - Baseline Simulations

	No Crash ($000's)	No Recovery (%)	Repeat 70s (%)	Full Recovery (%)
All	59.3	-8	-15	2
Gender				
Female	56.5	-8	-15	2
Male	62.5	-8	-15	2
Marital Status				
Unmarried	57.6	-7	-13	2
Married	60.3	-9	-16	2
Race/Ethnicity				
Non-Hispanic white	67.3	-9	-16	2
Non-Hispanic black	31.4	-4	-7	1
Hispanic	32.4	-5	-7	0
Other	50.1	-6	-12	2
Education				
High school dropout	20.1	-3	-6	1
High school graduate	44.2	-6	-11	1
College graduate	103.2	-10	-18	3
Income Quintile				
Bottom Quintile	10.8	-1	-2	0
2nd Quintile	22.6	-3	-5	0
3rd Quintile	36.3	-5	-8	1
4th Quintile	58.9	-6	-10	1
Top Quintile	168.1	-11	-20	3

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The baseline simulations all assume that individuals continue to retire at the same age and rebalance their portfolios annually after the stock market crash. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Income from retirement accounts includes the annuity value of 80 percent of investment assets in DC pensions, IRAs, and Keogh accounts. Income from assets includes the annuity value of 80 percent of non-retirement accounts including stocks, bonds, saving, checking, money market, non-residential real estate, business assets, and vehicles, less debt. Imputed rent is 3 percent of housing equity. Income is in thousands of annual per capita 2008 dollars.

Table 5. Distribution of Percent Change in Per Person Household Income at Age 67 Between the No-Crash and Alternative Scenarios by Birth Cohort (%) - Baseline Simulations

	No Recovery			Repeat 70s			Full Recovery		
Percent Change in Household Income	**Pre-Boomers (1941-45)**	**Middle Boomers (1951-55)**	**Late Boomers (1961-65)**	**Pre-Boomers (1941-45)**	**Middle Boomers (1951-55)**	**Late Boomers (1961-65)**	**Pre-Boomers (1941-45)**	**Middle Boomers (1951-55)**	**Late Boomers (1961-65)**
Win	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**22**	**25**
2% - < 5%	0	0	0	0	0	0	0	15	17
5% - < 10%	0	0	0	0	0	0	0	5	7
>= 10%	0	0	0	0	0	0	0	1	1
No Change (< 2%)	**57**	**49**	**58**	**53**	**40**	**46**	**62**	**73**	**73**
Lose	**43**	**51**	**42**	**47**	**60**	**54**	**38**	**5**	**2**
2% - < 5%	16	20	18	14	16	17	17	3	1
5% - < 10%	12	15	13	13	16	15	11	1	0
>= 10%	14	15	11	20	28	22	11	0	0

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The baseline simulations all assume that individuals continue to retire at the same age and rebalance their portfolios annually after the stock market crash. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Winners and losers are defined as having at least a 2 percent change in per person household income between the no-crash and alternative scenarios.

Table 6. Share of Individuals Who Lose at Least 10 Percent of Per Person Household Income at Age 67 and Their Average Change in Income - Baseline Simulations

	Share of Big Losers (%)			Average Change in Income Among Big Losers ($000's)		
	No Recovery	Repeat 70s	Full Recovery	No Recovery	Repeat 70s	Full Recovery
Pre-Boomers (1941-45)						
All	**14**	**20**	**11**	**-21.2**	**-22.8**	**-20.2**
Bottom Quintile	2	3	1	-1.8	-1.8	-1.5
2nd Quintile	5	8	3	-3.3	-3.8	-3.1
3rd Quintile	12	19	8	-5.0	-5.5	-4.6
4th Quintile	18	28	15	-9.4	-11.0	-8.5
Top Quintile	35	42	29	-36.2	-43.5	-32.8
Middle Boomers (1951-55)						
All	**15**	**28**	**0**	**-23.7**	**-27.1**	**N/A**
Bottom Quintile	2	7	0	-1.7	-2.0	N/A
2nd Quintile	6	15	0	-3.5	-3.9	N/A
3rd Quintile	14	30	1	-5.7	-6.9	N/A
4th Quintile	19	35	1	-9.7	-12.1	N/A
Top Quintile	36	54	0	-42.9	-57.5	N/A
Late Boomers (1961-65)						
All	**11**	**22**	**0**	**-22.5**	**-23.4**	**N/A**
Bottom Quintile	2	6	0	-1.5	-2.2	N/A
2nd Quintile	5	14	0	-3.5	-4.0	N/A
3rd Quintile	9	19	0	-5.9	-6.9	N/A
4th Quintile	13	25	0	-9.9	-12.7	N/A
Top Quintile	26	44	0	-39.9	-45.6	N/A

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The baseline simulations all assume that individuals continue to retire at the same age and rebalance their portfolios annually after the stock market crash. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Big losers are defined as having at least a 10 percent loss in per person household income between the no-crash and alternative scenarios. Household income includes the annuity value of 80 percent of retirement and other financial assets, Social Security benefits, DB pension benefits, earnings, SSI, and imputed rent (3 percent of housing equity). Income is in thousands of annual per capita 2008 dollars.

Table 7. Share of Individuals Who Win at Least 10 Percent of Per Person Household Income at Age 67 and Their Average Change in Income - Baseline Simulations

	Share of Big Winners (%)			Average Change in Income Among Big Winners ($000's)		
	No Recovery	Repeat 70s	Full Recovery	No Recovery	Repeat 70s	Full Recovery
Pre-Boomers (1941-45)						
All	**0**	**0**	**0**	**N/A**	**N/A**	**N/A**
Bottom Quintile	0	0	0	N/A	N/A	N/A
2nd Quintile	0	0	0	N/A	N/A	N/A
3rd Quintile	0	0	0	N/A	N/A	N/A
4th Quintile	0	0	0	N/A	N/A	N/A
Top Quintile	0	0	0	N/A	N/A	N/A
Middle Boomers (1951-55)						
All	**0**	**0**	**2**	**N/A**	**N/A**	**28.5**
Bottom Quintile	0	0	0	N/A	N/A	1.4
2nd Quintile	0	0	1	N/A	N/A	2.5
3rd Quintile	0	0	1	N/A	N/A	5.6
4th Quintile	0	0	1	N/A	N/A	6.9
Top Quintile	0	0	5	N/A	N/A	40.4
Late Boomers (1961-65)						
All	**0**	**0**	**1**	**N/A**	**N/A**	**18.6**
Bottom Quintile	0	0	0	N/A	N/A	2.6
2nd Quintile	0	0	1	N/A	N/A	3.4
3rd Quintile	0	0	1	N/A	N/A	5.2
4th Quintile	0	0	2	N/A	N/A	8.5
Top Quintile	0	0	4	N/A	N/A	30.2

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The baseline simulations all assume that individuals continue to retire at the same age and rebalance their portfolios annually after the stock market crash. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Big winners are defined as having at least a 10 percent gain in per person household income between the no-crash and alternative scenarios. Household income includes the annuity value of 80 percent of retirement and other financial assets, Social Security benefits, DB pension benefits, earnings, SSI, and imputed rent (3 percent of housing equity). Income is in thousands of annual per capita 2008 dollars.

Table 8. Share of Individuals Who Lose at Least 2 Percent of Per Person Household Income at Age 67 and the Share of Those Who Delay Retirement (%)

	No Recovery	Repeat 70s	Full Recovery
Pre-Boomers (1941-45)			
Share of Losers in the Baseline Simulations	43	47	38
Share of Losers Who Delay Retirement	6	6	5
Middle Boomers (1951-55)			
Share of Losers in the Baseline Simulations	51	60	5
Share of Losers Who Delay Retirement	24	29	2
Late Boomers (1961-65)			
Share of Losers in the Baseline Simulations	42	54	2
Share of Losers Who Delay Retirement	29	37	1

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The delay retirement simulations all assume that individuals delay their retirement and Social Security benefit take-up by one year in response to the stock market crash. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Losers are defined as having at least a 2 percent loss in per person household income between the no-crash and alternative scenarios. Only non-disabled workers who are projected to lose retirement income due to the crash will delay retirement.

Table 9. Sources of Mean Household Income Per Person at Age 67 by Birth Cohort (thousands, $2007) - Delay Retirement Simulations

	No Crash	No Recovery	Repeat 70s	Full Recovery
Pre-Boomers (1941-45)				
Retirement Accounts	$5.1	$4.1	$3.7	$4.3
Income from Assets	13.3	10.4	9.3	11.0
Social Security Benefits	12.1	12.2	12.2	12.2
DB Pension Benefits	5.0	5.0	5.0	5.0
Earnings	11.6	11.8	11.9	11.8
SSI	0.1	0.1	0.1	0.1
Imputed Rent	3.1	3.1	3.1	3.1
Total Income	50.4	46.7	45.3	47.5
%Change Total Income Relative to No Crash Scenario		-7%	-10%	-6%
Middle Boomers (1951-55)				
Retirement Accounts	$7.0	$5.7	$4.7	$7.4
Income from Assets	17.9	14.5	11.7	18.8
Social Security Benefits	13.5	13.6	13.6	13.5
DB Pension Benefits	4.7	4.9	5.0	4.8
Earnings	12.5	14.0	14.2	12.6
SSI	0.1	0.1	0.1	0.1
Imputed Rent	3.5	3.5	3.5	3.5
Total Income	59.3	56.3	52.9	60.7
%Change Total Income Relative to No Crash Scenario		-5%	-11%	2%
Late Boomers (1961-65)				
Retirement Accounts	$8.5	$7.4	$6.5	$9.1
Income from Assets	17.6	15.1	13.7	18.4
Social Security Benefits	14.4	14.5	14.6	14.4
DB Pension Benefits	3.3	3.6	3.7	3.3
Earnings	14.1	17.9	18.6	14.3
SSI	0.1	0.1	0.1	0.1
Imputed Rent	3.1	3.1	3.1	3.1
Total Income	61.0	61.7	60.2	62.6
%Change Total Income Relative to No Crash Scenario		1%	-1%	3%

Source: Authors' computations of DYNASIM3 (see text for details).
Note: The delay retirement simulations all assume that individuals delay their retirement and Social Security benefit take-up by one year in response to the stock market crash. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Income from retirement accounts includes the annuity value of 80 percent of investment assets in DC pensions, IRAs, and Keogh accounts. Income from assets includes the annuity value of 80 percent of non-retirement accounts including stocks, bonds, saving, checking, money market, non-residential real estate, business assets, and vehicles, less debt. Imputed rent is 3 percent of housing equity. Income is in thousands of annual per capita 2008 dollars.

Table 10. Percent Change in Mean Household Income Per Person at Age 67 Relative to the No-Crash Scenario for Middle Boomers Born 1951-55 - Delay Retirement Simulations

	No Crash ($000's)	No Recovery (% change)	Repeat 70s (% change)	Full Recovery (% change)
All	59.3	-5	-11	2
Gender				
Female	56.5	-6	-12	2
Male	62.5	-5	-10	2
Marital Status				
Unmarried	57.6	-5	-10	2
Married	60.3	-5	-11	3
Race/Ethnicity				
Non-Hispanic white	67.3	-6	-12	2
Non-Hispanic black	31.4	-2	-4	1
Hispanic	32.4	-2	-4	1
Other	50.1	-2	-8	2
Education				
High school dropout	20.1	-2	-4	1
High school graduate	44.2	-3	-8	2
College graduate	103.2	-7	-14	3
Income Quintile				
Bottom Quintile	10.8	0	0	0
2nd Quintile	22.6	1	-1	1
3rd Quintile	36.3	0	-2	2
4th Quintile	58.9	-2	-5	1
Top Quintile	168.1	-9	-17	3

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The delay retirement simulations all assume that individuals delay their retirement and Social Security benefit take-up by one year in response to the stock market crash. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Income from retirement accounts includes the annuity value of 80 percent of investment assets in DC pensions, IRAs, and Keogh accounts. Income from assets includes the annuity value of 80 percent of non-retirement accounts including stocks, bonds, saving, checking, money market, non-residential real estate, business assets, and vehicles, less debt. Imputed rent is 3 percent of housing equity. Income is in thousands of annual per capita 2008 dollars.

Table 11. Distribution of Percent Change in Per Person Household Income at Age 67 Between the No-Crash and Alternative Scenarios by Birth Cohort (%) - Delay Retirement Simulations

	No Recovery			Repeat 70s			Full Recovery		
Percent Change in Household Income	**Pre-Boomers (1941-45)**	**Middle Boomers (1951-55)**	**Late Boomers (1961-65)**	**Pre-Boomers (1941-45)**	**Middle Boomers (1951-55)**	**Late Boomers (1961-65)**	**Pre-Boomers (1941-45)**	**Middle Boomers (1951-55)**	**Late Boomers (1961-65)**
Win	**1**	**6**	**13**	**1**	**7**	**15**	**1**	**23**	**26**
2% - < 5%	0	1	2	0	1	2	0	15	17
5% - < 10%	0	1	2	0	1	3	0	6	7
>= 10%	0	4	8	1	5	10	0	2	2
No Change (< 2%)	**58**	**54**	**63**	**54**	**44**	**52**	**63**	**74**	**73**
Lose	**41**	**39**	**24**	**45**	**49**	**33**	**37**	**4**	**1**
2% - < 5%	15	15	10	13	12	9	16	2	1
5% - < 10%	12	12	7	12	13	9	10	1	0
>= 10%	14	12	7	19	23	14	11	0	0
Percent delay	6	24	29	6	29	37	5	2	1

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The delay retirement simulations all assume that individuals delay their retirement and Social Security benefit take-up by one year in response to the stock market crash. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Winners and losers are defined as having at least a 2 percent change in per person household income between the no-crash and alternative scenarios.

Table 12. Share of Individuals Who Lose at Least 10 Percent of Per Person Household Income at Age 67 and Their Average Change in Income - Delay Retirement Simulations

	Share of Big Losers (%)			Average Change in Income Among Big Losers ($000's)		
	No Recovery	Repeat 70s	Full Recovery	No Recovery	Repeat 70s	Full Recovery
Pre-Boomers (1941-45)						
All	**14**	**19**	**11**	**-21.2**	**-22.8**	**-20.1**
Bottom Quintile	2	3	1	-1.8	-1.8	-1.5
2nd Quintile	5	8	3	-3.3	-3.8	-3.1
3rd Quintile	11	18	8	-5.0	-5.5	-4.6
4th Quintile	17	27	15	-9.6	-11.0	-8.5
Top Quintile	34	41	27	-35.8	-43.6	-33.1
Middle Boomers (1951-55)						
All	**12**	**23**	**0**	**-25.0**	**-29.0**	**N/A**
Bottom Quintile	2	6	0	-1.7	-2.1	N/A
2nd Quintile	5	11	0	-3.6	-4.0	N/A
3rd Quintile	11	24	0	-5.8	-6.8	N/A
4th Quintile	15	28	1	-9.6	-12.3	N/A
Top Quintile	30	47	0	-44.7	-59.5	N/A
Late Boomers (1961-65)						
All	**7**	**14**	**0**	**-25.2**	**-25.2**	**N/A**
Bottom Quintile	2	5	0	-1.4	-2.1	N/A
2nd Quintile	3	8	0	-3.6	-4.1	N/A
3rd Quintile	5	12	0	-6.2	-6.9	N/A
4th Quintile	7	16	0	-10.2	-13.3	N/A
Top Quintile	16	30	0	-44.0	-48.5	N/A

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The delay retirement simulations all assume that individuals delay their retirement and Social Security benefit take-up by one year in response to the stock market crash. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Big losers are defined as having at least a 10 percent loss in per person household income between the no-crash and alternative scenarios. Household income includes the annuity value of 80 percent of retirement and other financial assets, Social Security benefits, DB pension benefits, earnings, SSI, and imputed rent (3 percent of housing equity). Income is in thousands of annual per capita 2008 dollars.

Table 13. Sources of Mean Household Income Per Person at Age 67 by Birth Cohort (thousands, $2007) - No Rebalance Simulations

	No Crash	No Recovery	Repeat 70s	Full Recovery
Pre-Boomers (1941-45)				
Retirement Accounts	$4.9	$3.8	$3.4	$4.1
Income from Assets	13.3	10.5	9.6	11.0
Social Security Benefits	12.1	12.1	12.1	12.1
DB Pension Benefits	5.0	5.0	5.0	5.0
Earnings	11.6	11.6	11.6	11.6
SSI	0.1	0.1	0.1	0.1
Imputed Rent	3.1	3.1	3.1	3.1
Total Income	50.2	46.3	44.9	47.0
%Change Total Income Relative to No Crash Scenario		-8%	-11%	-6%
Middle Boomers (1951-55)				
Retirement Accounts	$7.0	$5.5	$4.5	$7.3
Income from Assets	17.9	14.6	12.3	18.6
Social Security Benefits	13.5	13.5	13.5	13.5
DB Pension Benefits	4.7	4.7	4.7	4.7
Earnings	12.5	12.5	12.5	12.5
SSI	0.1	0.1	0.1	0.1
Imputed Rent	3.5	3.5	3.5	3.5
Total Income	59.3	54.4	51.1	60.3
%Change Total Income Relative to No Crash Scenario		-8%	-14%	2%
Late Boomers (1961-65)				
Retirement Accounts	$8.6	$7.3	$6.3	$9.2
Income from Assets	17.6	15.1	13.6	18.2
Social Security Benefits	14.4	14.4	14.4	14.4
DB Pension Benefits	3.3	3.3	3.3	3.3
Earnings	14.1	14.1	14.1	14.1
SSI	0.1	0.1	0.1	0.1
Imputed Rent	3.1	3.1	3.1	3.1
Total Income	61.1	57.3	54.8	62.4
%Change Total Income Relative to No Crash Scenario		-6%	-10%	2%

Source: Authors' computations of DYNASIM3 (see text for details).
Note: The no rebalance simulations all assume that individuals do not rebalance their investment porfolios in 2008 or later. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Income from retirement accounts includes the annuity value of 80 percent of investment assets in DC pensions, IRAs, and Keogh accounts. Income from assets includes the annuity value of 80 percent of non-retirement accounts including stocks, bonds, saving, checking, money market, non-residential real estate, business assets, and vehicles, less debt. Imputed rent is 3 percent of housing equity. Income is in thousands of annual per capita 2008 dollars.

Table A1. Source Share of Mean Household Income Per Person at Age 67 Under the No-Crash Scenario by Birth Cohort and Retirement Income Quintile (%) - No Rebalance Simulations

	Bottom Quintile	2nd Quintile	3rd Quintile	4th Quintile	Top Quintile	All
Pre-Boomers (1941-45)						
Retirement Accounts	3	6	11	13	9	10
Income from Assets	7	11	14	17	37	26
Social Security Benefits	65	55	39	26	12	24
DB Pension Benefits	4	7	10	12	10	10
Earnings	7	11	17	25	27	23
SSI	7	0	0	0	0	0
Imputed Rent	8	10	9	7	4	6
Total Income	100	100	100	100	100	100
Middle Boomers (1951-55)						
Retirement Accounts	5	8	12	15	11	12
Income from Assets	8	12	15	16	42	30
Social Security Benefits	66	54	39	27	11	23
DB Pension Benefits	4	7	8	9	8	8
Earnings	6	11	18	25	23	21
SSI	5	0	0	0	0	0
Imputed Rent	7	8	8	7	4	6
Total Income	100	100	100	100	100	100
Late Boomers (1961-65)						
Retirement Accounts	4	9	13	17	15	14
Income from Assets	9	13	15	16	40	29
Social Security Benefits	66	55	39	27	12	24
DB Pension Benefits	3	4	6	7	5	5
Earnings	5	12	21	27	25	23
SSI	4	0	0	0	0	0
Imputed Rent	7	7	7	6	4	5
Total Income	100	100	100	100	100	100

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The no rebalance simulations all assume that individuals do not rebalance their investment porfolios in 2008 or later. The no-crash scenario assumes that the stock market had not crashed in 2008. Income from retirement accounts includes the annuity value of 80 percent of investment assets in DC pensions, IRAs, and Keogh accounts. Income from assets includes the annuity value of 80 percent of non-retirement accounts including stocks, bonds, saving, checking, money market, non-residential real estate, business assets, and vehicles, less debt. Imputed rent is 3 percent of housing equity. Income is in thousands of annual per capita 2008 dollars.

Table A2. Percent Change in Mean Household Income Per Person at Age 67 Relative to the No-Crash Scenario for Middle Boomers Born 1951-55 - No Rebalance Simulations

	No Crash ($000's)	No Recovery (%)	Repeat 70s (%)	Full Recovery (%)
All	59.3	-8	-14	2
Gender				
Female	56.5	-8	-14	2
Male	62.4	-8	-14	2
Marital Status				
Unmarried	57.6	-7	-12	1
Married	60.3	-9	-14	2
Race/Ethnicity				
Non-Hispanic white	67.3	-9	-15	2
Non-Hispanic black	31.3	-4	-7	1
Hispanic	32.3	-5	-9	1
Other	50.0	-7	-11	2
Education				
High school dropout	20.1	-3	-6	0
High school graduate	44.2	-7	-11	1
College graduate	103.2	-10	-17	2
Income Quintile				
Bottom Quintile	10.8	-1	-2	0
2nd Quintile	22.6	-3	-5	0
3rd Quintile	36.2	-5	-8	1
4th Quintile	58.8	-6	-10	1
Top Quintile	168.2	-11	-18	3

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The no rebalance simulations all assume that individuals do not rebalance their investment porfolios in 2008 or later. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Income from retirement accounts includes the annuity value of 80 percent of investment assets in DC pensions, IRAs, and Keogh accounts. Income from assets includes the annuity value of 80 percent of non-retirement accounts including stocks, bonds, saving, checking, money market, non-residential real estate, business assets, and vehicles, less debt. Imputed rent is 3 percent of housing equity. Income is in thousands of annual per capita 2008 dollars.

Table A3. Distribution of Percent Change in Per Person Household Income at Age 67 Between the No-Crash and Alternative Scenarios by Birth Cohort (%) - No Rebalance Simulations

	No Recovery			Repeat 70s			Full Recovery		
Percent Change in Household Income	**Pre-Boomers (1941-45)**	**Middle Boomers (1951-55)**	**Late Boomers (1961-65)**	**Pre-Boomers (1941-45)**	**Middle Boomers (1951-55)**	**Late Boomers (1961-65)**	**Pre-Boomers (1941-45)**	**Middle Boomers (1951-55)**	**Late Boomers (1961-65)**
Win	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**22**
2% - < 5%	0	0	0	0	0	0	0	12	15
5% - < 10%	0	0	0	0	0	0	0	4	6
>= 10%	0	0	0	0	0	0	0	1	1
No Change (< 2%)	**56**	**49**	**58**	**51**	**41**	**47**	**61**	**76**	**76**
Lose	**44**	**51**	**42**	**49**	**59**	**53**	**39**	**7**	**2**
2% - < 5%	18	20	18	15	16	16	17	4	1
5% - < 10%	12	16	13	14	16	15	12	2	1
>= 10%	14	16	11	20	28	22	11	1	0

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The no rebalance simulations all assume that individuals do not rebalance their investment porfolios in 2008 or later. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Winners and losers are defined as having at least a 2 percent change in per person household income between the no-crash and alternative scenarios.

Table A4. Share of Individuals Who Lose at Least 10 Percent of Per Person Household Income at Age 67 and Their Average Change in Income - No Rebalance Simulations

	Share of Big Losers (%)			Average Change in Income Among Big Losers ($000's)		
	No Recovery	Repeat 70s	Full Recovery	No Recovery	Repeat 70s	Full Recovery
Pre-Boomers (1941-45)						
All	**14**	**20**	**11**	**-20.7**	**-22.3**	**-21.1**
Bottom Quintile	2	3	2	-1.8	-2.1	-1.4
2nd Quintile	4	8	3	-3.4	-3.8	-2.9
3rd Quintile	12	18	8	-4.9	-5.8	-4.8
4th Quintile	20	26	14	-9.1	-10.9	-8.8
Top Quintile	33	42	28	-37.1	-41.6	-34.7
Middle Boomers (1951-55)						
All	**16**	**28**	**1**	**-22.3**	**-25.5**	**-9.1**
Bottom Quintile	3	6	0	-1.6	-2.1	-2.1
2nd Quintile	7	16	1	-3.5	-3.9	-2.8
3rd Quintile	15	30	1	-5.8	-6.9	-6.5
4th Quintile	19	34	1	-9.9	-12.2	-9.5
Top Quintile	35	52	1	-41.5	-54.4	-18.7
Late Boomers (1961-65)						
All	**11**	**22**	**0**	**-22.4**	**-23.7**	**-17.8**
Bottom Quintile	3	5	0	-1.7	-2.1	-0.7
2nd Quintile	5	14	0	-3.5	-4.4	-2.9
3rd Quintile	8	20	0	-6.0	-6.8	-3.2
4th Quintile	13	27	0	-10.3	-12.6	-12.0
Top Quintile	27	44	0	-39.6	-47.0	-42.6

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The no rebalance simulations all assume that individuals do not rebalance their investment porfolios in 2008 or later. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-crash scenario assumes that the stock market had not crashed in 2008. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Big losers are defined as having at least a 10 percent loss in per person household income between the no-crash and alternative scenarios. Household income includes the annuity value of 80 percent of retirement and other financial assets, Social Security benefits, DB pension benefits, earnings, SSI, and imputed rent (3 percent of housing equity). Income is in thousands of annual per capita 2008 dollars.

Table A5. Share of Individuals Who Win at Least 10 Percent of Per Person Household Income at Age 67 and Their Average Change in Income - No Rebalance Simulations

	Share of Big Winners (%)			Average Change in Income Among Big Winners ($000's)		
	No Recovery	Repeat 70s	Full Recovery	No Recovery	Repeat 70s	Full Recovery
Pre-Boomers (1941-45)						
All	**0**	**0**	**0**	**N/A**	**N/A**	**N/A**
Bottom Quintile	0	0	0	N/A	N/A	N/A
2nd Quintile	0	0	0	N/A	N/A	N/A
3rd Quintile	0	0	0	N/A	N/A	N/A
4th Quintile	0	0	0	N/A	N/A	N/A
Top Quintile	0	0	0	N/A	N/A	N/A
Middle Boomers (1951-55)						
All	**0**	**0**	**1**	**N/A**	**N/A**	**30.5**
Bottom Quintile	0	0	0	N/A	N/A	1.9
2nd Quintile	0	0	0	N/A	N/A	2.5
3rd Quintile	0	0	1	N/A	N/A	5.4
4th Quintile	0	0	1	N/A	N/A	8.3
Top Quintile	0	0	4	N/A	N/A	45.5
Late Boomers (1961-65)						
All	**0**	**0**	**1**	**N/A**	**N/A**	**14.8**
Bottom Quintile	0	0	0	N/A	N/A	2.2
2nd Quintile	0	0	1	N/A	N/A	3.1
3rd Quintile	0	0	1	N/A	N/A	5.0
4th Quintile	0	0	2	N/A	N/A	8.3
Top Quintile	0	0	3	N/A	N/A	26.8

Source: Authors' computations of DYNASIM3 (see text for details).

Note: The no rebalance simulations all assume that individuals do not rebalance their investment porfolios in 2008 or later. The no-recovery scenario incorporates the 2008 stock market crash and assumes it subsequently grows at historic rates. The repeat 70s scenario incorporates the 2008 stock market crash and assumes it repeats the stock returns experienced between 1974 and 1982. The full-recovery scenario incorporates the 2008 stock market crash and assumes it returns to the projected no-crash level in 2017. Big winners are defined as having at least a 10 percent gain in per person household income between the no-crash and alternative scenarios. Household income includes the annuity value of 80 percent of retirement and other financial assets, Social Security benefits, DB pension benefits, earnings, SSI, and imputed rent (3 percent of housing equity). Income is in thousands of annual per capita 2008 dollars.

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