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PERSPECTIVE

Can 401(k) Accumulations Generate Significant Income for Future Retirees?

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I. OVERVIEW AND SUMMARY

The 401(k) plan is only about 20 years old, which means that individuals retiring today could have participated in 401(k) plans for at most half of a typical full working career. As more American workers participate in 401(k) plans and become increasingly responsible for their own retirement security, the question of whether their 401(k) accumulations[2] will produce sufficient income in retirement is a significant policy concern. This issue of *Perspective* develops a model that projects the proportion of an individual's pre-retirement income that *might* be replaced by 401(k) plan accumulations at retirement, under several different projected scenarios.

Because current retirees cannot accurately reflect the typical experience of individuals working an entire career with the availability of 401(k) plans, this study reports the results of a model built to project what participants might be able to expect from their 401(k) accumulations at retirement after a full working career with exposure to 401(k) plans. A standard methodology used in building such a model starts with typical individual behaviors observed today to forecast where individuals might end up if they continue their current paths.[3] The typical individual 401(k) participant behaviors observed today are derived from an analysis of 2.5 million 401(k) participants drawn from the year-end 2000 database collected by the Employee Benefit Research Institute (EBRI)[4] and the Investment Company Institute (ICI)[5] in their collaborative effort known as the EBRI/ICI Participant-Directed Retirement Plan Data Collection Project.[6]

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[2] The term "401(k) accumulations" covers 401(k)-related balances whether maintained as balances remaining in the current and past employer plan(s) or as rollover IRA balances (generated at job change).

[3] For other examples of model simulations see VanDerhei and Copeland (July 2002); Poterba, Venti, and Wise (November 2001); Samwick and Skinner (October 2001); VanDerhei and Copeland (April 2001); Poterba, Venti, and Wise (August 1999); and Even and Macpherson (March 1998).

[4] The Employee Benefit Research Institute is a nonprofit, nonpartisan, public policy research organization, which does not lobby or take positions on legislative proposals.

[5] The Investment Company Institute is the national association of the American investment company industry. Its membership includes 8,982 open-end investment companies ("mutual funds"), 513 closed-end investment companies, and six sponsors of unit investment trusts. Its mutual fund members manage assets of approximately $6.4 trillion, accounting for approximately 95 percent of total industry assets, and represent more than 90 million individual shareholders.

[6] In this effort, EBRI and ICI have collected data from some of their members that serve as plan recordkeepers and administrators. The EBRI/ICI data collection project is the most comprehensive source of 401(k) plan participant-level data available to date. The EBRI/ICI data are unique because they cover a wide variety of plan administrators and recordkeepers and, therefore, a wide range of plan sizes offering a variety of investment alternatives.

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Analysts often evaluate the adequacy of an individual's retirement savings by comparing the income that retirement savings are projected to generate in retirement to pre-retirement income. This "replacement rate" measures the ability of retirement savings, including 401(k) investments, to generate income in retirement and thus to maintain retirees' standard of living.[7] In this study, the replacement rate is calculated for each individual at age 65.[8] The replacement rate compares the individual's initial annual retirement income generated by projected 401(k) accumulations to his or her projected five-year average salary immediately before retirement.[9]

The EBRI/ICI 401(k) Accumulation Projection Model[10] examines several potential future scenarios. In the scenarios, each participant's income, contributions, loans, withdrawals, and asset allocations are projected every year from year-end 2000 until the participant retires. In addition, in the model, participants may change jobs, and with job change, they may set up rollover individual retirement accounts (IRAs) or cash out the balance accumulated at a previous employer.

In this study, the EBRI/ICI 401(k) Accumulation Projection Model first is used to project replacement rates for participants in a "baseline case." The baseline case assumes continuous employment, continuous 401(k) plan coverage, and historical experiences with investment returns—based on an individual's asset allocations over the forecast and the range of rates of return historically observed in the United States. To highlight results that are representative of what a full career with exposure to 401(k) plans could generate in retirement for an individual, most of the discussion in this paper focuses on the projection model experience of participants who were in their late twenties in 2000, and who are projected to reach age 65 between 2035 and 2039. For comparison, this study estimates Social Security replacement rates (a retirement income most Americans are likely to receive) in addition to 401(k) accumulation replacement rates.[11] While it is impossible to anticipate every possible scenario, several variations in both participant behaviors and equity market returns are analyzed.

If equity and bond markets provide returns that are near their historical norms, income generated from 401(k) plan accounts (and Social Security) is projected to replace significant proportions of projected pre-retirement income for future retirees (Figure 1, top panel). Alternative scenarios designed to analyze the effect of different participant activities and varying investment return situations are also examined. The key finding is that the most important factor affecting projected retirement income is having access to a 401(k) plan. The study also finds that even under situations of relatively brief periods (e.g. three years) of negative equity market performance, or returns from the worst historical 50-year period for the U.S. equity market throughout the entire projection period, projected retirement income from 401(k) accumulations are forecast to be significant.

[7] Because retirees may have lower living expenses (no children in school, no transportation expenses to and from work, and possibly no mortgage payments), they may not need to replace 100 percent of their pre-retirement income. Thus, replacement rates may understate maintenance of pre-retirement standards of living. See Steuerle, Spiro, and Carasso (May 2000) for a discussion of replacement rates.

[8] For simplicity, in this study, it is assumed that all individuals retire at age 65.

[9] The 401(k) accumulations are converted into an income stream—an annuity or set of installment payments—using current life expectancies at age 65 and discount rates. The replacement rate compares the income or installment payment generated in the first year of retirement to the final five-year average pre-retirement income. The 401(k) distributions are not indexed for inflation over retirement, whereas Social Security benefits are. In addition, if the participant elects a set of installment payments rather than an annuity, the amount he or she may reasonably withdraw each year after the first year may increase or decrease as future market conditions affect the account balance going forward.

[10] The EBRI/ICI model primarily is based on 401(k) participant behavior observed in the EBRI/ICI Participant-Directed Retirement Plan Data Collection Project. In addition, information taken from other surveys is used to model participant income changes over time; frequency of and activities associated with job change; and IRA activities. The EBRI/ICI model focuses on 401(k) plan participants and is distinct from the EBRI-ERF (Education and Research Fund) Retirement Income Projection Model (see VanDerhei and Copeland (April 2001; July 2002)).

[11] A complete analysis of preparedness for retirement would also require estimating retirement income from defined benefit plans, all IRAs, and possibly other defined contribution plans. For examples of research addressing preparedness for retirement, see Scholz (August 2001); Uccello (July 2001); Engen, Gale, and Uccello (May 2001); Montalto (April 2000); U.S. Social Security Administration's Modeling Income in the Near Term (MINT) projections summarized in Toder, Uccello, O'Hare, Favreault, Ratcliffe, Smith, Burtless, and Bosworth (September 1999); Yuh, Hanna, and Montalto (1998); Smith (1997); and Moore and Mitchell (October 1997).

Effect of Participant Behaviors on Projected Replacement Rates at Retirement

- The most significant factor affecting projected replacement rates from 401(k) accumulations at retirement is having access to a 401(k) plan. Projected replacement rates at retirement are reduced significantly when participants are not offered a 401(k) plan in all portions of their careers (Figure 1, middle panel).
- Most 401(k) participants tend to have contributions in any given year. Thus, projecting that participants always have contributions (their own and/or employer contributions) every year raises projected replacement rates, but not by much compared with the importance of being offered a plan to begin with.
- The model simulations show that participant activities such as taking loans, taking pre-retirement withdrawals, or cashing out account balances at job change reduce projected 401(k) accumulations and thus replacement rates at age 65. Because loans are forecast to be paid back to the account in full, their effect on replacement rates at retirement in the model is the smallest.

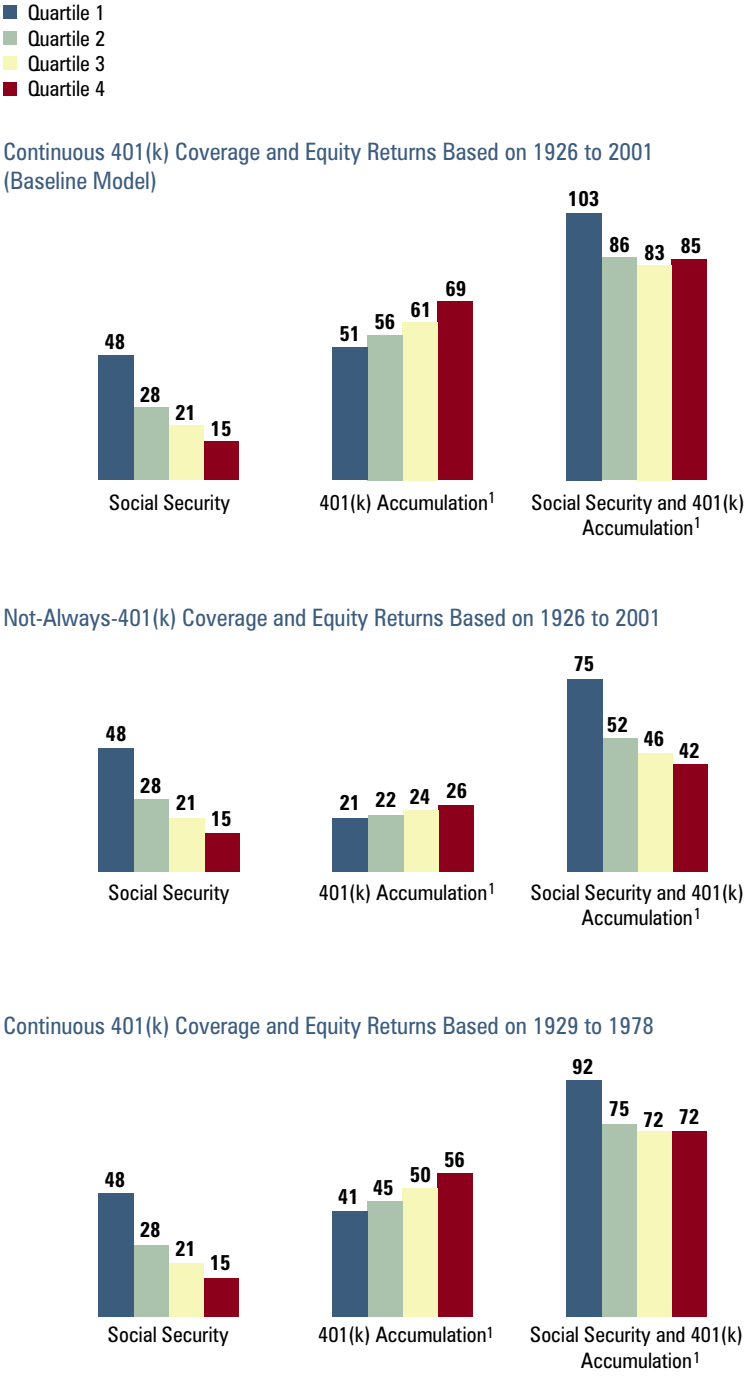
Effect of Investment Returns on Projected Replacement Rates at Retirement

- Even if equity returns in the future are projected to replicate the worst 50-year segment in the Standard & Poor's (S&P) 500 history (1929 to 1978),[12] 401(k) accumulations are still projected to replace significant proportions of projected pre-retirement income (Figure 1, bottom panel).
- Another projection scenario forecasts participants experiencing a simulated three-year bear market (negative equity returns) either early in their careers, near the middle of their careers, or at the end of their careers. Forecasts of the effects of bear markets on 401(k) balances show

FIGURE 1

Median Replacement Rates for Participants Turning 65 Between 2035 and 2039, by Income Quartile at Age 65

(percent of final five-year average salary)



[1] The 401(k) accumulation includes 401(k) balances at employer(s) and rollover IRA balances.

Source: Tabulations from EBRI/ICI 401(k) Accumulation Projection Model

[12] The baseline projection scenario assumed that future equity returns would be similar to historical returns experienced by the S&P 500 from 1926 to 2001. The "S&P 500" total equity returns used in the analysis are from Ibbotson (2002). The Ibbotson series used is "large company stocks total returns."

that a bear market in equities is projected to have the largest effect the closer it occurs to age 65 (retirement), even though older participants typically have diversified their portfolios away from equities.

- Similarly, a simulated three-year bull market (positive equity returns) is projected to have a larger positive effect on projected account balances and replacement rates the closer to retirement it occurs.

Section II of this paper discusses key highlights in the structure of the EBRI/ICI 401(k) Accumulation Projection Model, while an Appendix, which presents the details of the model, elaborates on the discussion of Section II.[13] The model forecasts for a very large sample of 401(k) plan participants their future behavior inside 401(k) plans as well as over their careers as they change jobs. Projected replacement rates for 401(k) participants retiring in the near and distant futures are reported in Section III. For comparison, replacement rates for Social Security, a retirement income most American workers are likely to receive, are also projected. After examining the projected replacement rates across individuals retiring at different future dates, variation within a group retiring at the same time is discussed. Section IV of this paper analyzes the effect of each participant behavior or activity on projected replacement rates at retirement, while Section V focuses on the effect of investment returns on replacement rates at retirement. Section VI contains a brief conclusion.

II. MODELING GROWTH IN 401(k) PLAN PARTICIPANT ACCOUNTS

Whereas current retirees cannot reflect the experience of an entire career with exposure to 401(k) plans, projections of what current 401(k) participants might achieve at future retirement dates are needed. A standard methodology to generate such projections is building a model based on typical behaviors observed today to see where individuals end up if they continue their current paths. This study builds such a model, the EBRI/ICI 401(k) Accumulation Projection Model, using recent 401(k) participant behavior observed in the EBRI/ICI Participant-Directed Retirement Plan Data Collection Project[14] to project what 401(k) participants might expect from their 401(k) accumulations at retirement under several scenarios.

Although projections are always surrounded by uncertainty, the EBRI/ICI model offers valuable insight into the possible future situations of 401(k) participants at retirement. First, several different scenarios are examined with the model. In addition, the model is based on recent information from a very large and representative sample of 401(k) participants. Furthermore, unlike household survey information,[15] which can suffer from difficulties with participant recall,[16] the EBRI/ICI data used to construct the 401(k) plan behaviors in the model are based on administrative records.

Much of the previous simulation model research has been aimed at comparing defined benefit and defined contribution plan results. For example, VanDerhei and Copeland (April 2001) forecast that an increasing proportion of retiree wealth (and therefore retirement income) is expected to be managed by retirees as a result of participation in defined contribution and individual account pension assets, especially among later cohorts born between 1936 and 1964. In addition, Samwick and Skinner (October 2001) conclude that 401(k) plans provide pension benefits at retirement at least as well as or, in most cases, better than defined benefit plans. Furthermore, Poterba, Venti, and Wise (November 2001) forecast that the average 401(k) balances of people who will reach retirement age in 2035 are projected to be roughly the same size as the present value of their Social Security benefits. On the other hand, Wolff (2002) argues that, among near-retirees in 1998, only those with wealth holdings above $1 million saw consistent

[13] The Appendix is available through ICI's website at www.ici.org. Hard copies may be obtained from ICI's Research Department.

[14] Several EBRI and ICI members provided records on active participants in 401(k) plans they administered at year-end 2000. These plan administrators include mutual fund companies, insurance companies, and consulting firms. Records were encrypted to conceal the identity of employers and employees. Data provided for each participant include participant date of birth, from which an age cohort is assigned; participant date of hire, from which a tenure range is assigned; outstanding loan balance; withdrawals; funds in a participant's investment portfolios; and asset values attributed to those funds. An account balance for each participant is the sum of the participant's assets in all funds.

[15] Available public data sets on households include the Federal Reserve Board's Survey of Consumer Finances (SCF), the University of Michigan's Health and Retirement Study (HRS), the U.S. Census Bureau's Survey of Income and Program Participation (SIPP), and the U.S. Census Bureau's and Bureau of Labor Statistics' Current Population Survey (CPS). (See the Bibliography for websites.)

[16] For research covering the confusion evidenced in household survey responses, see Gustman and Steinmeier (September 1999) and Starr-McCluer and Sundén (January 1999).

increases in retirement wealth (after inflation) compared with their counterparts in 1983.[17] However, Wolff (2002) fails to project defined contribution plan balances at retirement, whereas it does project the present value of Social Security and defined benefit plan benefits at retirement.[18]

EBRI/ICI 401(k) Accumulation Projection Model

This section of the paper summarizes the components of the EBRI/ICI 401(k) Accumulation Projection Model used to forecast 401(k) asset accumulations at retirement for each participant in a sample drawn from the database. Using salary, contribution, account balance, asset allocation, loan balance, and withdrawal information for each participant drawn from the database, 401(k) accumulations at the age of 65 are estimated for each participant. Using current life expectancies and discount rates, these accumulations are then expressed as an annual income—an annuity or set of installment payments.[19] The income stream provides a means of comparing income generated in the first year of retirement to income estimated to have been earned during the participant's working career immediately prior to turning 65.[20] The ratio of retirement income to pre-retirement income—known as a "replacement rate"—serves as a rough indicator of whether retirees are expected to be able to maintain their pre-retirement consumption activity in retirement.

In order to estimate replacement rates at retirement, several items must be tracked for each 401(k) participant over time. Each participant's income, contributions, loans, withdrawals, asset allocations, and investment returns are projected from year-end 2000 until the participant retires. For simplicity, it is assumed that all individuals retire at age 65. As participants age, they may change jobs, and with job change, they may roll account balances into IRAs or cash out the balance accumulated at a previous employer. All of these elements are incorporated in the EBRI/ICI 401(k) Accumulation Projection Model.

The starting component for a participant in the model is the 401(k) account information for year-end 2000 in the EBRI/ICI database. The year-end 2000 EBRI/ICI database contains records for 11.8 million 401(k) plan participants, of these 2.5 million are a representative sample containing information for every element of the model.[21] Because the EBRI/ICI database covers the 401(k) account balance at the participant's current employer and does not include rollover IRAs or 401(k) account balances left at previous employers' plans, account balances of 401(k) plan participants at their current employer tend to vary not only with age but, more importantly, with tenure.[22] Participants with lower tenures tend to have lower account balances and many such participants, especially older ones, may have rollover IRAs or accounts left at previous employers. Selecting a sample of participants of all ages and tenures in the analysis understates the 401(k) accumulation replacement rates at retirement for those participants who are older and with lower tenure at year-end 2000.[23] Thus, a second sample was carved out of the first—a "high-tenure sub-sample"—of nearly one million participants, who

[17] Wolff analyzes SCF data; however, a Federal Reserve Board researcher, Kennickell (1998), has criticized Wolff's previous SCF-based research.

[18] Wolff (2002) uses defined contribution plan balances at the time of the 1998 SCF and defines participants near retirement to include persons age 47 and older. However, an individual who is 47 years old would have another 18 years to work assuming a retirement age of 65, over which time defined contribution plan assets would benefit from additional contributions as well as investment returns. In addition, it appears that for some households defined benefit plan participants are projected to have continuous defined benefit coverage at the same employer for the remainder of their careers, which would tend to overstate defined benefit plan accruals particularly for those in final average plans. U.S. Department of Labor (DOL), Bureau of Labor Statistics (September 19, 2002) reports that only a little over one-quarter of older workers (age 55 and older) have long tenures (20 years or more) at their current employers (data for January 2002), suggesting the reward of long tenure in traditional defined benefit plans does not accrue to the majority of workers (see also Yakoboski (May 1998)).

[19] See text footnote 9.

[20] The definition of pre-retirement income used by different researchers can vary. Results presented throughout this paper compare retirement income to five-year average salary immediately before retirement. However, results relative to final working-year salary were substantially similar. For a discussion of the impact of the definition of pre-retirement income used on replacement rates, see Steuerle, Spiro, and Carasso (May 2000).

[21] In addition, to screen for part-time employees or individuals who had worked at their current employer for only part of the year in 2000, participants in the EBRI/ICI database with an annual salary less than the age-equivalent for a 25-year-old earning $5,000 were also not included in the analysis.

[22] See Holden and VanDerhei (November 2001).

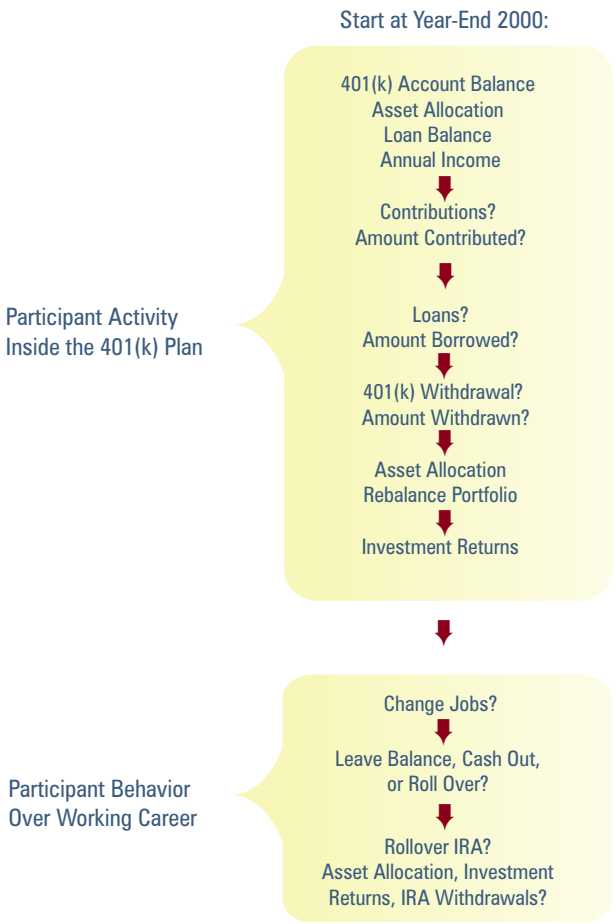
[23] This difficulty with tenure only occurs in the initial selection of the participants because the previous accumulations left at other employers or in rollover IRAs are not available on the EBRI/ICI database. Over the projection, the model tracks all 401(k) accumulations—at the current employer when the person reaches age 65, at all previous employers between year-end 2000 and when the person reaches 65, and all amounts rolled into IRAs.

have long tenure for their age group at year-end 2000. Results for this sub-sample of high-tenure participants are also analyzed.

A brief description of the key elements of the participants' behavior in the model is presented in this section.[24] Each 401(k) participant is projected to engage in activity inside 401(k) plans and behaviors at job change over the remainder of their careers (Figure 2).

FIGURE 2

Diagram of Basic Elements of the EBRI/ICI 401(k) Accumulation Projection Model



Source: EBRI/ICI 401(k) Accumulation Projection Model

Participant Activity Inside the 401(k) Plan

Once employed and eligible to participate in the 401(k) plan, the participant must decide whether to contribute to the plan, and their employer may make contributions. Over the year, a participant may decide to borrow from his or her 401(k) account or take a withdrawal. Finally, asset allocation (which changes with age) and investment returns must be accounted for. The projection model's treatment of these activities inside the 401(k) plan is summarized below.

Income. In order to forecast participant activity inside a 401(k) plan, future incomes must be estimated for each participant. Contributions to the 401(k) plan by participants and/or their employers are determined as a percent of the participant's income. In addition, the income projections are used to determine final salaries and measure replacement rates. The income forecast for each participant is based on regression results analyzing the income paths by age of individuals in the Current Population Survey (CPS) data.[25] Both the level and growth of an individual's income over time are dependent on an individual's education and gender. This information is not available in the EBRI/ICI database. Consequently, based on each participant's age and income, an education level and gender are assigned to each participant. The model projects annual incomes for each individual based on their personal characteristics and growth in the national average wage.

Contributions. For each year in the model, it is determined whether a participant's account will receive a contribution, whether from the participant, the employer, or both. A two-step process is modeled: (1) will there be a contribution? and (2) how much will be contributed? Analysis of contribution activity among EBRI/ICI participants in calendar-year 2000 suggests that approximately

[24] The detailed assumptions governing the evolution of participants' behaviors over time in the model are presented in the Appendix (see text footnote 13).

[25] CPS data for 1999, 2000, and 2001 were used. The CPS is a monthly survey of about 50,000 households conducted by the U.S. Bureau of the Census for the Department of Labor's Bureau of Labor Statistics (see the Bibliography for the CPS website). The survey has been conducted for more than 50 years. The CPS is the primary source of information on the labor force characteristics of the U.S. population.

91 percent of participants had contributions into their 401(k) accounts in that year. In addition, among those with contributions, the total contribution averaged 9.3 percent of salary but varied with age, tenure, and salary. For each year in the model, it is determined whether each participant has contributions to his or her account based on the percentage of participants with that age, tenure, and salary level from year-end 2000 who had a contribution. Once it was determined that a contribution occurred, the total contribution rate is calculated for the participant using a regression equation. Contributions are limited by Internal Revenue Code (IRC) regulations and those limits change over time in the model as legislated in the Economic Growth and Tax Relief Reconciliation Act (EGTRRA) of 2001.[26]

Loans. Most 401(k) plan participants are in plans that allow loans; however, most participants do not borrow from their accounts.[27] At year-end 2000, EBRI/ICI data indicate only 12 percent of participants analyzed had a loan outstanding. Among those participants with an outstanding loan balance, the loan represented, on average, 15 percent of the 401(k) account balance (including the loan balance). Each year, for any participant not already in the process of paying down an existing loan, the model assigned a probability to whether a given participant would borrow from his or her account based on the individual's age, tenure, and salary. Once it is determined that a loan would be taken, the percentage of the account balance borrowed is calculated using a regression equation, but subject to IRC regulations. All loans originated over the projection are paid down over the subsequent five years[28,29] and earn the bond rate of return.

401(k) Withdrawals. In some circumstances, participants are permitted to take withdrawals from their 401(k) accounts. However, given the restrictions and penalties involved, very few 401(k) participants take withdrawals. At year-end 2000, EBRI/ICI data indicate that only 4.5 percent of participants had taken a withdrawal during the year. Younger participants, who may be penalized for withdrawals, were less likely to have taken a withdrawal than participants in their sixties. In each year, the model determines whether a participant takes a withdrawal based on the percentage of participants with that age, tenure, and salary that had a withdrawal in 2000. If it is decided that the participant takes a withdrawal, a regression equation is used to estimate the percentage of the account balance withdrawn.[30]

Asset Allocation. Among EBRI/ICI 401(k) plan participants, asset allocation appears to vary with age.[31] Younger participants tend to have higher percentages of their account balances invested in equity securities, while older participants tend to favor fixed-income securities, such as guaranteed investment contracts (GICs) and bond funds. Each year in the model, assets are rebalanced based on these changing patterns as participants age, while still preserving an individual participant's asset allocation preferences relative to the average participant in the age group.[32]

Investment Returns. To project 401(k) participant account balances at retirement, the assets held in the accounts must earn investment returns over the participant's projected working career. In the EBRI/ICI database, 401(k) plan participants' account balances are identified by type of investment objective. In the model, rates of returns are projected

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[26] For a complete discussion of the IRC regulations governing 401(k) plan participant contributions and a detailed analysis of 401(k) plan participants' contribution activity, see Holden and VanDerhei (October 2001). In the model projections, it is assumed that the EGTRRA provisions do not sunset.

[27] See Holden and VanDerhei (November 2001).

[28] In order for the loan not to be treated as a distribution from the plan, it generally must be repaid within five years. See Internal Revenue Service (IRS), *Publication 575*. (This IRC exception also applies to loans that are used to buy a main home, regardless of their repayment term.) Furthermore, unpublished ICI data from a 401(k) household survey (see ICI (Spring 2000) for the published survey results) suggest that the vast majority of 401(k) participants who took a loan from their 401(k) plan repaid the loan in full within five years.

[29] In the model, it is assumed that if the participant changes jobs within the five-year repayment window, then the remaining loan balance is immediately repaid in full to the account.

[30] Given that participants age 59½ or older may take penalty-free withdrawals, two separate regression equations are used: one for participants in their sixties, and another for participants younger than 60.

[31] For the most recent analysis, see Holden and VanDerhei (November 2001).

[32] For example, if a participant in his or her twenties holds a higher percentage of his or her account in equity funds than the average participant in their twenties, then that participant will hold a higher percentage of his or her account in equity funds relative to the average at all ages, while still rebalancing over time away from equity securities.

for three investment categories: diversified equity funds[33] and the equity portion of balanced funds;[34] company stock (the employer's stock); and all other investments (bond funds, the bond portion of balanced funds,[35] GICs, money funds, other stable value funds, other, and unknown).[36] Historic returns for these three investment categories are used to create the range of returns possible in any given year in the projection.

For equity investments in the baseline projection, the historical total returns of the S&P 500 from the beginning of 1926 to the end of 2001 were used.[37] For each year in the model, each participant holding equity securities is randomly assigned a rate of return from the historical range of returns. Company stock (the plan sponsor's stock) was modeled to experience a wider range of returns to capture the higher variation one stock experiences compared with a market average. All other investments earned a projected nominal total return of 5.3 percent.[38]

In any given year equity and company stock holdings each earn a randomly selected rate of return drawn from their respective distributions of the range of historical returns. However, if an average participant in his or her twenties with the average asset allocation for that age group were to draw the average return for that portfolio, he or she would be projected to have a nominal return of about 9¾ percent in that year in the baseline case. Similarly, if an average participant in his or her sixties with the average asset allocation of that age group were to experience an average year, he or she would be projected to have a nominal return of about 8½ percent in the baseline case.[39]

Because exposure of 401(k) participants to equity market risk is an area of policy concern, several rate-of-return scenarios were examined in the projection model. The baseline case uses the longest historical time period available for S&P 500 total returns: 1926 to 2001.[40] The first alternative scenario uses the worst 50-year time period for the S&P 500, 1929 to 1978, which concentrates on a time period excluding some strong bull markets but including several severe bear markets (the 1929 stock market crash, the 1937 crash, and the sell-off from 1973 to 1974). In this scenario, an average participant in his or her twenties with the average portfolio experiencing an average year, would have a projected nominal return of about 7¼ percent. Similarly, in this lower-equity-return scenario, an average participant in his or her sixties with the average portfolio experiencing an average year, would have a projected nominal return of about 6¾ percent.[41] In other model scenarios, the projected effects of the timing of relatively brief but highly concentrated bear and bull markets are also examined.

Participant Behavior Over Working Career

Job Change. Workers often change jobs over the course of their working careers and participants in the EBRI/ICI model do so as well. Based on SCF job duration behavior, EBRI/ICI model participants may change jobs; however, they were projected to have continuous careers (i.e., they were always employed).[42] Under baseline assumptions, having entered the model employed at a firm that offers a 401(k) plan, the EBRI/ICI 401(k) participants are assumed to continue to work at employers that offer a 401(k) plan.[43] At

[33] "Funds" include mutual funds, bank collective trusts, life insurance separate accounts, and other pooled investments.

[34] Generally, equities represent about 60 percent of balanced funds' asset holdings (see ICI, *Quarterly Supplemental Data*).

[35] Generally, fixed-income securities represent about 40 percent of balanced funds' asset holdings (see ICI, *Quarterly Supplemental Data*).

[36] See the Appendix (see text footnote 13) for more discussion of these investment categories.

[37] Historically (and in the baseline case of the model), about two-thirds of the time, equity returns in any given year are between -7 percent and 33 percent. Ibbotson (2002) data were used (see text footnote 12).

[38] The total return used for bonds, GICs, money market funds, and other investments was based on Ibbotson's long-term government bonds total returns from the beginning of 1926 to the end of 2001 (percent per annum compounded annually; see Ibbotson (2002)).

[39] With an inflation rate of 3.3 percent per year in the forecast, the real return for the average participant experiencing an average year in his or her twenties is projected to be 6½ percent. For the average participant in his or her sixties experiencing an average year, the projected real return is about 5¼ percent.

[40] For an explanation of the Ibbotson data used, see text footnote 12.

[41] With a projected inflation rate of 3.3 percent, the real return for the average participant experiencing an average year in his or her twenties is a projected 4 percent in the lower-equity-return scenario. For the average participant in his or her sixties experiencing an average year, the projected real return is about 3½ percent.

[42] Each participant's income path is independent of the number of times the individual changes jobs and is modeled as explained in the Appendix (see text footnote 13).

[43] This baseline assumption is based, in part, on Ippolito (1997), which suggests that employers use defined contribution plans to sort workers, specifically to attract individuals who value saving because they tend to be highly productive workers.

job change, participants decide whether to leave their 401(k) balance at the previous employer, cash it out, or roll it over into an IRA.

Leave Balance, Cash Out, or Roll Over? Studies of distribution of 401(k) balances at job change find that larger account balances tend to be rolled over and smaller account balances tend to be cashed out.[44] If a participant leaves the account balance with the previous employer, then the participant moves through the 401(k) plan activities in his or her new job, until another job change occurs. If the participant then chooses to cash out the 401(k) balance, only the 401(k) account balance at his or her most recent (soon-to-be) previous employer is cashed out; balances in IRAs or held at any earlier previous employer(s) are not cashed out. If the participant chooses to roll the balance over into an IRA, then a rollover IRA is created for the participant.[45] In this last case, the participant is projected to move through 401(k) plan activities in his or her new job, but also manages the IRA.

IRA Asset Allocation and Investment Returns. At rollover, the asset allocation of the 401(k) balance is maintained within the new rollover IRA balance.[46] However, the asset allocation of the IRA changes over time as the participant ages, just as the 401(k) account is rebalanced over time. In addition, the IRA assets are projected to earn the same rates of return as the 401(k) account assets.

IRA Withdrawals. IRA owners may choose to take withdrawals from their IRAs, although withdrawals taken prior to age 59½ may face a penalty tax in addition to ordinary income taxes. Very few young individuals withdraw from their IRAs; however, among the few younger individuals taking withdrawals, the amount withdrawn is sizable.[47]

III. WHAT ARE FUTURE RETIREES PROJECTED TO RECEIVE FROM SOCIAL SECURITY AND 401(k) PLAN ACCUMULATIONS AT RETIREMENT?

There are potentially several sources of income in retirement: (1) Social Security benefits; (2) income from private pension plans, whether defined benefit, defined contribution, or both; (3) income from IRAs, whether contributory, rollover, or both; (4) income from other individual savings (in some cases, including home equity); and (5) income from continued employment, perhaps at a part-time job. This paper focuses on income future retirees are projected to receive from Social Security and from their 401(k) plan accumulations. By the time the 401(k) participants are projected to reach age 65, some may have rolled some of their 401(k) accumulations into an IRA, typically at job change. Thus, to paint the complete picture of 401(k) plan savings, both rollover IRAs that were generated solely from 401(k) balance rollovers and 401(k) balances themselves are included in "401(k) accumulations" in this analysis. Using current life expectancies for individuals age 65 and a discount rate, the accumulations at retirement are converted into an annual income stream — an annuity or set of installment payments[48] — for comparison with income prior to retirement.

Combined, income from Social Security and 401(k) plan accumulations at retirement is projected to replace a substantial proportion of individuals' pre-retirement income. For example, among individuals who were in their late twenties in 2000 and are projected to turn 65 between 2035 and 2039, the median individual in the lowest income quartile at age 65 is projected to see Social Security and 401(k) accumulations

[44] For examples, see Copeland (July 2002); Fidelity Investments (2001); Hewitt Associates (May 2000); McCarthy and McWhirter (2000); Burman, Coe, and Gale (September 1999); Yakoboski (1999 and October 1999); Sabelhaus and Weiner (September 1999); Poterba, Venti, and Wise (August 1999); Hurd, Lillard, and Panis (October 1998); Yakoboski (August 1997); Poterba, Venti, and Wise (October 1995); and Yakoboski (February 1994).

[45] The EBRI/ICI 401(k) Accumulation Projection Model does not include contributory traditional IRAs or Roth IRAs. The model only permits participants to have rollover IRAs, which serve as receptacles for 401(k) balances from previous jobs. Whether the account balances are held in the 401(k) or a rollover IRA is not significant. Asset allocation and investment returns are modeled in the same way in both the 401(k) and rollover IRA accounts. The only differences between the two vehicles, as modeled here, are (1) loans are not permitted from IRAs, and (2) withdrawal rules and behaviors vary between the two vehicles.

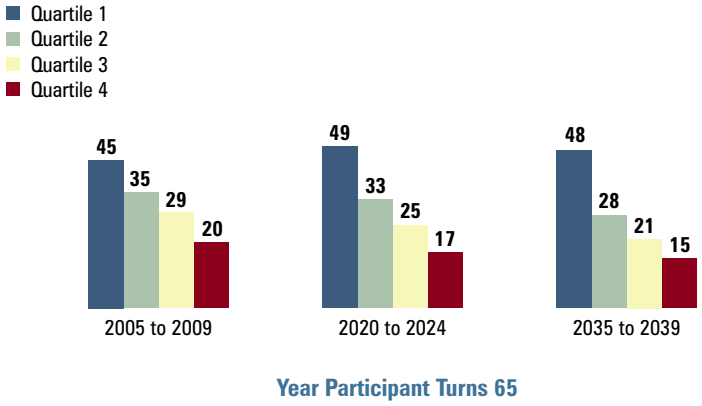
[46] Thus, participants who held company stock in their 401(k) plans continue to hold company stock in their IRAs. For a study comparing the asset allocation of household (contributory and rollover) IRA and 401(k)-type plan balances, see Copeland (October 2000).

[47] See the Appendix (see text footnote 13). IRA withdrawal activity in the model is based on Sabelhaus (December 2000).

[48] See text footnote 9.

FIGURE 3

Median Replacement Rates from Social Security for Participants Turning 65 in the Year Indicated, by Income Quartile at Age 65
(percent of final five-year average salary)



Note: The model assumes participants have continuous full working careers.
Source: Tabulations from EBRI/ICI 401(k) Accumulation Projection Model

replacing 103 percent of their pre-retirement income (Figure 1, top panel).[49] The median individual in the highest income quartile at age 65 is projected to replace 85 percent of his or her pre-retirement income with Social Security and 401(k) accumulations in the first year of retirement.[50]

Projected Replacement Rates from Social Security

Based on the lifetime earnings history generated for each EBRI/ICI participant, the projected Social Security income benefit[51] for the first year of retirement was calculated for each participant at age 65. By design, Social Security replaces a higher percentage of lower-income individuals' incomes. Among participants who were in their late twenties at year-end 2000, half of those in the lowest income quartile at age 65 are projected to have Social Security replace 48 percent or more of their pre-retirement income when they reach age 65 between 2035 and 2039, while half of those in the highest income quartile are projected to experience a Social Security replacement rate of at least 15 percent (Figures 1 and 3).

The EBRI/ICI model preserves Social Security benefit calculations in their present form and does not consider the impact of Social Security reform. Thus, Social Security replacement rates do not vary much by birth cohort (generation). Half of participants in the lowest income quartile at age 65, reaching age 65 between 2005 and 2009, are projected to replace at least 45 percent of their pre-retirement income with Social Security, while half of the lowest income quartile participants reaching age 65 between 2020 and 2024, are projected to replace at least 49 percent (Figure 3). Similarly, half of the participants in the highest income quartile at age 65 reaching age 65 between 2005 and 2009 are projected to replace 20 percent of their pre-retirement income with Social Security, while half of those in the highest income quartile at age 65 reaching age 65 between 2020 and 2024 are projected to replace 17 percent.

Projected Replacement Rates from 401(k) Accumulations

Another source of income in retirement is private pension savings. Although workers may be offered defined benefit and/or defined contribution pension benefits, this paper focuses on 401(k) plans. At age 65, the model forecasts that 401(k) accumulations—the sum of balances in 401(k) plan accounts and rollover IRA balances—are projected to generate income to replace a substantial portion of projected pre-retirement income.

While Social Security replacement rates tend to fall as income rises, 401(k) accumulation replacement rates tend to rise with income. For example, among participants reaching age 65 between 2035 and 2039, 401(k) accumulations are projected to generate income to replace at least 51 percent of pre-retirement income for half of those in the lowest income quartile and at least 69 percent for half of those in the highest income quartile (Figures 1 and 4).

[49] To construct income quartiles, income cutoffs at age 65 were determined for each five-year birth cohort that divided the cohort into four equal groups of participants (quartiles).

[50] These are baseline results. As discussed, replacement rates are much lower when workers do not always find themselves in 401(k) plans (see Figures 1 and 7).

[51] Technically, this is called the primary insurance amount (PIA). The PIA was calculated for the individual participant's earnings history and did not consider the possibility of a spousal benefit, which can be substantially larger than an individual's own benefit in some cases. The PIA calculated for each individual is the sum of three separate percentages of portions of their average indexed monthly earnings (AIME). The portions depend on the year in which the worker reaches retirement. For example, for 2002 the PIA was 90 percent of the first $592 of their AIME plus 32 percent of their AIME over $592 and through $3,567 plus 15 percent of their AIME over $3,567 (see the Social Security Administration's website, www.ssa.gov, for benefit formulas).

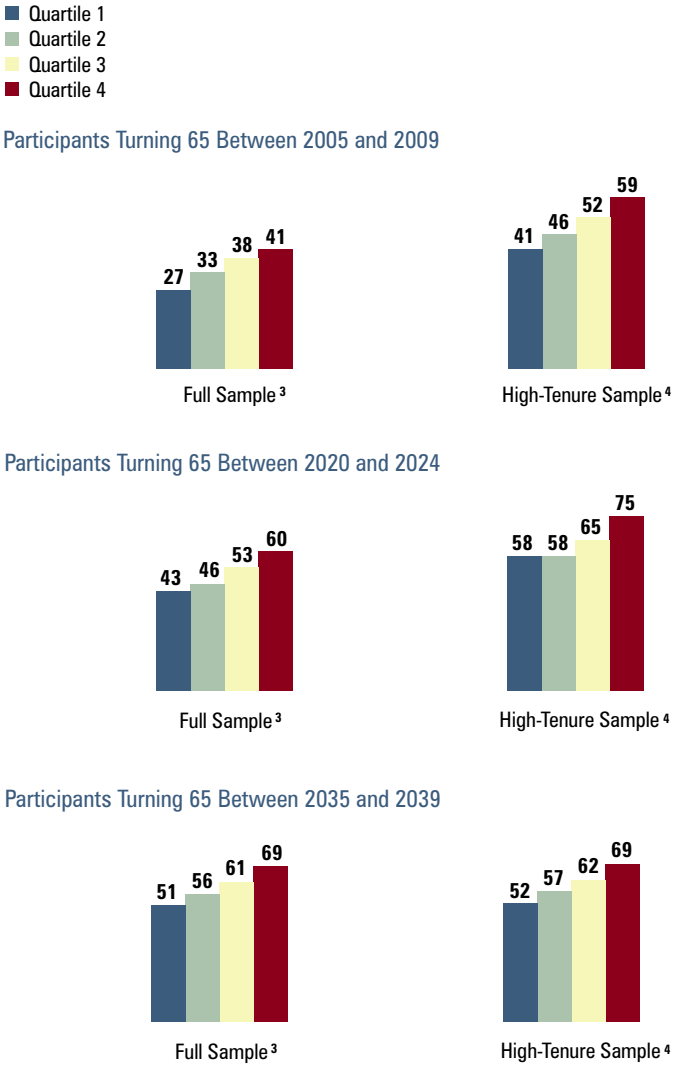
Participants reaching age 65 between 2035 and 2039 are young at year-end 2000 and the EBRI/ICI model projected a full career for them. Older participants at year-end 2000 in the EBRI/ICI database do not have as much time before retirement as younger participants and therefore experience a shorter time in the model. Because some of these older participants may have recently changed jobs and left account balances at a previous employer or rolled them into an IRA, they may have 401(k) accumulations not included in their EBRI/ICI year-end 2000 account balance. Missing these prior accumulations understates the replacement rates that these older participants may experience. Thus, as explained earlier (in Section II), a high-tenure sub-sample of participants is also analyzed.

Figure 4 compares median replacement rates for three different birth cohorts between the full sample and the high-tenure sub-sample of participants who had long tenure for their age group at year-end 2000. When participants in the EBRI/ICI database are analyzed based on birth cohort without regard for tenure (the full sample), projected replacement rates at retirement appear to vary widely by birth cohort. For example, among those participants close to retirement (reaching age 65 between 2005 and 2009), half of the lowest income quartile at age 65 are projected to replace 27 percent of pre-retirement income with their 401(k) accumulations, while half of the highest income quartile are projected to replace 41 percent of salary or more (Figure 4, top panel). Among participants reaching age 65 between 2020 and 2024, half of the lowest income quartile at age 65 are projected to replace at least 43 percent of salary, while half of the highest income quartile are projected to replace 60 percent of salary or more (middle panel). However, these relatively low replacement rates are in part the result of not correctly accounting for accumulations that occurred at employers previous to the EBRI/ICI participant's year-end 2000 employer.

FIGURE 4

Median Replacement Rates[1] from 401(k) Accumulations[2] for Participants Turning 65 in the Year Indicated, by Income Quartile at Age 65

(percent of final five-year average salary)



[1] Baseline model assumes participants have continuous coverage in 401(k) plans.
[2] The 401(k) accumulation includes 401(k) balances at employer(s) and rollover IRA balances.
[3] Full sample contains 2.5 million participants drawn from the year-end 2000 EBRI/ICI database.
[4] High-tenure sample contains nearly 1 million participants with high tenure for their age at year-end 2000.
Source: Tabulations from EBRI/ICI 401(k) Accumulation Projection Model

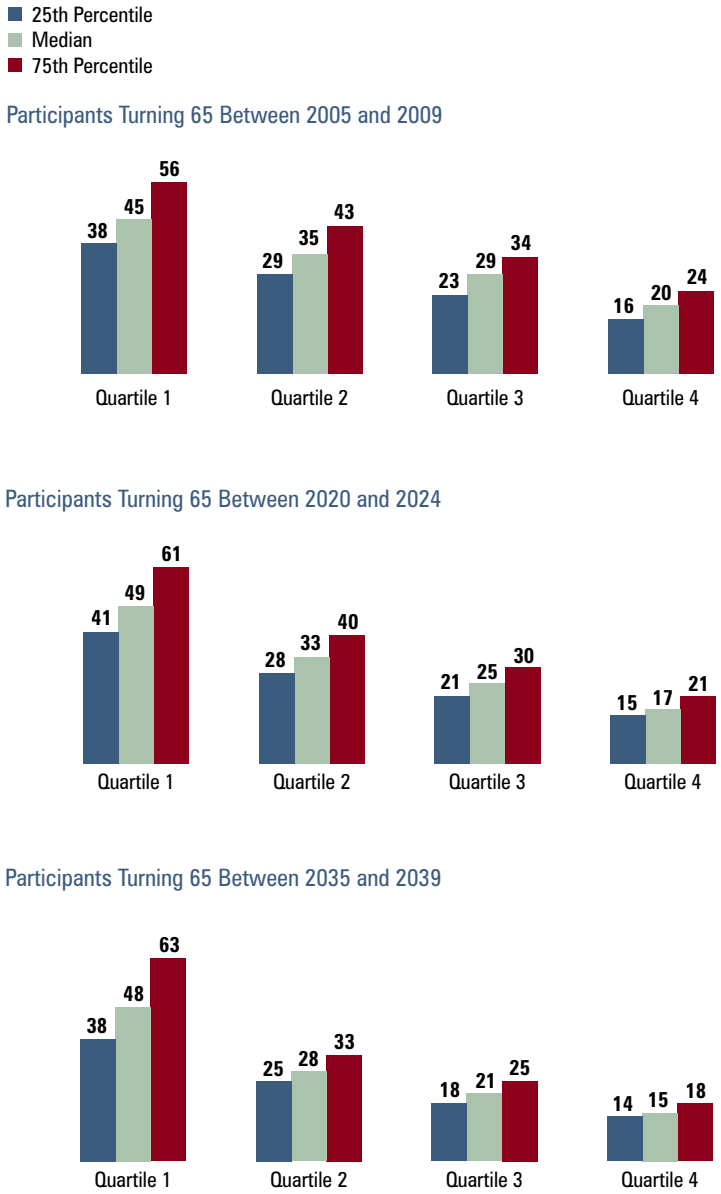
When the high-tenure sub-sample is analyzed, there is much less variation by birth cohort.

Even though the projection horizon is short for some of these older participants, participants who had already experienced a long working career (relative to their age) at their year-end 2000 employer were used as an approximation to better estimate full career behavior of these birth cohorts. Among the high-tenure sub-sample participants, on average,

FIGURE 5

Distribution of Replacement Rates from Social Security for Participants Turning 65 in the Year Indicated, by Income Quartile at Age 65

(percent of final five-year average salary)



Note: The model assumes participants have continuous full working careers.
Source: Tabulations from EBRI/ICI 401(k) Accumulation Projection Model

401(k) accumulations are projected to generate income to replace at least 41 percent of projected pre-retirement income for those participants reaching age 65 between 2005 and 2009 who are in the lowest income quartile and at least 59 percent for those in the highest income quartile (Figure 4, top panel). Among participants reaching age 65 between 2020 and 2024, half of the lowest income quartile at age 65 are projected to replace at least 58 percent of salary, while half of the highest income quartile are projected to replace 75 percent of salary or more (middle panel). Results for the full sample and high-tenure sample differ only slightly among participants reaching 65 between 2035 and 2039 because they are young in the year-end 2000 database and essentially have a full career before them in the model.

Variation of Projected Replacement Rates Within Birth Cohorts

Although there is no systematic variation in median replacement rates between soon-to-retire participants and those not retiring for many years, there is variation of replacement rates within birth cohorts (generations).[52] This variation reflects the fact that individuals are likely to differ in their experience in the workforce and/or in their 401(k) plans.

Social Security Replacement Rates.

Within any given birth cohort, there is variation in projected Social Security replacement rates, and the variation is wider in lower income quartiles. For example, among participants reaching age 65 between 2035 and 2039, three-quarters of those in the lowest income quartile at age 65 are projected to have Social Security replace 38 percent or more of their pre-retirement income, half of them are projected to have replacement rates of 48 percent or more, and one-quarter of them are projected to experience replacement rates of 63 percent or more

[52] Other research has also noted that there is a range of individual experiences at retirement. For example, Venti and Wise (February 2000), using HRS data, conclude that the bulk of the dispersion in wealth at retirement results from the choice of some families to save while other similarly situated families (in terms of lifetime earnings) chose to spend. They conclude that very little of the dispersion was explained by chance events or asset allocation choices. In addition, see Bernheim, Skinner, and Weinberg (September 2001).

(Figure 5, bottom panel). The wider variation within the lower income quartile primarily results from the higher marginal benefit per additional dollar earned at lower income levels.[53]

Among participants reaching age 65 between 2035 and 2039, one-quarter of those in the highest income quartile at age 65 are projected to have Social Security replace 14 percent or less of their pre-retirement income, half of them are projected to have replacement rates of 15 percent or less, and three-quarters of them are projected to experience replacement rates of 18 percent or less (Figure 5, bottom panel). Similar variations within income quartiles and birth cohorts are projected to occur for participants projected to retire in other time periods as well (Figure 5, top and middle panels, for example).

401(k) Accumulation Replacement Rates. There is also variation in projected 401(k) accumulation replacement rates within birth cohorts. For example, among participants turning 65 between 2035 and 2039, three-quarters of those in the lowest income quartile at age 65 are projected to replace at least 37 percent of their income with 401(k) accumulations, half are projected to replace at least 52 percent, and one-quarter are projected to replace 71 percent (Figure 6, bottom panel). Among those in this birth cohort, but in the highest income quartile at age 65, three-quarters are projected to replace at least 54 percent of their pre-retirement income using their 401(k) accumulations, half are projected to replace at least 69 percent, and one-quarter are projected to replace 89 percent or more. A similar distribution of replacement rates occurs among participants projected to retire in other years (Figure 6, top and middle panels, for example).

IV. EFFECT OF PARTICIPANT BEHAVIOR ON PROJECTED REPLACEMENT RATES AT RETIREMENT

The results discussed above represent the typical experience of 401(k) participants projected to work a continuous career and always at employers offering a 401(k) plan (the baseline model). However, changing assumptions for 401(k) behavior related to contributions, loans, or withdrawals has an effect on the income that is projected to be provided in retirement by 401(k) accumulations. In addition, changing assumptions regarding the influence of job changes also has a significant effect on results at retirement. Figure 7 presents the effects of changing some key 401(k) participant behaviors and experiences.[54] Projected median replacement rates from 401(k) accumulations for participants reaching age 65 between 2030 and 2039 are compared with the baseline model experience for those participants.

Effect of Contributions. Based on contribution activity observed among EBRI/ICI 401(k) participants, the baseline model assumes that a small portion of participants do not make contributions themselves or have employer contributions to their 401(k) plans in any given year. Altering this assumption so that participants always[55] have contributions to their plans every year raises the percentage of income that is projected to be replaced at retirement. Because lower income participants are a little less likely to have contributions, their replacement rates are increased the most. For example, among participants reaching age 65 between 2030 and 2039, those in the lowest income quartile at age 65 are projected to replace 9.1 percentage points more of their pre-retirement income if they always had contributions compared with their baseline results when they didn't always have contributions (Figure 7). For the median individual in the highest income quartile, 4.6 percentage points more of income are projected to be replaced if they continuously had contributions compared with the baseline model.[56]

Effect of Loans. Although most participants are permitted to borrow from their 401(k) accounts, most do not take advantage of the loan option. In addition, amounts borrowed typically are paid back into the account. However, if participants were assumed to have never borrowed from their accounts, the projected proportion of income replaced at retirement would have been slightly higher. For example, participants in the lowest income quartile at age 65, turning 65 between

[53] See text footnote 51 for the explanation of the PIA formula, which shows that an additional dollar of AIME generates higher marginal benefits the lower the AIME.

[54] The effects presented do not take into account the changes in other behaviors that might result from changing the behavior in question.

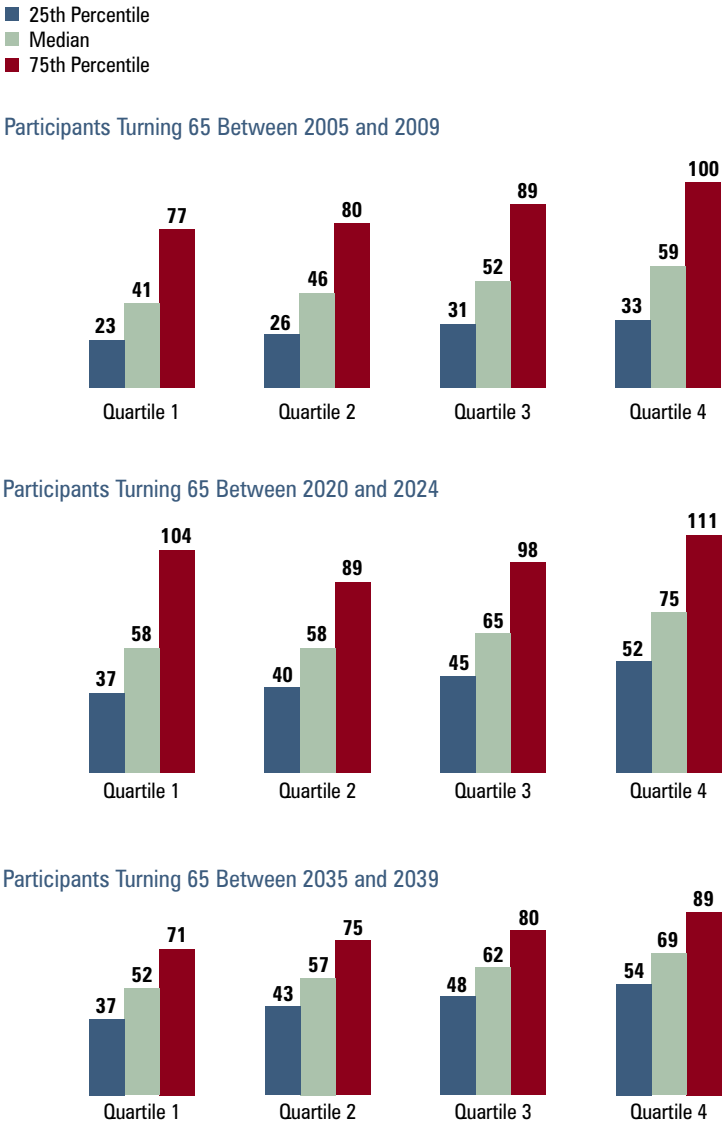
[55] It is assumed that contribution amounts are not influenced by the change in frequency.

[56] Other research has found that savings rates greatly influence the distribution of wealth at retirement (for example, see Samwick and Skinner (October 2001), Venti and Wise (February 2000), and Even and Macpherson (March 1998)).

FIGURE 6

Distribution of Replacement Rates[1] from 401(k) Accumulations[2] for Participants Turning 65 in the Year Indicated, by Income Quartile at Age 65: High-Tenure Sample

(percent of final five-year average salary)



[1] *Baseline model assumes participants have continuous coverage in 401(k) plans.*

[2] *The 401(k) accumulation includes 401(k) balances at employer(s) and rollover IRA balances.*

Source: Tabulations from EBRI/ICI 401(k) Accumulation Projection Model

2030 and 2039, are projected to replace 0.4 percentage points more of their pre-retirement income compared with the baseline scenario (Figure 7). Similarly, for the highest income quartile, it is projected that 0.3 percentage points more of income would be replaced. These small effects do not account for the possible influence of the change in loan usage on other activities, such as contributions (which might be reduced)[57] and withdrawals (which might be increased).

Effect of Pre-Retirement 401(k) Withdrawals. Although few participants make pre-retirement withdrawals from their 401(k) accounts, withdrawals are permanently removed (unlike loans—where the amount is projected to be repaid to the account). If participants never made withdrawals from their 401(k) plans, participants reaching age 65 between 2030 and 2039 are projected to replace 3.8 to 6.7 percentage points more of their pre-retirement income compared with the baseline scenario, depending on income quartile (Figure 7).

Effect of Lapses in 401(k) Coverage. The baseline results presented above assume that EBRI/ICI 401(k) participants always choose an employer that offers a 401(k) plan as they change jobs over the remainder of their working careers in the projection model. However, many employers do not offer a 401(k) plan.[58] When the EBRI/ICI participants experience careers with lapses in 401(k) plan coverage, replacement rates from projected 401(k) accumulations fall drastically. Among those reaching age 65 between 2030 and 2039, the lowest income quartile at age 65 are projected to replace 27.5 percentage points less of pre-retirement income while those in the highest income quartile are projected to replace 39.4 percentage points less, compared with the baseline model (Figure 7). It is important to note

[57] Other research has shown that participants in plans with a loan option contribute higher percentages of salary. For example, see Holden and VanDerhei (October 2001), Munnell, Sundén, and Taylor (December 2000), and U.S. General Accounting Office (October 1997).

[58] See U.S. Department of Labor, Pension and Welfare Benefits Administration (Winter 2001–2002), which reports that 27 percent of private wage and salary workers were active participants in defined contribution plans only, 15 percent were active participants in both defined benefit and defined contribution plans, and 7 percent were in private defined benefit plans only.

that these reductions may be partially offset by participation in a defined benefit plan or a non-401(k)-type defined contribution plan, or with contributions to traditional IRAs during the periods of lapses in 401(k) coverage. However, IRA contribution limits are lower than those permitted in 401(k) plans and have no possibility of employer contributions.[59]

Effect of Cash-Out at Job Change. Research on participant behavior at job change has found that participants with smaller balances are more likely to cash out those balances at job change, while larger account balances are more likely to roll over into an IRA.[60] To the extent that lower income participants tend to have lower account balances,[61] if they chose never to cash those balances out at job change, they would see an increase in their replacement rates at retirement. Among participants turning 65 between 2030 and 2039, those in the lowest income quartile at age 65 are forecast to replace 13.3 percentage points more of their pre-retirement income had they never cashed out a 401(k) balance, while those in the highest income quartile are projected to replace 4.7 percentage points more, compared with the baseline case (Figure 7).[62]

Effect of IRA Withdrawals. In the model, participants who do not cash out balances at job change may roll them into IRAs. However, once a participant has a rollover IRA established, pre-retirement withdrawals from IRAs are also possible in the projection. Among participants reaching age 65 between 2030 and 2039, those in the lowest income quartile are projected to replace 11.1 percentage points more of pre-retirement income if they had not taken withdrawals from their IRAs, while those in the highest income quartile are projected to replace 18.4 percentage points more, compared with the baseline scenario (Figure 7).

FIGURE 7

Change in Median Replacement Rates from 401(k) Accumulations[1] Relative to Baseline Model Assumptions for Participants Reaching Age 65 Between 2030 and 2039, by Income Quartile at Age 65

(percentage points)

	Income Quartile			
	1	2	3	4
Assuming always have contributions to 401(k) plan account	9.1	8.9	6.5	4.6
Assuming loans are never taken from 401(k) plan account	0.4	0.3	0.4	0.3
Assuming pre-retirement withdrawals are never taken from 401(k) plan account	6.7	6.0	6.0	3.8
Assuming do not always have 401(k) plan coverage	-27.5	-30.8	-34.7	-39.4
Assuming never cash out balance at job change	13.3	9.1	6.8	4.7
Assuming pre-retirement withdrawals are never taken from IRA balances	11.1	12.8	14.8	18.4
Memo:				
Median Replacement Rates for Typical 401(k) Participant[2]	50.7	54.0	59.5	67.2

[1] Change in median replacement rate for 401(k) accumulations relative to final five-year average salary. This is the first-order difference and does not take into account changes in participant behavior that might occur as result of changing the activity in question.

[2] The ratio of the income generated in the first year of retirement from 401(k) accumlations to final five-year average salary (in percent) for the baseline model.

Source: Tabulations from EBRI/ICI 401(k) Accumulation Projection Model

[59] The EBRI/ICI 401(k) model does not allow for contributory traditional IRAs or for participation in defined benefit plans or non-401(k)-type defined contribution plans.

[60] See text footnote 44.

[61] Although a participant with contributions of 9 percent of salary and a salary of $40,000 a year will have an account balance of about $3,600 in the first year, an otherwise similar participant with salary of $80,000 will have twice as much. However, the saving rate and ratio of account balance to salary are identical between those two participants. Research on the relationship of account balance to salary has found that there is little variation in that ratio across salary groups (see Holden and VanDerhei (November 2001)).

[62] Other research has also found small effects, on average (for example, see Engelhardt (June 2001) and Poterba, Venti, and Wise (August 1999)).

V. EFFECT OF INVESTMENT RETURNS ON PROJECTED REPLACEMENT RATES

In defined benefit plans, participants primarily bear "employment" and "employer" risk. Employment risk occurs because a participant might not stay in the job long enough to vest[63] in benefits. In addition, employment risk occurs if the participant changes jobs and benefits left at early jobs are not indexed for inflation. Employer risk results from the possibility that the employer may change the prospective terms of the plan or may enter bankruptcy (in which case, insured pension amounts may be less than those promised). However, in defined benefit plans, employees generally do not directly bear investment risk.[64]

In 401(k) plans, participants face employment risk, but it is not as great as in defined benefit plans. Participants in 401(k) plans are always 100 percent vested in their own contribution to the plans, but must vest in the employer contributions. Typically, the vesting period in 401(k) plan matching employer contributions has been shorter than in defined benefit plans.[65] Employer risk for 401(k) participants occurs if the employer changes prospective terms of the plan and, if participants hold company stock, they face the potential negative consequences of inadequate diversification.

Participants in 401(k) plans directly bear investment risk. Whereas the baseline results of the projection model analysis randomly expose participants to a distribution of historical rates of return (based on S&P 500 total returns from the beginning of 1926 to the end of 2001), this section first examines the effect of an entire projection period that replicates the equity investment experience of the worst 50 years of S&P 500 total return history. Alternatively, the model is then used to project the effect of concentrated negative (bear market) and high (bull market) equity returns on participants. In addition, it examines the impact of the timing of the bear or bull returns—early in an individual's career, near the middle (age 39 to 41), or immediately prior to retirement (age 63 to 65).

Effect of Projecting Total Returns to Equities Based on 1929 to 1978 Historical Returns. Projecting equity total returns based on the worst 50-year period tracked by the S&P 500 reduces projected median replacement rates from 401(k) accumulations by 10 to 13 percentage points (Figure 1, top and bottom panels). Nevertheless, 401(k) accumulations are still projected to replace substantial portions of projected pre-retirement income, ranging from a projected median of 41 percent for the lowest income quartile at age 65 to a projected median of 56 percent for the highest income quartile.

Modeling Concentrated Equity Market Extremes. To model the effect of extreme equity market results on participants, the worst and best contiguous three-year average total returns on the S&P 500 after the Great Depression era were used for the bear and bull market returns, respectively (Figure 8).[66] In the bear market scenario, participants' equity holdings (equity funds, company stock, and the equity portion of balanced funds) are projected to experience three contiguous years of an annual -9.3 percent total return, which reduced equity holdings by 25 percent by the end of the three-year period. In the bull market scenario, participants' equity holdings are projected to experience three years of an annual 31.2 percent total return, which increased equity holdings by 126 percent. Participants continue to be exposed to a random draw from historical equity market returns (based on S&P 500 total returns from 1926 through 2001) for every other year in the model, while experiencing three contiguous years of controlled equity market returns either early, mid, or late in their careers.

[63] Vesting refers to the amount of time a participant must work before earning a nonforfeitable right to a pension benefit (see U.S. DOL (September 1999)).

[64] However, if poor investment returns contribute to the distress termination of the plan, participants face the risk of receiving the insured pension amounts (which may be lower for some participants).

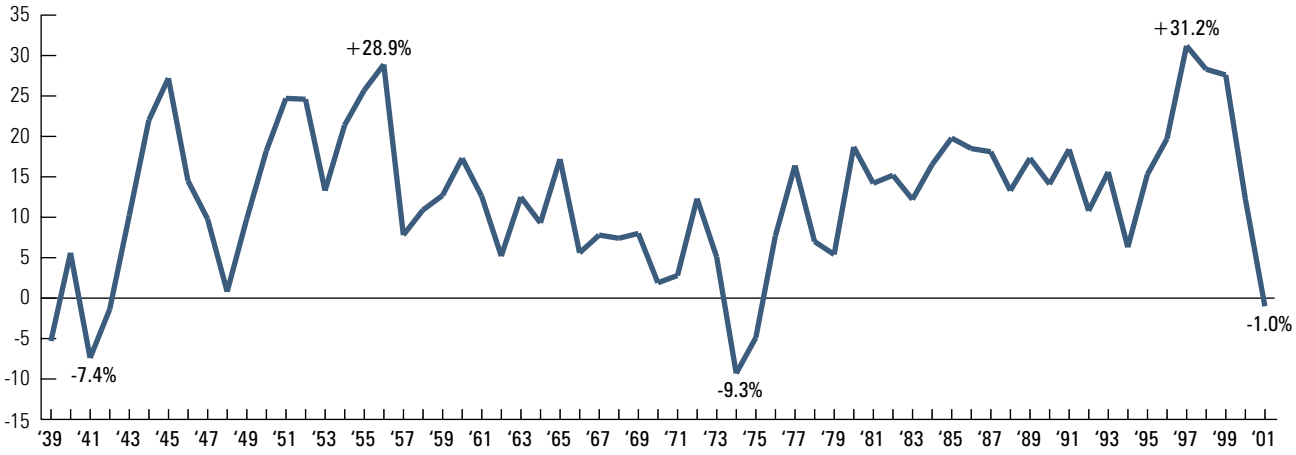
[65] Prior to EGTRRA, vesting practices were subject to the same legal constraints for defined contribution and defined benefit plans, while practically, defined contribution plans typically had shorter vesting periods (see U.S. DOL (September 1999)). However, EGTRRA legally shortened the vesting schedule for matching contributions in defined contribution plans.

[66] In all other remaining years of the model, participants are projected to experience the normal distribution of returns historically seen in the United States between 1926 and 2001. There was no adjustment to the average historical experiences to offset or otherwise account for the concentration of the three good or the three bad years imposed on the participants.

FIGURE 8

Total Return on S&P 500 Stock Index, 1939 – 2001

(three-year annual geometric average; percent)



Source: Calculation using Standard & Poor's 500 total returns (see text footnote 12) from Ibbotson (2002)

Effect of Three-Year Bear Market. Figure 9 presents the projected effect of the timing of a bear market in equities for participants reaching age 65 between 2030 and 2039 compared with their baseline results. If a market downturn occurs early in a participant's career, little of the final balance has been accumulated and there is a long time horizon over which to recover. The median replacement rates from 401(k) accumulations at age 65 for participants experiencing a bear market early in their careers are projected to be pulled down between 2.9 and 3.7 percentage points (depending on income quartile) compared with the baseline scenario. A market downturn is projected to have a larger impact the closer it occurs to retirement, even though older participants tend to have diversified their portfolios away from equities. If the bear market is projected to occur immediately before retirement, projected median replacement rates fall between 13.4 and 17.7 percentage points (depending on income quartile) compared with the baseline.

FIGURE 9

Equity Market Investment Returns' Effect on Median 401(k) Replacement Rates Among Participants Reaching Age 65 Between 2030 and 2039, by Income Quartile at Age 65

(percentage points)

	Income Quartile			
	1	2	3	4
Bear Market[1] in Equities Occurs:				
Start of career	-3.2	-2.9	-3.0	-3.7
Middle of career[2]	-7.5	-8.0	-8.8	-10.4
End of career	-13.4	-14.1	-15.6	-17.7
Bull Market[3] in Equities Occurs:				
Start of career	3.9	3.6	3.9	4.5
Middle of career[2]	10.2	10.7	11.7	13.8
End of career	16.0	16.8	18.6	21.0
Memo:				
Median Replacement Rates for Typical 401(k) Participant[4]	50.7	54.0	59.5	67.2

[1] The bear market consisted of three consecutive years of -9.3 percent annual returns, which reduced equity holdings (equity funds, company stock, and the equity portion of balanced funds) by 25 percent by the end of the three-year period.

[2] Middle of career is defined as the years the participant is 39, 40, and 41 years old.

[3] The bull market consisted of three consecutive years of +31.2 percent annual returns, which increased equity holdings (equity funds, company stock, and the equity portion of balanced funds) by 126 percent by the end of the three-year period.

[4] The ratio of the income generated in the first year of retirement from 401(k) accumulations to final five-year average salary (in percent) for the baseline model.

Source: Tabulations from the EBRI/ICI 401(k) Accumulation Projection Model

Effect of Three-Year Bull Market. Figure 9 also presents the projected effect of the timing of a bull market in equities on the projected median replacement rates from 401(k) accumulations. Although younger participants tend to concentrate more of their accounts in equity securities, because little of the final balance has been accumulated early on, a bull market in equities that is simulated to occur early in a participant's career does not have a large effect on account balances at retirement. The median replacement rates at age 65 for participants experiencing a bull market early in their careers are projected to increase by 3.6 to 4.5 percentage points (depending on income quartile) compared with their baseline experience. A bull market in equities is projected to have a larger effect the closer it occurs to retirement. A simulated three-year bull market increasing equity holdings by 126 percent immediately before retirement caused projected median replacement rates to be between 16.0 and 21.0 percentage points (depending on income quartile) higher compared with the baseline.

VI. CONCLUSION

Current retirees have not had access to 401(k) plans long enough to examine the ability of such plans to generate income in retirement. This paper uses a standard simulation model methodology to project 401(k) accumulations at age 65 for a very large sample of current 401(k) plan participants. A number of future scenarios are examined, but the bottom line is that 401(k) accumulations for workers with continuous 401(k) coverage over a full working career are projected to generate substantial income at age 65. The most significant factor in reducing projected replacement rates from 401(k) accumulations for future retirees is not having access to a 401(k) plan in all portions of the individual's career.

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