New Estimates of the Future Path of 401(k) Assets

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Abstract: The future paths of 401(k) contributions and withdrawals, and the associated path of 401(k) asset values, will affect both the preparation of future retirees for their retirement years and the income tax revenues of the federal and state governments. In this paper, we project the future growth of assets in self-directed personal retirement plans, such as 401(k) plans, at age 65 for cohorts attaining that age between now and 2040. We also project the ratio of 401(k) assets at 65 to prior earnings, and the ratio of aggregate 401(k) account balances to GDP. While there is substantial uncertainty in the future path of 401(k) balances, our projections of the future means for these balances suggest that cohorts that attain age 65 in future decades will have accumulated substantially more retirement saving (in real dollars) than current retirement-age cohorts. Our projections also highlight the drag that pre-retirement withdrawals and management fees place on asset accumulation.

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Over the past two and a half decades there has been a fundamental change in saving for retirement in the United States. Employer-managed defined benefit pensions have been eclipsed by defined contribution retirement saving plans that are largely controlled by employees. In 1980, 92 percent of contributions to private retirement saving plans were to employer plans; 64 percent of these contributions were to defined benefit plans. By 2000, about 87 percent of private contributions were to plans in which individuals decide how much to contribute to the plan, how to invest plan assets, and how and when to withdraw money from the plan. This proportion declined somewhat as employers made "catch-up" contributions to under-funded DB plans in the period of weak stock market returns beginning in 2000.

In this paper we develop projections of the future contribution flows to, withdrawals from, and assets in self-directed personal retirement plans. 401(i) plans are the most important of the large number of personal retirement plans. We consider them as well as 403(b), 457, and other tax-deferred retirement saving plans, as well as traditional defined contribution plans. We refer to these plans collectively as "401(k)" or as “401(k)-type” plans. In a companion paper, Poterba, Venti and Wise (PVW) (2007a), we project future asset holdings in defined benefit plans.

The shift from defined benefit to defined contribution plans has potentially important implications not only for the well-being of future retirees, but also for the projection of federal income tax revenues. Contributions to 401(k)-type plans reduce taxable income, and the average amount of 401(k) wealth that retirees accumulate influences taxes paid after retirement. The time profile of withdrawals from these plans affects the time profile and the present discounted value of tax liabilities.

We combine projections of future 401(k) participation rates and asset accumulation patterns, based on historical cohort data on 401(k) participation rates, with the Social Security Administration's demographic forecasts to project the stock of 401(k) retirement plan assets in each year between 2006 and 2040. We also project accumulated 401(k) assets at age 65 for all cohorts attaining age 65 between 2006 and 2040.

Our study is closely related to several other recent investigations of the future path of retirement plan assets. Holden and VanDerhei (2002a, 2002b, 2006) project the proportion of pre-retirement income that will be replaced by the 401(k) accumulations of future retirees. They simulate future 401(k) assets for individuals who had 401(k) accounts in 2000. Their forecasts do not track aggregate 401(k) assets, since they do not consider future increases in 401(k) participation rates or the entry of new workers to the labor market in future years. Both of these factors will contribute raise future 401(k) balances. The Congressional Budget Office (2004a, 2004b) projects asset flows into and out of

defined benefit (DB) plans, defined contribution (DC) plans, and Individual Retirement Accounts (IRAs). Their projections are based primarily on the 1997 Information Returns Master file from the IRS, supplemented with data from the Survey of Consumer Finances and Form 5500. Their projections of future DC balances assume that future participation and contribution rates will remain fixed at their 1997 age-specific rates. If 401(k) plans continue to spread in the future, which seems likely, holding participation rates constant will understate future 401(k) balances.

The paper is organized into five sections. In the first section, we describe the spread of 401(k) saving programs since these saving plans first became widely available in the early 1980s. In the second section, we explain how we project the level of future assets in 401(k) plans. We detail key assumptions about employment trends, participation rates, contribution rates, and withdrawal patterns once 401(k) participants reach retirement. The third section reports projections of 401(k) assets at age 65 for each cohort that retires between now and 2040, as well as the total value of 401(k) plan assets for each year until 2040. We also compare projected 401(k) assets with our projection of future assets in DB plans. In section four, we discuss the key sources of uncertainty in our projections. The conclusion summarizes our results and discusses their implications.

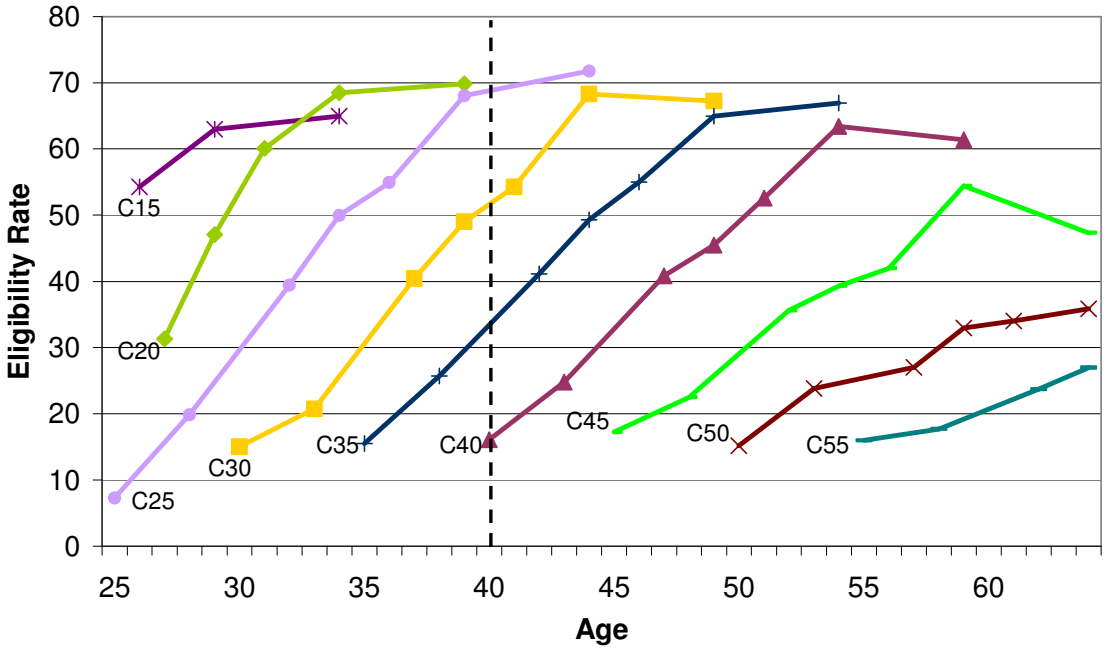
1. The Spread of 401(k) Plans Between 1984 and 2003

This section summarizes the diffusion of 401(k)-type plans over the last twenty-five years. It draws heavily on PVW (2007b). We use data from the Survey of Income and Program Participation (SIPP) to track the spread of 401(k) plans and to develop projections of future 401(k) assets. Various SIPP surveys provide data on eligibility for and participation in 401(k) plans in 1984, 1987, 1991, 1993, 1995, 1998, and 2003. Each survey is a random cross-section sample of the population; these cross-sections can be used to create "synthetic" cohorts. For example, to construct cohort data for the cohort that was 25 years old in 1984 we use the 1984 panel to obtain data for 25 year olds in 1984, the 1987 panel to obtain data for persons who were 28 in that year, the 1991 panel to obtain data for persons who were 32 in that year, and so forth. The cohort that was age 25 in 1984 was age 44 in 2003. We sometimes label a cohort by its age in 1984 and sometimes by the year in which it attains age 65. We refer interchangeably to the cohort that was 25 in 1984, and will turn 65 in 2024, as the C25 or the R2024 cohort.

The unit of observation in the SIPP, and the basis for most of our calculations, is the individual. In addition, we sometimes present results for families by grouping individual responses, treating unmarried persons as single-person families and matching spouses to create two-person family units. A family is eligible for (or participates in) a 401(k) plan if at least one member of the

family is eligible for (or participates) in a plan. The "age" of a two-person family is assumed to be the age of the male spouse.

Figure 1-1a. 401(k) eligibility data for 9 cohorts, C15 to C55



We first consider data on family eligibility, organized by cohort. The SIPP provides some data for 54 cohorts (C11 to C64). Figure 1-1a shows cohort data for nine of the 54 cohorts, five years apart, denoted by the cohort's age in 1984. Consider cohort C25. In 1984, about seven percent of C25 cohort families, which had male heads 25 years old, were eligible for a 401(k) plan. By 1987, this percent had risen to about 20 percent. By 2003, when the members of this cohort were 44 years old, 401(k) eligibility was slightly more than 70 percent. The most important feature of the figure is the increase in eligibility over time for families of a given age. For example, the dashed vertical line highlights the increase in the eligibility of families in cohorts that attained age 40 in successively later years. When cohort C40 was 40 years old in 1984, about 16 percent of the cohort families were eligible for a 401(k). When cohort C35 attained age 40 in 1989, about 34 percent of the C35 cohort was eligible. The C25 cohort was 40 in 1999, and almost 70 percent of cohort families were 401(k)-eligible. Similar increases in eligibility are evident at other ages.

Figure 1-1b. 401(k) eligibility data for all cohorts, C11 to C64

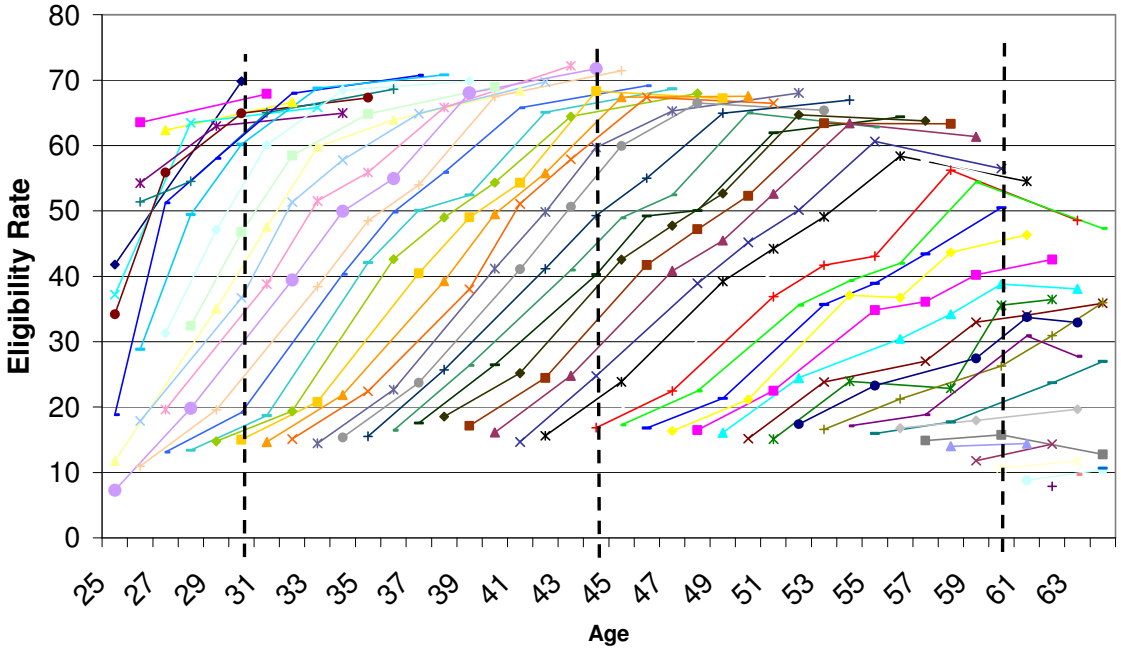


Figure 1-1b shows eligibility data for every cohort for which data can be obtained from the SIPP – cohorts from C11 to C64. The youngest cohorts are shown in the upper left of the figure and the oldest are shown in the lower right. The SIPP does not present data on 401(k) eligibility for those under the age of 25. The C11 cohort in Figure 1-1b is observed twice – once at age 25 in 1998 and again at age 30 in 2003. Cohorts younger than the C11 cohort were younger than age 25 in 1998, and were thus only observed once – in 2003. These cohorts are not shown in the figure.

The dashed vertical lines highlight increases in eligibility for cohorts that reached given ages in successively later years. With a few exceptions, cohorts that reached a given age in successively later years had successively higher 401(k) eligibility rates. There are surprisingly few "cross-overs" in the individual cohort trends even though cohorts depicted in the figure are only one year apart in age.

The increase in eligibility rates reflects the spread of 401(k) plans to more firms and especially to smaller employers. PVW (2004) explain that a large fraction of the employers who adopted 401(k) plans in the early and mid-1980s also offered DB plans. Few discontinued their DB plan when the 401(k) plan was adopted. Employers who instituted 401(k) plans later were less likely to have existing DB plans and were typically smaller firms.

The participation rates in 401(k) plans show patterns similar to those for eligibility rates. Family participation rates in 401(k) plans are shown by cohort in Figures 1-2a and 1-2b. Once again, the dashed vertical lines highlight the increase in the participation rate of families who attained a given age in successively later years. For example, Figure 1-2a shows that only about 10 percent of the C40 cohort, those who were 40 years old in 1984, participated in a 401(k) plan. But over 50 percent of the C25 cohort, which attained age 40 in 1999, participated in a 401(k) plan. Figure 1-2b shows more detail: participation rates for all of the SIPP cohorts.

Figure 1-2a. 401(k) participation data for 9 cohorts

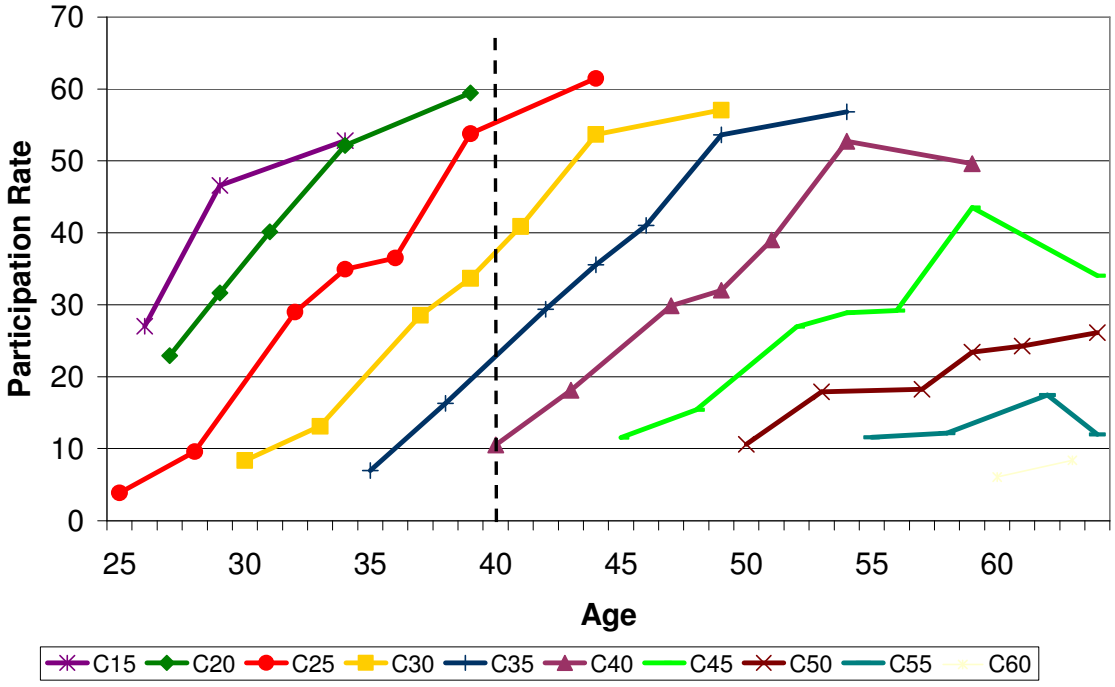
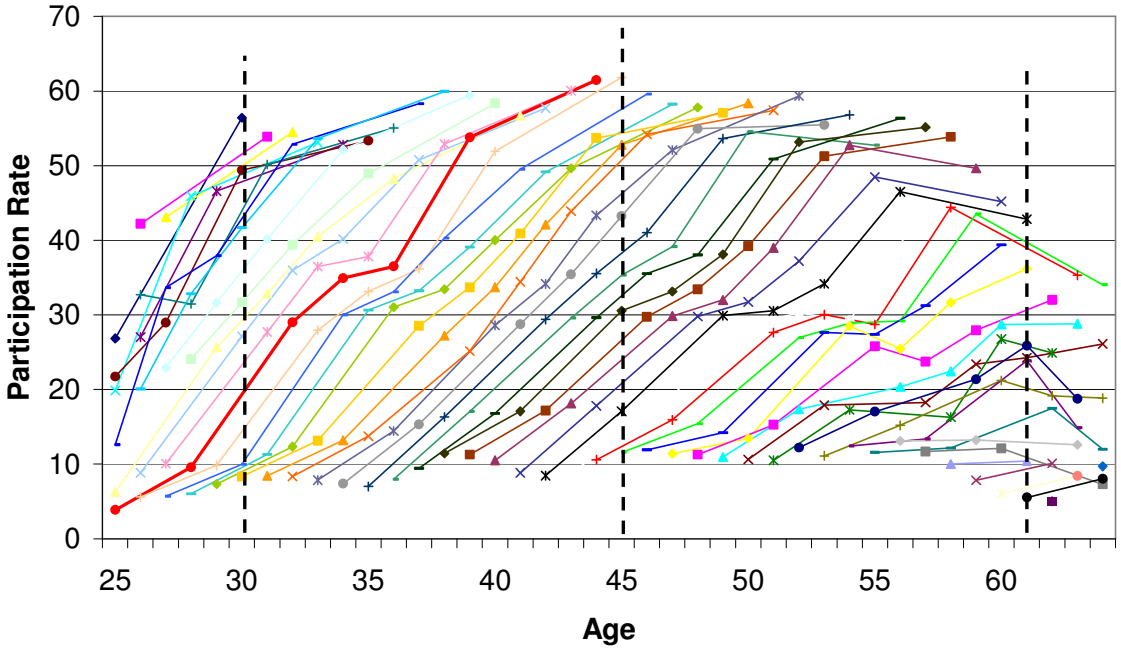


Figure 1-2b. 401(k) participation data for all cohorts



The cohort figures show a large increase in both 401(k) eligibility and participation rates between 1984 and 2003. Cohorts that reached a given age in successively later years had successively higher eligibility and participation rates. Table 1-1 summarizes the increase in eligibility and participation rates at selected ages between 1984 and 2003. It presents data for the age intervals 30-34, 45-49 and 60-64 in 1984 and 2003. While only 14.8 percent of the families in the 30-34 cohort in 1984 was eligible for a 401(k) plan, 66.8 percent of those who reached that age in 2003 were eligible. Only 8.2 percent of the cohort that attained age 30-34 in 1984 participated in a 401(k) plan, compared with 53.9 percent of the cohort that reached this age in 2003. The rise in 401(k) contribution and participation behavior that we find in the SIPP data is confirmed in other studies using other data sets, such as Dushi and Honig's (2007) analysis of the Health and Retirement Survey.

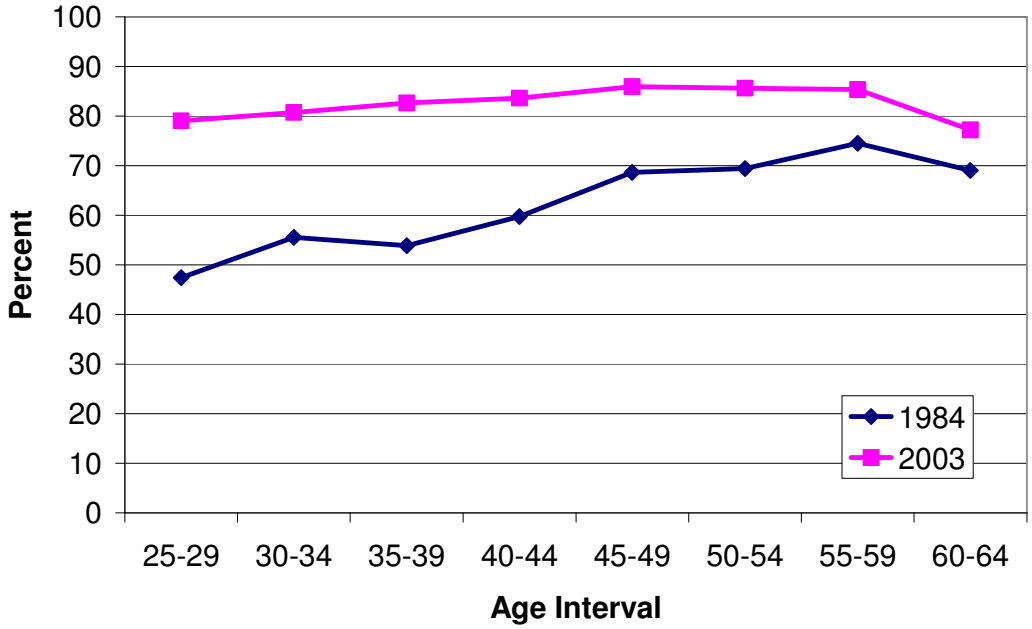
Table 1-1 also shows the percent of 401(k) eligible workers who participated in 401(k) plans in 1984 and 2003. For each age, the participation rate given eligibility increased substantially over this period. For example, in 1984, 55.5 percent of eligible families with heads aged 30-34 participated in a 401(k) plan. By 2003, 80.7 percent of those who were eligible participated. Among families with heads aged 45-49, participation given eligibility increased from 68.6 percent to 85.9 percent between 1984 and 2003.

Table 1-1. 401(k) eligibility and participation rates for families, by age, selected years (percent)

Eligibiliy / Participation	Age 30-34	45-49	60-64
Eligibiliy			
1984	14.8	17.2	9.1
2003	66.8	68.7	53.1
Paticipation			
1984	8.2	11.8	6.3
2003	53.9	59	41
Participation Rate / Eligibility Rate			
1984	55.5	68.6	69.0
2003	80.7	85.9	77.2

Figure 1-3 presents data on participation given eligibility. This conditional participation rate increased between 1984 and 2003 for all age groups, especially for younger ones. In 2003 the participation rate given eligibility was about the same (80 percent) for each of the age intervals from 40-44 to 60-64. It was higher for younger cohorts.

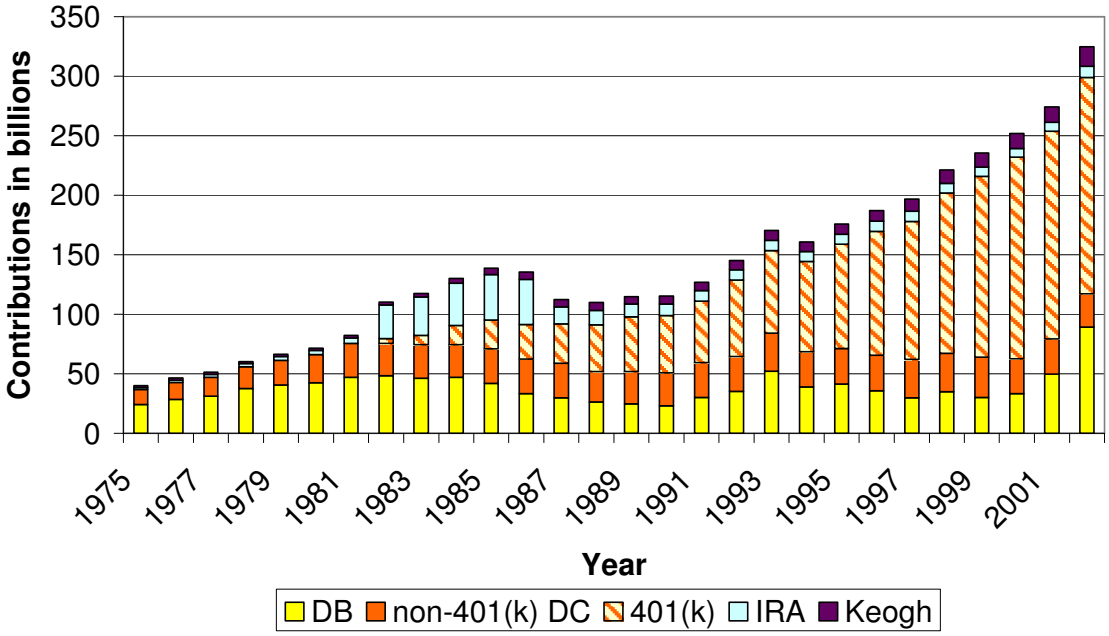
Figure 1-3. 401(k) participation percent given eligibility, by age interval, 1984 and 2003.



The rapid spread of 401(k) eligibility and the rise in participation rates has resulted in sharp growth in aggregate 401(k) contributions. Figure 1-4 shows contributions to 401(k) plans and to all other private pension plans from 1975 to 2002, the most recent year for which we could access Form 5500 data. The data

are presented in nominal dollars. Contributions to 401(k) plans are shown by the lined bars. Contributions to 401(k) plans were first made in 1982. By 2000, they had reached $182 billion and accounted for 73 percent of all private pension plan contributions. Counting IRA, Keogh, and traditional employer provided non-401(k) DC plans, 87 percent of contributions were to personal accounts. This fell to 61 percent by 2002 due to large DB catch-up contributions triggered by the stock market decline.

Figure 1-4. Private pension plan contributions, 1975-2002, in current dollars



The increase in total pension plan contributions between 1982 and 2000 was accounted for almost entirely by the increase in contributions to 401(k) plans. Contributions to defined benefit (DB) plans fluctuated substantially over this period. In nominal dollars, contributions to these plans in 2000 were $13.5 billion lower than in 1981; in constant 2000 dollars, the decline was more than $54 billion. DB plan contributions more than tripled between 2000 and 2002, however, in response to the stock market decline and the corresponding decline in plan funding status. Contributions to non-401(k) defined contribution (DC) plans changed little between 1981 and 2002. There was a substantial spike in IRA contributions in 1982 through 1986. Thereafter IRA contributions fell by about 75 percent, when the tax advantage of IRA contributions was reduced for a small proportion of contributors. Since 1987, the sum of IRA and Keogh plan contributions has changed very little. Most inflows to IRAs today are roll-overs of previous accumulations in DC plan accounts.

2. Projecting Future 401(k) Contributions

This section describes the calculations that underlie our projections of 401(k) wealth. We denote persons by the subscript i and cohorts by the subscript *c*. Associated with each person in each cohort is a lifetime earnings profile. Earnings of person i in cohort c at age a are denoted by $E_{ci}(a)$ The zero-one indicator that person i in cohort c participates in a 401(k) plan at age a is denoted by $P_{ci}(a)$ the rate of return earned on 401(k) assets that were held at the beginning of the year when the person attained age a is denoted by $R_{ci}(a)$, and the contribution rate as a share of earnings is γ. The total contribution by person i in cohort c at age a is therefore $\gamma * E_{ci}(a) * P_{ci}(a)$. The value of the 401(k) assets held by person i in cohort c at age a is given by

$$W_{ci}(a) = \sum_{t=0}^{a} \left\{ \prod_{j=0}^{t} [1 + R_{ci}(a-j)] \right\} C_{ci}(a-t) \tag{1}$$

We make this calculation for every person using that individual's earnings history; we consider individuals of every age in every cohort. In practice, we distinguish between 401(k) assets held in stocks and bonds, and make separate accumulation calculations for each for each individual. We assume the same rates of return for all individuals. The 401(k) wealth of person i in cohort c at 65 is given by

$$W_{ci}(65) = \sum_{t=0}^{65} \left\{ \prod_{j=0}^{t} [1 + R_{ci}(65-j)] \right\} C_{ci}(65-t) \tag{2}$$

We calculate 401(k) wealth using the earnings history for each individual in our sample and then obtain the average wealth held by the population of all 65-year-olds in a given cohort. To do this we need to know how many persons of type *i* are in the population. Denote the number of persons with lifetime earnings profile *i* in cohort *c* at age 65 by N_{ci}. The average of 401(k) assets held by all persons in cohort *c* at age 65 is given by

$$\bar{W}_c(65) = \sum_i \left(\frac{N_{ci}(65)}{\sum_{j=1}^{J} N_{cj}(65)} \right) \cdot W_{ci}(65) \tag{3}$$

.

where J is the number of individuals in our sample. In practice, we don't have population forecasts associated with each earnings history in the sample. We use projections from the Office of the Actuary of the Social Security Administration (SSA) for individuals by gender and marital status, by age, in each calendar year. We group individuals in our sample by their gender and marital status, and calculate the average of $W_{ci}(65)$ separately for each of the four gender-marital status pairs. We denote this average by $\overline{W}_{c,gm}$. Average wealth at 65 for each cohort is then

$$\overline{W}_c(65) = \sum_{gm} \left(\frac{N_{c,gm}(65)}{\sum_{j=1}^{GM} N_{c,j}(65)} \right) \cdot \overline{W}_{c,gm}(65) \tag{4}$$

The sum is over the four gender-marital status groups, and the number of persons in each of these groups is taken from the SSA demographic projections.

We project total 401(k) assets in each year through 2040. The 401(k) assets of person i in cohort c in calendar year y equal $W_{ci}(y-c+65)$. The total value of 401(k) assets in year y is just the sum of these person-cohort values across all persons and cohorts.

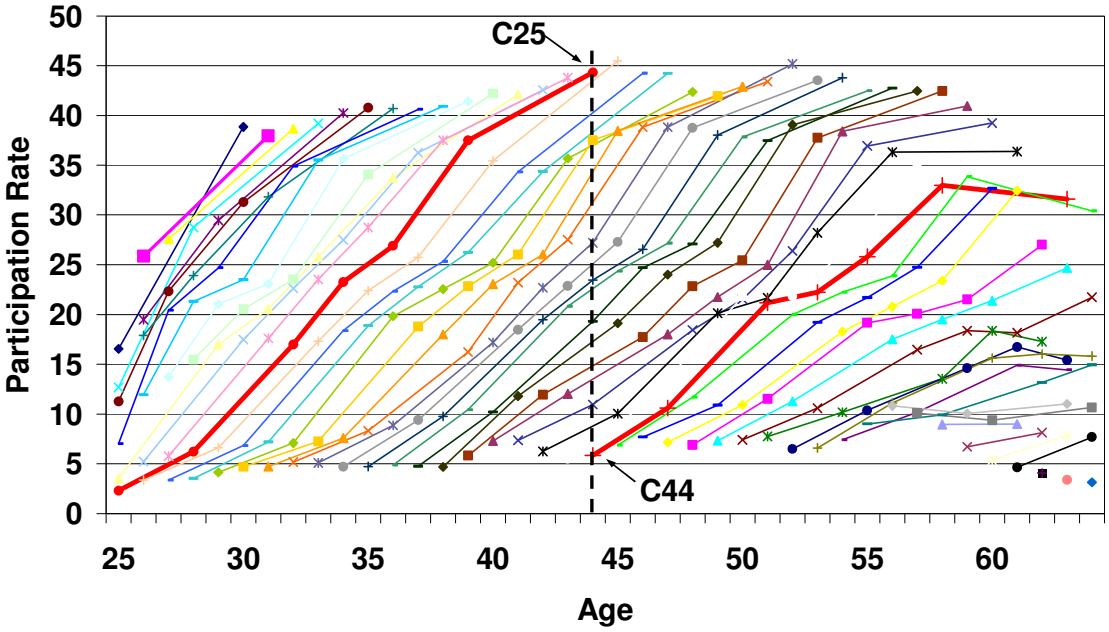
To implement these calculations we need to project future 401(k) participation rates and earnings and to make assumptions about future 401(k) contribution rates, rates of return, cash-out probabilities, and 401(k) withdrawals. We begin by describing our projections of average 401(k) participation rates for each cohort. We then describe our other assumptions.

Participation rates: We use SIPP data for 1984, 1987, 1991, 1993, 1995, 1998, and 2003 to track the spread of 401(k) plans over the past two decades and to project future 401(k) participation rates. We begin with historical participation rates for individuals by cohort, as shown in Figure 2-1. The earliest SIPP data are for 1984 and the most recent data are for 2003. We use these data to project 401(k) participation at ages 25 through 65 for a large number of cohorts, ranging from the one that attains age 65 in 1982 through the one that attains age 65 in 2040. Only a few of the cohorts (shown in the bottom right of Figure 2-1) had attained age 65 by 2003. Thus for all but a few of the cohorts we must project participation rates from the last observed age in 2003 to age 65.

The participation rate is the eligibility rate times the participation rate given eligibility. The future eligibility rate will depend in particular on the spread of 401(k) plans to small employers. PVW (2004) show that eligibility rates have increased rapidly over the past two decades, and that participation, given eligibility, increased substantially over the 1984 to 2003 period. We have not

found a compelling way to project future rates of eligibility or participation conditional on eligibility. Thus we make simple assumptions about future participation rates and use them to project future cohort participation rates for persons in cohorts not covered in the SIPP data.

Figure 2-1. 401(k) participation rate for persons, by cohort



Simple extrapolations of the cohort data yield implausibly large future participation rates. Consider, for example, the participation rates at age 44 highlighted by the vertical dashed line in Figure 2-1. The C44 cohort attained age 44 in 1984 and had a participation rate of 5.8 percent at that time. The C25 cohort attained age 44 in 2003, 19 years later, and had a participation rate of 44.3 percent. On average, the participation rate at age 44 increased about 2 percentage points with each successively younger cohort. Were this to continue, the participation rate of the C12 cohort at age 44, in 2016, would be 70.3 percent (44.3+13x2). We suspect that this is too high, because 401(k) plans have already diffused through the segments of the corporate population with the largest workforces. The early adopters of 401(k)s are also likely to have been the firms whose workforces found these plans most attractive, and for which the per-employee administrative costs of plan implementation were lowest.

Cohort effects estimated from the profiles above shows some compression with successively younger cohorts. In addition, Figure 2-1 suggests that within cohorts, the increase in participation rates was lower between the last two data points for each cohort, 1998 and 2003, than for earlier intervals of comparable length. These features of the data suggest that the rate of growth of 401(k) participation may be slowing.

To recognize the apparent compression in the cohort effects and the apparent decline in the rate of within-cohort increase in participation rates, we make future projections for each cohort based on its observed 2003 participation rate. We assume that the annual increase in future participation rates will be smaller than the increase between 1998 and 2003 – in particular, that this annual rate of increase declines by 0.12 percent per year. With this assumption, we obtain the projected future participation rates for the C25 and the C12 cohorts that are shown in Figure 2-2, which also shows the actual participation rates for these cohorts in 2003 and earlier years. Based on these projections, the participation rate of the C12 cohort when it attains age 44 in 2016 would be 61.7 percent. This can be compared with 44.3 percent, the participation rate at age 44 for the C25 cohort, which reached this age in 2003. The projected participation rate of the C25 cohort when it attains age 64 in 2024 is 56.6 percent, while that of the C12 cohort when it attains age 64 in 2037 is 69.4 percent.

The average projected participation rate of all cohorts in 2037 substantially lower than the participation rate of the cohort that attains age 64 in 2037. We project that the average 401(k) participation rate will increase from 46 percent in 2003 to 61 percent in 2040.

Figure 2-2. Projected participation rates for cohorts C25 (R2024) and C12 (R2037)

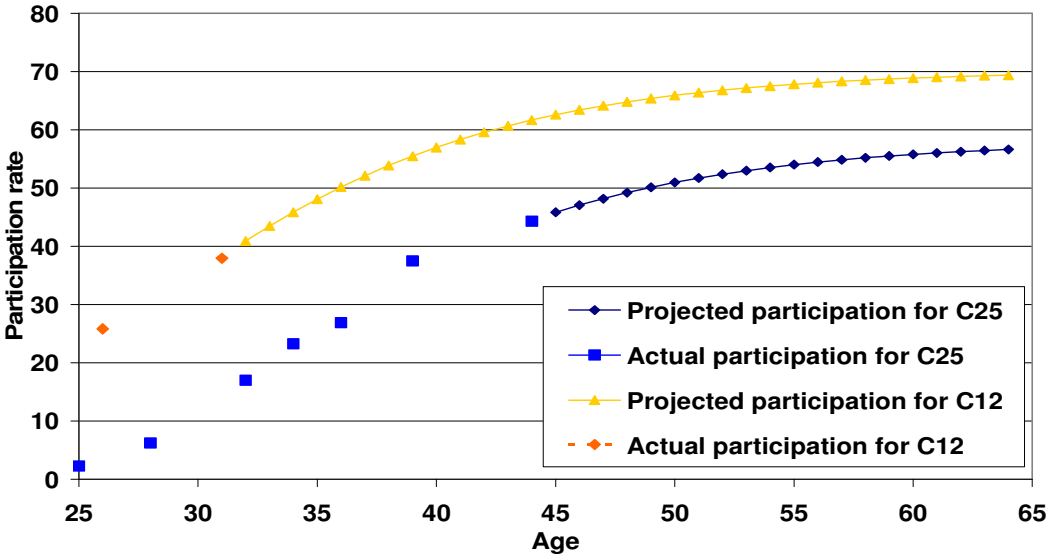
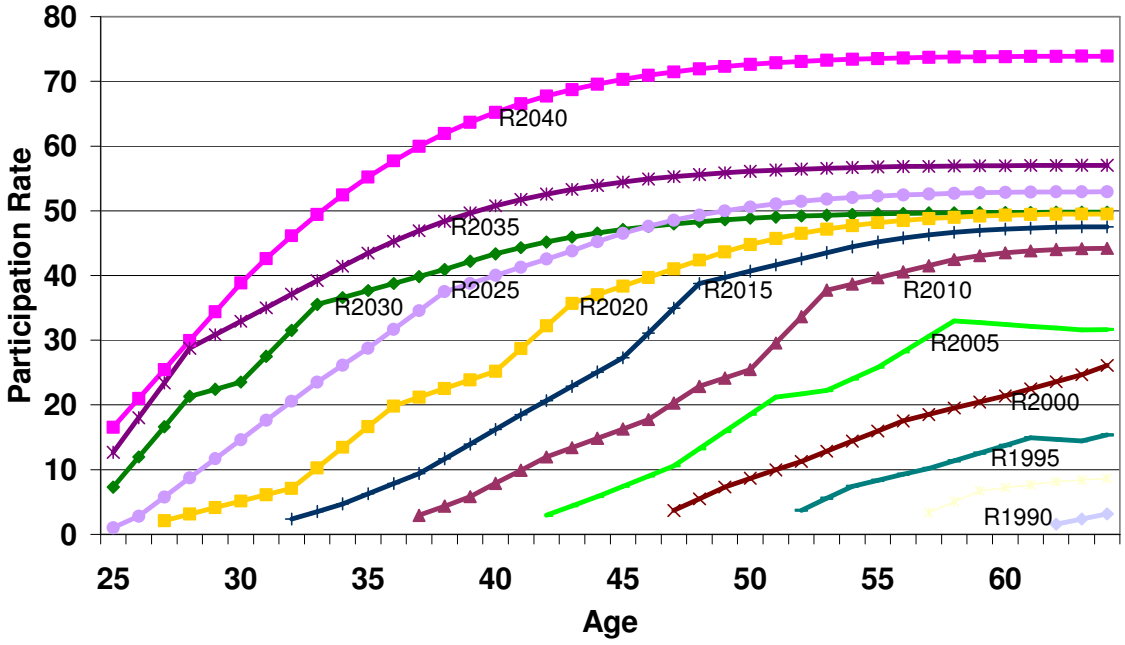


Figure 2-3 shows the projected average participation rates after 2003 for selected cohorts. The figure also shows the interpolated participation rates between the years for which data are available prior to 2003. There is a noticeable decline in the rate of growth of 401(k) participation between 1998 and

2003, the last two years for which SIPP data are available, for many of the cohorts shown in the figure. The figure shows projections for selected cohorts. The projection algorithm we use includes projections for all cohorts from C65 (R1984) through C9 (2040). The highest projected participation rate at age 65, 74 percent, is for the cohort that reaches that age in 2040. The average projected participation rate over all cohorts increases from almost 50 percent in 2006 to 61 percent in 2040. Participation rates also vary by the level of earnings, given age and cohort. In PVW (2007b), we develop projections that recognize this variation.

Figure 2-3. Interpolated (1982-2003) and projected (2004-2040) participation rates for selected cohorts



Rate of Return and Allocation: Our projections use actual annual pre-tax rates of return on stocks and bonds for all years prior to 2005. Beginning in 2006 we make projections based on two rate-of-return scenarios. Ibbotson Associates (2006) reports an arithmetic average real return of 9.2 percent for large company stocks, 14.3 percent for small company stocks and 3.1 percent for long-term corporate bonds over the period 1926-2005.

A number of previous studies of future accumulation in defined contribution accounts or individual account Social Security programs have assumed that on average, prospective equity returns will be somewhat lower than they have been historically. The President's Commission on to Strengthen Social Security (2001), for example, used equity returns below the historical average in its baseline projections. We recognize the possibility of that future equity returns will be lower than past returns by focusing first on projections that

set the average return on equities at 6.2 percent, 300 basis points below the historical value. We assume that the future average real return on corporate bonds will equal the historical mean return on this asset class.

For comparison we also show the results of projections that assume that the average future equity return equals the historical equity return. This implies a real return of 9.2 percent on equities and a real return of 3.2 percent on bonds. We also adopt the Social Security Administration intermediate assumption of 2.8 percent inflation; this implies an average nominal return of 6 percent for bonds.

In both return scenarios, we first calculate the pretax returns available on a portfolio with no pre-retirement cash-outs and no management fees. We then show results with cash-outs and then with cash-outs and management fees. No management fees would correspond roughly to a setting in which 401(k) investments are held in very low-cost index funds. To evaluate the effect of management fees on 401(k) asset accumulation, we also make projections that assume annual management fees of 70 basis points on both stock and bond funds. The cash-out projections are described in detail below.

The allocation of 401(k) assets between stocks and bonds has an important influence on long-term accumulation patterns. We assume that all participants allocate 60 percent of 401(k) contributions to large-capitalization equities and 40 percent to corporate bonds. The actual allocation may vary substantially depending on the investment options included in individual firm plans. Recent evidence suggests that this 60/40 split may be more conservative than actual choices. Fidelity Investments (2006) reports that in the years 2001 to 2005 between 68 and 77 percent of annual employee contributions to plans for which Fidelity Investments was the record-keeper were in equities and between 77 percent and 85 percent of employer contributions were to equities. Vanguard Group (2006) reports that in 2005 equities accounted for 72 percent of contributions to DC plans for which Vanguard was the record-keeper.

The initial asset allocation of contributions and subsequent rebalancing decisions affect 401(k) accumulation patterns. We begin by assuming that 401(k) participants do not rebalance their portfolios – an assumption that is supported by empirical evidence. Yamaguchi, Mitchell, Mottola, and Utkus (2007) analyze the trades of about one million Vanguard 401(k) participants between January 2003 and December 2004. They find that only 3.1 percent of trades represent active rebalancing, and that "most 401(k) plan participants are characterized by profound inertia, tending to buy and hold." Fidelity Investments (2006) finds “the large majority of participants choosing not to exchange assets in any given year. In 2005, 86% of participants did not make any exchanges; 8% made exchanges on only one day; and 2% made exchanges on four or more days. The consistency of these findings over time indicates that most participants have not rebalanced their accounts on a regular basis.” Ameriks and Zeldes (2004) find that 73 percent of persons in their TIAA-CREFF

sample made no change in asset allocation over the 10 year period studied and another 14 percent made only one change. They find no evidence of age-related reductions in equity exposure. Agnew, Balduzzi and Sunden (2003) analyze data for a single employer with 7,000 accounts between 1994 and 1998 and find that "on average over 87% of the participants make no trades during a year."

These studies suggest very little trading activity of any kind in 401(k) accounts. The frequency of rebalancing is likely to be even lower than the frequency of trading, because not all of the exchanges that are made are for the purpose of rebalancing. Some are triggered by changes in the menu of investment options offered by employers, and others may reflect return-chasing rather than rebalancing.

The absence of substantial rebalancing in many accounts was one of the motivations for the creation of life-cycle or "target retirement date" funds. These funds rebalance on behalf of investors by imposing a target equity exposure that is age-related. The share of the funds' assets in equities declines as the participant approaches retirement. The Investment Company Institute (2006) reports that in 2005, nearly 50 percent of 401(k) plans offered a lifecycle fund. Vanguard Group (2006) shows that in 2005, two thirds of the plans administered by Vanguard offered a life-cycle option. Moreover, 28 percent of 401(k) participants who were offered a life-cycle option used it. Overall, nine percent of DC assets administered by Vanguard were invested in life-cycle funds. The spread of life-cycle funds is likely to increase the frequency of rebalancing in the future. To help to understand how this will affect the accumulation of assets in 401(k) plans, we present some projections that assume 401(k) assets are invested exclusively in a life-cycle fund in which the percent of assets in equities at each age is equal to 100 - age. This formula approximates the equity exposure of the life cycle funds discussed in Poterba, Rauh, Venti, and Wise (2006).

Job Separation, Lump Sum Distributions, and Cashouts: At age 25 each person is assigned to a 401(k) job based on the participation probability for that person's age, cohort and earnings. In subsequent years each person either remains in the 401(k) job or leaves the 401(k) job. Table 2-1 shows job separation rates for five-year intervals estimated from the 1998 SIPP. Separation rates are allowed to vary by age, but not by time in job. Estimated annual rates range from a high of 23 percent for the youngest workers to 12.1 percent for workers age 50 to 54. After leaving a 401(k) job persons enter a pool of "non-participants." In each year members of this pool are selected for a new 401(k) job at a rate that makes the overall participation rate for persons of a particular age and cohort equal to the projected probability for that age and cohort. PVW (2001) describe a similar projection algorithm with an identical treatment of transitions into and out of 401(k) participation.

The probability that a 401(k) accumulation is cashed out is determined by the job separation rate, the probability that the employee takes a lump sum distribution (LSD), and the probability that a lump sum distribution is cashed out rather than rolled over into an IRA:

$$\Pr[cashout] = \Pr[\ job\ separation] * \Pr[LSD] * \Pr[LSD\ cashout]$$

Table 2-1 shows the probabilities associated with each of the components of the cash-out decision.

Table 2-1. Cashout: probability of job separation, probability of LSD conditional on job separation, and probability of cashout conditional on LSD

Probability of job separation*		Probability LSD | separation*	Probability cash out | LSD**	
Age	Percent	Percent	Size of distribution	Percent of dollars cashed-out
25 – 29	23.0	57	< $1,000	77.2
30 – 34	15.6	57	1,000-2,000	67.7
35 – 39	15.6	57	2,000-5,000	49.6
40 – 44	13.6	57	5,000-10,000	52.8
45 – 49	13.9	57	10,000-15,000	39.1
50 – 54	12.1	57	15,000-25,000	37.8
55 – 59	12.5	57	25,000-50,000	28.8
60 – 64	15.7	57	50,000-100,000	8.2
			> $100,000	10.2
All	15.1	57.0		27.2

*Authors' calculation based on SIPP data.
**From Hurd, Lilliard, and Panis (1998), based on HRS data.

When employees separate from a job they may choose to keep their accumulation with their old employer or to take a LSD. The SIPP provides information on the disposition of LSDs but it does not record information on situations in which a job changer chose not to take an LSD. This makes it impossible to use SIPP data to estimate the probability of a potential LSD given job separation. Instead, we use the average rate of 57 percent obtained by Hurd, Lilliard, and Panis (1998) from data in the Health and Retirement Study (HRS). On average, the probability that a dollar in a 401(k) account is cashed out in a given year is (.151) x (.570) x (.272) = 0.0234. The probability of course depends on a person's age and on the level of 401(k) assets. For someone between the ages of 60 and 64 with assets between $50,000 and $100,000, for example, the

probability is about 0.006 – well below the average across all potential cashouts. To make projections for future years, the cutoff points for potential LSDs in Table 2-1 are indexed to nominal wage growth, which is 3.9 percent per year in the Social Security Administration intermediate case.

The cash-out probabilities in our projections differ from the probabilities in PVW (2001), which averaged about 0.0108. The principle reason for the difference is a difference in job separation rates between that study and this one. In the earlier paper we used estimates based on retrospective information in the HRS, which yielded a separation rate of 0.048, well below the average rate of 0.151 based on the SIPP estimates or Stewart's [2002] estimate of nearly twenty percent from the Current Population Survey. In the earlier paper our average estimate of the (probability of a LSD) x (probability of cashout | LSD) was 0.226. The average of these two components here is smaller: (.570) x (.272) = 0.155.

Withdrawals: Our projections assume a very simple pattern of withdrawals from 401(k) accounts. Annual withdrawals are assumed to be two percent of balances between ages 65 and 70 ½. At older ages, the amount withdrawn from the 401(k) is (1/Remaining Life Expectancy) times the 401(k) balance. These withdrawal assumptions may overstate prospective withdrawals, and thereby understate asset balances at older ages. Bershadker and Smith (2006) report that over 50 percent of current IRA holders who are over 70 made not withdrawals before age 70. HRS data for 2004 suggest that the percent of IRA holders making withdrawals in the past year ranged from about 5 percent at age 55 to 30 percent at age 70. The percent of assets withdrawn, at all ages, was probably less than the rate of return. Love and Smith (2007) show that for a sample of HRS retired respondents, the income accruing to assets in tax-deferred retirement accounts exceeded withdrawals from these accounts, so account balances were rising during retirement. We assume withdrawal rates beginning at age 71 that are much higher than current required minimum withdrawals. For example, between ages 71 and 90 we assume withdrawal rates that rise from 6.13 percent to 18.18 percent. The required minimum distributions under current law are much lower, ranging from 3.77 to 8.77 percent over this age range.

Earnings: To estimate a cohort's 401(k) contributions, we need to determine the earnings and the contribution rates of cohort members. The key to developing an earnings history is access to a long time series of earnings by a single individual or a family. We use the HRS, which provides linked Social Security earnings histories for respondents who agreed to the link. These data represent earnings histories for a sample of individuals who were between the ages of 52 and 61 in 1992. We assume implicitly that the distribution of earnings histories that will be realized by younger cohorts will be similar to the distribution of earnings histories of the HRS respondents.

To develop earnings histories for younger cohorts we begin with the Social Security earnings histories of the HRS respondents, available for the years 1951 through 1991. We used a two-limit tobit specification, with a separate equation for each year, to impute earnings for individuals whose earnings were censored at the upper Social Security earnings limit. Earnings for 1992 through 2000 are obtained directly from HRS respondents. We begin with the earnings of the cohorts that attained age 65 in 1998, 1999, and 2000. We obtain lifetime earnings for all single persons that attained age 65 in these years and for all persons in two-person families in which the male partner attained age 65 in these years. The earnings of the 1998 cohort are “aged” two years and the earnings of the 1999 cohort are "aged" one year, based on the Social Security average wage index. We then treat these earnings histories as a random sample of the earnings of the cohort that attained age 65 in 2000 (the “R2000” cohort). The sample reports actual earnings histories, including years with zero earnings, so it recognizes that individuals may not be employed in some years. We implicitly assume that the employment rate and the distribution of employment by age are similar for future cohorts as for past ones. Note that the R2000 cohort contains some female spouses who were not 65 in 2000.

To project the earnings of younger cohorts, we inflate the R2000 sample using the intermediate earnings growth assumptions reported in the 2005 Annual report of the Board of Trustees of the Social Security Administration. Similarly, to project earnings for older cohorts we deflate the earning of the R2000 cohort based on the Social Security average wage index. This method holds fixed the relative earnings of high and low-wage persons.

Contribution Rate: We assume a contribution rate of 10 percent of earnings, including both the employee and the employer contributions. There are several sources of information on contribution rates. Data from the 2003 SIPP are shown by age interval in Table 2-4. The overall median of the total of employee and employer contributions is 9.8 percent. The employee and employer medians are 5.7 percent and 3.0 percent respectively. The overall mean is 12.6 percent. Reporting errors may affect the estimated mean. The finding that the mean contribution rate exceeds the median is one force that may lead our mean 401(k) balances to exceed the median for future cohorts of retirees.

Table 2-2. Employee and employer 401(k) contribution rates as a percent of earnings, for individuals, based on 2003 SIPP

Age	Employee		Employer		Total	
	Mean	Median	Mean	Median	Mean	Median
25 - 29	6.8	5.0	4.6	3.0	11.4	9.0
30 - 34	7.7	5.2	4.6	3.0	12.4	9.3
35 - 39	7.9	5.8	4.7	3.0	12.5	9.7
40 - 44	7.8	5.7	4.6	3.0	12.4	10.0
45 - 49	8.0	6.0	4.8	3.0	12.8	10.0
50 - 54	8.6	6.0	4.3	3.0	13.0	10.0
55 - 59	9.1	6.0	4.6	3.0	13.7	10.0
60 - 64	8.7	6.0	4.6	3.0	13.3	10.0
All	8.0	5.7	4.6	3.0	12.6	9.8

PVW (1998) analyze contribution rates in the 1993 Current Population Survey (CPS) and find an average employee contribution rate of 7.1 percent and an average employer rate of 3.1 percent. Holden and VanDerHei (2001) analyze the responses to an Employee Benefit Research Institute (EBRI)-Investment Company Institute (ICI) survey and report that in 1999 the average total contribution rate was 9.7 percent. The 1998 Form 5500 data show that about 32 percent of dollars are contributed by employers, which is roughly consistent with the 2003 SIPP median percent and with the 1993 CPS values. Engelhardt and Cunningham (2002) report that based on HRS data the average employee contribution rate was 6.6 percent in 1991, which is again generally consistent with the estimates based on SIPP and on CPS data.

For several reasons, the contribution rate in future years is uncertain. One is that legislation in the past several years has increased contribution limits substantially. Contribution limits are also linked prospectively to inflation, so the real value of the contribution limit will not be eroded as it has sometimes been in the past. The legislated increases in contribution limits for 401(k) and related plans are summarized in an appendix. Our projections assume that contributions as a percent of salary will be unaffected by the rising limits. In part, the effect of the limit increases depends on how many participants are constrained by the contribution limits now and whether fewer participants or more participants will be constrained by future limits. Holden and VanDerhei (2001) report that in 1999, 11 percent of participants with incomes over $40,000 contributed at the legislated maximum. Among those with incomes between $70,000 and $80,000, 13 percent were at the contribution limit. The analogous statistic was 18 percent at incomes between $80,000 and $90,000.

It is not clear how wage growth will interact with rising contribution limits to affect the proportion of persons at the limit. Even though the limits have increased and are now indexed to the CPI, wages are likely to increase faster than the CPI. The Social Security Administration assumes future wage growth of

3.9 percent and future inflation of 2.8 percent. The legislated maximum, however, may not be the effective limit for many employees. Holden and VanDerhei (2001) report that 52 percent of participants in 1999 faced employer imposed limits below the legislated maximum. We do not know how many participants are currently constrained by these limits, or how these limits may change in future years. Legislated increases in contribution limits may also affect participant decisions of how much "should" be saved for retirement, and government-set limits may serve to "frame" employee decisions. .

A second source of uncertainty arises from the recent enactment of the Pension Protection Act of 2006, which gives employers latitude to set more "saving friendly" defaults in 401(k) plans. Beshears, Choi, Laibson, and Madrian (forthcoming) survey some of the recent evidence on how changing defaults for enrollment, contribution rates, and asset allocation can significantly increase retirement saving through 401(k) plans. Our projections may underestimate future 401(k) assets if new default options are successful in raising participation and contributions. The U.S. Department of Labor Employee Benefits Security Association (2007) projects substantial positive effects of the 2006 legislation on both participation rates and contribution rates to 401(k) plans. In 2034, for example, the study projects between a $70 billion ($2006) and a $134 billion increase in 401(k) contributions.

3. Assets in 401(k) Plans at Retirement and Total Assets by Year

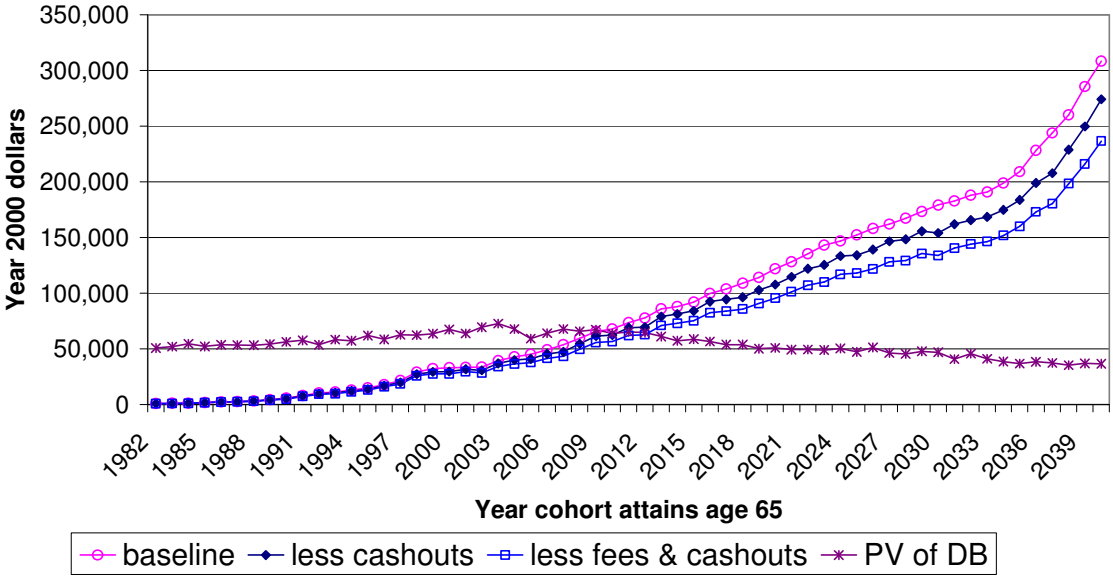
In this section we present projections of 401(k) assets at retirement by cohort and then consider the total value of assets in 401(k) plans by year.

401(k) Assets at Retirement: Figure 3-1 shows the average per person value of 401(k) assets at age 65 (in 2000 dollars). The average is across all members of the cohort, not just those with 401(k) accounts. There are four projections. The baseline is one that assumes that equity returns equal their historical values less 300 basis points. The second projection shows accumulated assets assuming cash-outs. The third shows accumulated assets assuming cash-outs as well as management fees of 70 basis points for investments in both stocks and bonds. Finally, the figure also shows the projected present value of DB assets at age 65, taken from PVW (2007a).

Without cash-outs or management fees, the projected average value of 401(k) assets at retirement, averaging across participants and non-participants, would increase from $33,045 in 2000 to $308,356 by 2040. The projected increase is due to the increase in the participation rates of younger cohorts and to the increase in the number of years that successively younger cohorts were able to accumulate 401(k) assets. The 401(k) program effectively began in 1982 so cohorts retiring before 2020 could only make contributions over part of their working lives. Persons who attained age 65 in 2000 could have contributed to a

401(k) plan for at most 18 years. For the cohort that will attain age 65 in 2040, 401(k) plans will have been available over the entire working life.

Figure 3-1. Average 401(k) assets and PV of DB assets at retirement (age 65), by year of retirement, all persons, assuming stock returns 300 basis points less than historical average



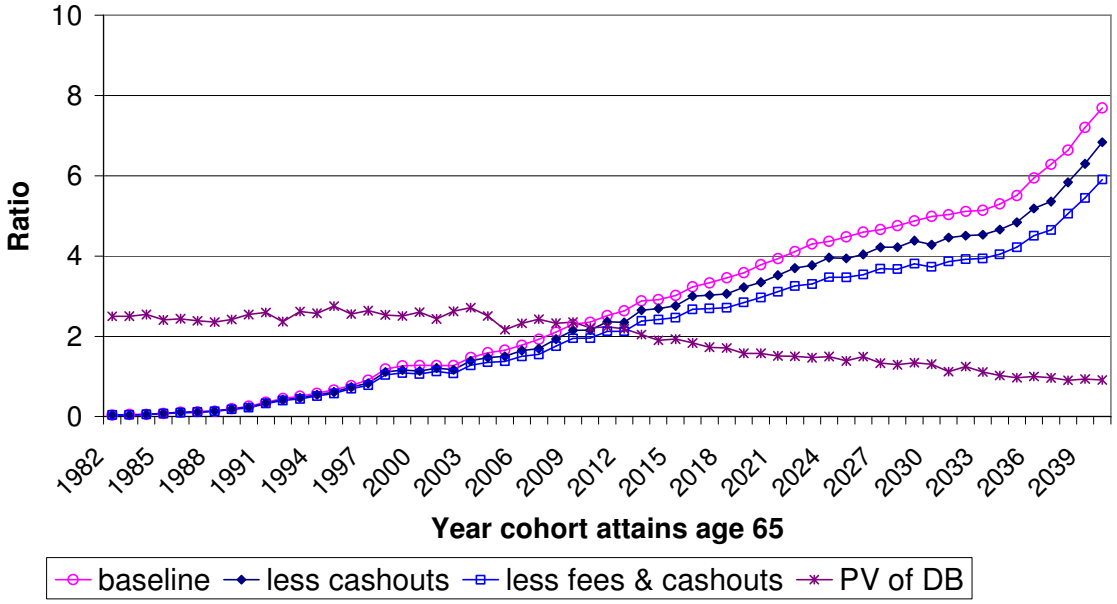
If the recent cash-out probabilities described above persist, they will reduce 401(k) assets at retirement by roughly 11 percent relative to the no-cash out baseline. The average value of 401(k) balances in 2040 in this case would be $274,091. With management fees of 70 basis points the accumulation would be further reduced to $236,664, 23.2 percent below the baseline. Management fees alone would reduce the accumulation by 13.9 percent. While management fees and leakage through cash-out of assets before retirement can reduce the accumulation of assets, a reduction in leakage or a reduction in management fees could correspondingly increase 401(k) accumulations.

For comparison, the average over all persons of the present value of DB benefits at age 65 reaches its maximum at about $73,000 in 2003. After that year, the average present value of benefits from DB plans declines. Between 2009 and 2012 projected assets in 401(k) plans become greater than the present value of DB benefits at age 65.

Figure 3-1 shows projected 401(k) assets at age 65 in year 2000 dollars. It is common to consider retirement assets relative to earnings while working. Figure 3-2 therefore shows the ratio of average 401(k) assets at age 65 to average earnings between ages 55 and 60 for persons attaining age 65 in each year. The figure also shows the ratio of average DB wealth to average earnings.

Assuming equity returns equal to historical values less 300 basis points, the ratio of 401(k) assets to earnings between 55 and 60 would grow from less than two today to 7.69. With cash-outs, the ratio would be reduced by 11.1 percent, to 6.84. With cash-outs and management fees of 70 basis points the ratio would be reduced to 5.91.

Figure 3-2. Ratio of 401(k) assets and PV of DB benefits to average earnings (ages 55 to 60), at retirement (age 65), by year of retirement, all persons, assuming stock returns 300 basis points less than historical average



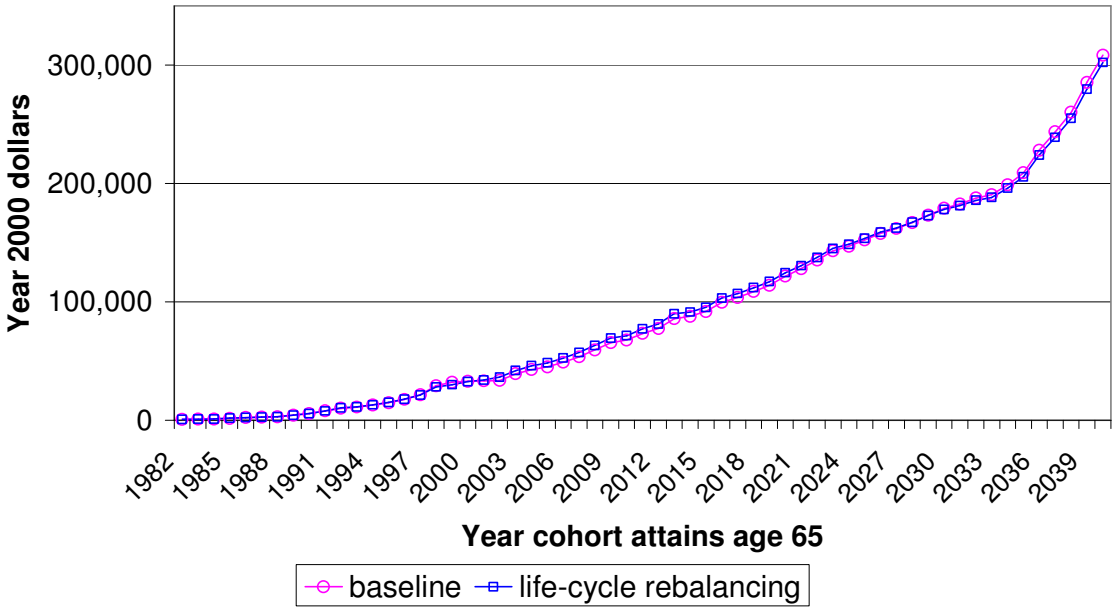
To place these ratios in context, Figure 3-2 also shows the present value of DB benefits divided by average earnings between ages 55 and 60. The maximum value for this ratio occurs in 1995 when it is 2.75. The ratio was 2.72 in 2003 when the PV of DB benefits reached its maximum. Thus even with cash-outs and management fees of 70 basis points, by 2040 the projected ratio of 401(k) assets to prior earnings will be more than twice as large as the historical maximum of the ratio of the present value of DB payouts to earnings.

The projections in Figures 3-1 and 3-2 assume that individuals do not rebalance their portfolios as they age. Thus by age 65, a large fraction of assets are held in equities. For individuals turning 65 in 2040, we project about 73 percent of assets will be in equities assuming historical returns less 300 basis points. While the assumption of little or no active rebalancing is consistent with the behavior of current 401(k) participants, the rise of lifecycle funds may lead to greater rebalancing in the future. To explore how life-cycle rebalancing could affect asset accumulation, we project the average 401(k) assets of persons at age 65 assuming historical rates of equity returns less 300 basis points and assuming all 401(k) assets are invested in a stylized life-cycle fund. Each person

is assumed to hold (110 – age) of their 401(k) balance in equities at each age. Thus a 25-year old will hold 85 percent in equities and someone aged 65 or older will hold 45 percent in equities. For those early in their careers, our stylized lifecycle fund as well as actual life-cycle funds offered by mutual fund providers allocates a larger share of assets to equity than the 60 percent equity allocation in our baseline projections.

Figure 3-3 shows projections with and without rebalancing. The baseline in this figure is projected assets at age 65, assuming historical returns less 300 basis points. The life cycle fund projection assumes that all 401(k) participants invest exclusively in the life-cycle fund. The life cycle allocation has very little effect on the accumulation of assets: assets at age 65 for those retiring in 2040 are only two percent lower than the base accumulation. This reflects the combination of greater equity exposure earlier in life, and less exposure later in life, in the lifecycle fund than in the "no rebalancing" scenario.

Figure 3-3. Average 401(k) assets at retirement (age 65) , by year of retirement, all persons, assuming stock returns 300 basis points less than historical average



Tables 3-1 and 3-2 present more detail on the asset accumulation profiles that are graphed in Figures 3-1 to 3-3. The tables show projections using historical equity returns less 300 basis points as well as projections assuming that historical equity returns continue into the future. Both tables show accumulation at 10-year intervals. Table 2-1 shows dollar values, while Table 2-2 shows the ratio of 401(k) assets to average earnings between ages 55 to 60. Both tables also show the percent reduction in assets associated with allowing cash-outs and management fees, and the effect of life cycle rebalancing. In

addition, Table 2-1 shows the present value of DB benefits and Table 2-2 shows the ratio of DB benefits to average earnings between 55 and 60.

Table 3-1. Simulated 401(k) balance at age 65 for selected years--in year 2000 dollars

Assumptions	Year 2000		2010		2020		2030		2040	
	balance	% decline	balance	% decline	balance	% decline	balance	% decline	balance	% decline
Equity returns historical less 300 basis points	33,045		67,839		121,873		179,110		308,356	
With cashouts	29,440	-10.9	62,294	-8.2	107,782	-11.6	153,909	-14.1	274,091	-11.1
With administrative costs of 70 basis points	30,772	-6.9	61,361	-9.5	107,376	-11.9	155,368	-13.3	265,542	-13.9
With cashouts and administrative costs of 70 basis points for both stocks and bonds	27,482	-16.8	56,457	-16.8	95,475	-21.7	133,920	-25.2	236,684	-23.2
Life-cycle rebalancing	32,785	-0.8	71,586	5.5	124,724	2.3	178,278	-0.5	302,229	-2.0
Equity returns historical	34,324		77,588		161,334		274,114		527,290	
With cashouts	30,560	-11.0	71,130	-8.3	142,041	-12.0	233,061	-15.0	462,117	-12.4
With administrative costs of 70 basis points	31,893	-7.1	70,039	-9.7	141,718	-12.2	236,223	-13.8	449,395	-14.8
With cashouts and administrative costs of 70 basis points for both stocks and bonds	28,466	-17.1	64,399	-17.0	125,271	-22.4	201,493	-26.5	395,035	-25.1
Life-cycle rebalancing	33,713	-1.8	78,760	1.5	152,705	-5.3	242,991	-11.4	445,311	-15.5
Present value of DB benefits	67,386		63,836		50,835		46,984		36,646	

Table 3-2. Ratio of 401(k) assets at age 65 to average earnings at ages 55-60

Assumptions	Year 2000		2010		2020		2030		2040	
	balance	% decline	balance	% decline	balance	% decline	balance	% decline	balance	% decline
Equity returns historical less 300 basis points	1.28		2.35		3.79		4.99		7.69	
With cashouts	1.14	-10.9	2.16	-8.1	3.35	-11.6	4.28	-14.2	6.84	-11.1
With administrative costs of 70 basis points	1.19	-7.0	2.13	-9.4	3.33	-12.1	4.33	-13.2	6.63	-13.8
With cashouts and administrative costs of 70 basis points for both stocks and bonds	1.06	-17.2	1.96	-16.6	2.97	-21.6	3.73	-25.3	5.91	-23.1
Life-cycle rebalancing	1.27	-0.8	2.48	5.5	3.87	2.1	4.96	-0.6	7.54	-2.0
Equity returns historical	1.33		2.69		5.01		7.63		13.16	
With cashouts	1.18	-11.3	2.46	-8.6	4.41	-12.0	6.49	-14.9	11.53	-12.4
With administrative costs of 70 basis points	1.23	-7.5	2.43	-9.7	4.40	-12.2	6.58	-13.8	11.21	-14.8
With cashouts and administrative costs of 70 basis points for both stocks and bonds	1.10	-17.3	2.23	-17.1	3.89	-22.4	5.61	-26.5	9.86	-25.1
Life-cycle rebalancing	1.30	-2.3	2.73	1.5	4.74	-5.4	6.76	-11.4	11.11	-15.6
Present value of DB benefits	2.60		2.21		1.58		1.31		0.91	

The tables, like the figures, show the important drag that management fees and leakage due to cash-outs place on the accumulation of 401(k) assets. The percent reduction in accumulation due to these factors is not very sensitive to our assumption about the level of equity returns. The effect of life cycle

rebalancing does depend on whether we use historical returns or historical returns reduced by 300 basis points. Shifting away from equities as the retirement age approaches, as lifecycle funds do, has a larger impact on average accumulation when the return on equities is higher.

Finally, to check our projection algorithm, we compared our estimates of the mean 401(k) assets of persons who attained age 65 in 2000 with the mean 401(k) assets of HRS respondents between the ages of 63 and 67 in 2000. The HRS mean is $25,892, while our projected mean is $29,708. However, the mean 401(k) balance in the HRS excludes assets that were accumulated in 401(k) plans but later rolled into IRAs; our projected 401(k) balance includes amounts that were rolled over into an IRA. A large fraction of assets in IRAs are rollovers from 401(k) plans, and today many new retirees roll over 401(k) assets into an IRA. Holden, Ireland, Leonard-Chambers, and Bogdan (2005) report that 89 percent of flows into IRAs in 1996 were rollovers. The percentages for the next four years were 89, 93, 95, and 96, respectively. Given the importance of roll-overs, our projection seems plausible relative to the HRS mean. Determining the significance of pension plan-to-IRA rollovers is a key issue in evaluating statistics on average retirement plan balances for recent retirees, such as those in Munnell and Sunden (2006).

Total 401(k) Assets by Year: The total value of assets in 401(k) plans will increase substantially over the next three decades. To place the increase in a broader economic context, Figures 3-4 and 3-5 show the total value of 401(k) assets as a proportion of the Social Security Administration intermediate projections of future GDP. The figures also show the projected value of assets held by DB plans, from PVW (2007a), relative to GDP projections. The rise in 401(k) saving and the decline in DB pension savings means that 401(k) pensions will dominate the pension landscape in the future. Figure 3-4 shows that total 401(k) assets grew from essentially zero in 1982 to about 37 percent of GDP in 2005. Our projections indicate that 401(k) assets will continue to increase after 2005, reaching 87 percent of GDP in 2040 assuming historical equity returns less 300 basis points. Total pension assets, including both 401(k) and DB assets grow to about 110 percent of GDP in 2040. Again, for comparison, Figure 3-5 shows the projection of total assets if historical returns were to continue in the future. Under this scenario, 401(k) assets would grow from about 37 percent of GDP in 2005 to 138 percent of GDP by 2040. Total pension assets, both 401(k) and DB assets, would grow to 161 percent of GDP.

Figure 3-4. Ratio of projected 401(k) and DB assets to projected GDP by year (historical returns less 300bp)

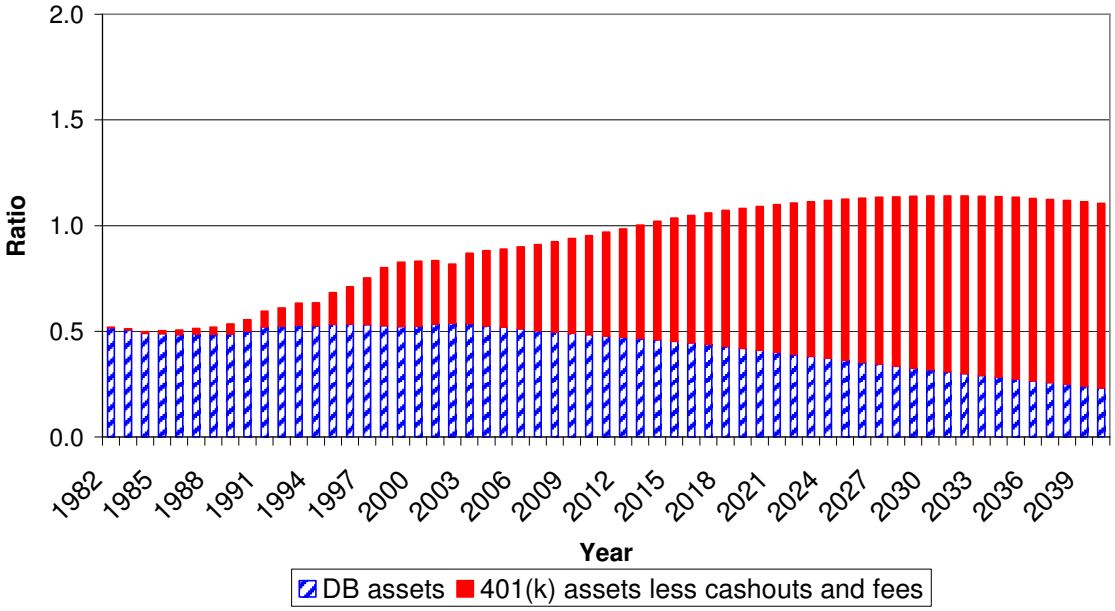
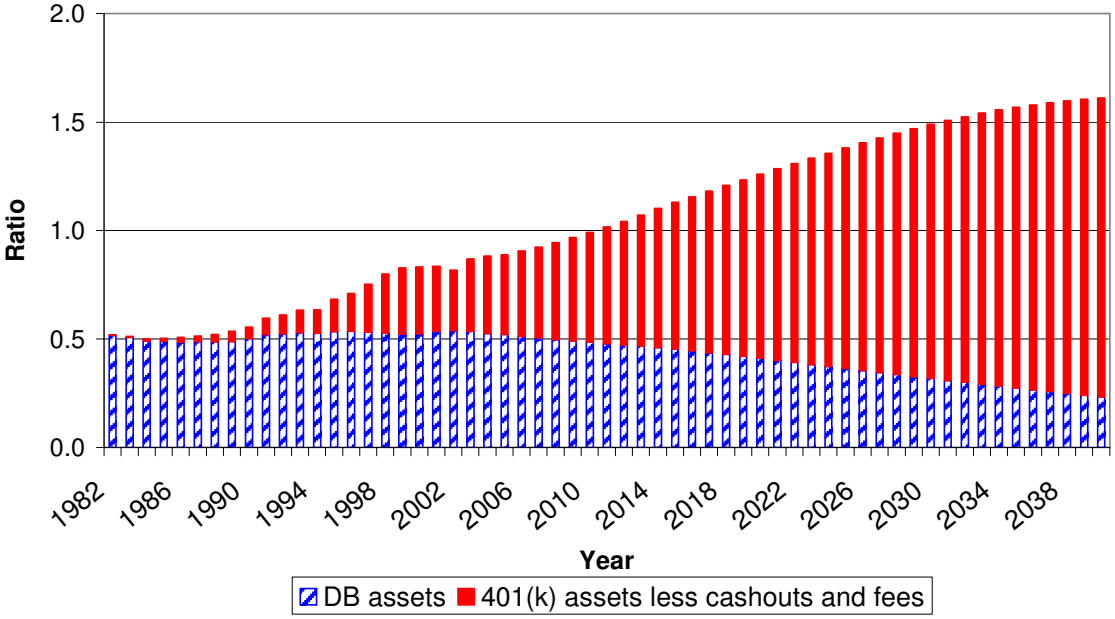


Figure 3-5. Ratio of projected 401(k) and DB assets to projected GDP by year (historical equity returns)



4. Summary and Discussion

Over the past two and a half decades there has been a fundamental change in saving for retirement in the United States. There has been a rapid shift from saving through employer-managed defined benefit pensions to saving through defined contribution retirement saving plans that are largely controlled by employees. To understand how this change will affect the well-being of future retirees, we project the future growth of assets in self-directed personal retirement plans.

Our projections rely on many assumptions. We assume that 401(k) participation rates will grow in the future but at a much slower rate than in the past. Realized future participation rates could be lower than our projections but could also be much higher, as some legislative proposals have called for policies that would increase 401(k) participation and in some cases make it universal. Recent legislation has also made it much easier for employees in small firms to contribute to a personal account by payroll deduction, which may also increase participation. We assume a contribution rate that is consistent with recent employee and employer rates. It is difficult to judge whether this rate is likely to increase or decrease in the future. The uncertainty stems from uncertainty about the effect of future contribution limit increases, the effect of the increasing use of default options, and the effect of recent legislation. We assume that current patterns of withdrawal from retirement saving plans will persist, but some recent evidence on withdrawals from IRAs suggests that we may overstate withdrawal behavior. We also project asset accumulation assuming management fees of 70 basis points for both bond and stock investments.

Assumptions about the rate of return on equities have an important effect on the projected accumulation of 401(k) assets. We emphasize results assuming that future equity returns will be 300 basis points less than historical returns. For comparison, we also show results assuming that historical equity returns continue into the future. We consider scenarios in which 60 percent of contributions are in equities and 40 percent in bonds, with no rebalancing, as well as one with all 401(k) assets rebalanced in line with typical life-cycle funds. Our focus on average values in our projections should not obscure the substantial uncertainty of future 401(k) balances. Given the uncertainty of future asset returns, the potential dispersion of projected future retirement balances is large.

Our projections indicate that the 401(k) assets of persons who attain age 65 in 2040 will be much greater than the 401(k) assets of persons who attained age 65 in 2000. Assuming the historical rate of return on equities less 300 basis points, accounting for cash-outs, and assuming management fees of 70 basis points on both equities and bonds, the average 401(k) balance increases from $27,482 in 2000 to $236,684 by 2040. There are three principal reasons for the growth of average 401(k) assets. First, the 401(k) system was not fully mature in 2000. Retirees in 2000 could have contributed to a 401(k) plan for at most 18

years and on average participants had contributed just over seven. Beginning in about 2020 retirees working for employers offering a 401(k) will have been able to contribute for their entire working lives. Second, we project continued growth of 401(k) coverage, albeit at a considerably slower rate than in the recent past, as 401(k) plans continue to spread to smaller firms in the private sector, as well as to employers in the public sector. Third, future retirees will benefit from real wage growth, assumed to be 1.1 percent per year in our projections. The increase in the ratio of 401(k) balances at retirement to pre-retirement earnings is smaller than the increase in real 401(k) assets.

Our projections imply that the ratio of 401(k) assets to average earnings between 55 and 60 would rise to about six by 2040 if future equity returns were 300 basis points less than historical returns. The implication of such increased can be judged by recalling that for years after 2012, projected assets in 401(k) plans at age 65 exceeded the maximum level of assets ever attained in DB plans. In 2012, the ratio of 401(k) assets to earnings is projected to be about 2.5. Thus our projections suggest that on average future retirement assets relative to earnings will substantially exceed current levels.

The projections highlight the important drag on asset accumulation due to pre-retirement cash-outs of assets and management fees. Together they reduce by about 23 percent the 401(k) accumulation at retirement for those who turn 65 in 2040. A reduction in either could increase accumulation substantially. Purcell (2007) illustrates a similar point.

An important feature of the asset allocation of current 401(k) participants is the virtual absence of active rebalancing. Life cycle funds were developed, in part, to assist participants to rebalance by reducing the fraction of assets in equities and increasing the fraction in bonds as participants approach retirement. These funds have been growing rapidly and by 2005 nearly 50 percent of 401(k) plans offered one. The availability of life-cycle funds is expected to increase further following passage of the Pension Protection Act of 2006, as employers are encouraged to use life-cycle funds as investment default options. The projections summarized above assume no rebalancing and thus the projected fraction of assets in equities at retirement is large. To understand how assets at retirement would be affected by rebalancing, we also projected accumulations assuming that 100 percent of contributions were invested in a life-cycle fund. Assuming historical equity returns less 300 basis points, there is little difference between accumulation under life cycle rebalancing and the accumulation assuming contributions of 60 percent equities and 40 percent bonds. The reduction with rebalancing is greater when historical equity returns are assumed, about 16 percent.

To place the growth of 401(k) assets in a broader economic context, we also calculated the total value of 401(k) assets as a proportion of the Social Security Administration intermediate projections of future GDP (in year 2000

dollars). Total 401(k) assets grow from essentially zero percent of GDP in 1982 to about 38 percent of GDP in 2005. Our projections indicate that 401(k) assets continue to increase after 2005, reaching 87 percent of GDP in 2040 assuming historical equity returns less 300 basis points. In addition, we find that the decline in DB pension assets is far outweighed by the increase in 401(k) assets. Total pension assets, including both DB and 401(k) plans, grow from about 52 percent of GDP in 1982 to 110 percent of GDP in 2040 assuming equity returns are 300 basis points below their historical average.

Our focus on the average level of 401(k) wealth at retirement and on the aggregate amount of retirement wealth accumulation is natural when considering how changing demographics and pension structure may affect the aggregate economy, but it can conceal important heterogeneity in the retirement circumstances of different households. In PVW (2007b), we consider the average growth of 401(k) assets across the range of possible lifetime earnings trajectories. In particular, we emphasize the growth of the sum of Social Security wealth plus 401(k) assets for families in each decile of the Social Security wealth distribution. Our projections show a substantial increase between 2000 and 2040 in the sum of these retirement assets in each wealth decile. There is however substantial heterogeneity in the accumulation of 401(k) assets within deciles, with some households substantially greater than our projected means and others with no 401(k) assets.

References

Agnew, Julie, Pierluigi Balduzzi, and Annika Sunden. 2003, "Portfolio Choice, Trading, and Returns in a Large 401(k) Plan," American Economic Review 93, 193-215.

*Ameriks, John and Stephen Zeldes. 2004. "How Do Household Portfolio Shares Vary with Age?" Mimeo, Columbia University, Graduate School of Business.

Bershadker, Andrew and Paul Smith. 2006. "Cracking open the Nest Egg: IRA Withdrawals and Retirement Finance." In Proceedings of the 98th Annual Conference of the National Tax Association (Washington: National Tax Association).

Beshears, John, James Choi, David Liabson, and Brigitte Madrian, forthcoming, "The Importance of Default Options for Retirement Savings Outcomes: Evidence from the United States," in S. Kay and T. Sinha, eds., Lessons from Pension Reform in the Americas (Oxford: Oxford University Press).

Congressional Budget Office. 2004a. Tax-Deferred Retirement Savings in Long-Term Revenue Projections. Washington: Congressional Budget Office.

Congressional Budget Office. 2004b. "A Model to Project Flows Into and Out of Tax-Deferred Retirement Saving Accounts." CBO Technical Paper 2004-15.

Dushi, Irena, and Marjorie Honig, 2007, "Are 401(k) Saving Rates Changing? Cohort/Period Evidence from the Health and Retirement Survey," Working Paper 2007-160, University of Michigan Retirement Research Center.

Engelhardt, Gary and Christopher Cunningham, 2002, "Federal Tax Policy, Employer Matching, and 401(k) Saving: Evidence from HRS W-2 Records," National Tax Journal 55, 617-645.

Fidelity Investments. 2006.Building Futures: Volume VI. (Boston: Fidelity Investments).

Holden, Sarah, Kathy Ireland, Vicky Leonard-Chambers, and Michael Bogdan, 2005, "The Individual Retirement Account at Age 30: A Retrospective," Investment Company Institute Research Perspective, 11 (2, February).

Holden, Sarah and Jack VanDerhei. 2001. "Contribution Behavior of 401(k) Plan Participants," EBRI Issue Brief Number 238.

Holden, Sarah and Jack VanDerhei. 2002a. "Can 401(k) Accumulations Generate Significant Income for Future Retirees?" Investment Company Institute Perspective 8 (3, November).

Holden, Sarah and Jack VanDerhei. 2002b. "Appendix: EBRI/ICI 401(k) Accumulation Projection Model" Investment Company Institute Perspective 8 (3a, November).

Holden, Sarah and Jack VanDerhei. 2006. "The Role of 401(k) Accumulations in Providing Future Retirement Income," in D. Blitzstein, O. Mitchell, and S. Utkus, eds., Restructuring Retirement Risks (Oxford: Oxford University Press), 37-51.

Hurd, Michael, Lee Lillard, and Constantijn Panis, 1998, "An Analysis of the Choice to Cash Out Pension Rights at Job Change or Retirement," RAND Working Paper 1979-DOL. RAND Corporation: Santa Monica, CA.

Ibbotson Associates. 2006. 2006 Yearbook. (Chicago: Ibbotson Associates).

Investment Company Institute. 2006. "401(k) Plans: A 25 Year Retrospective," Investment Company Institute Research Perspective, 12 (2, November).

Love, David and Paul Smith. 2007. "Measuring Dissaving out of Retirement Wealth." Mimeo, Department of Economics, Williams College.

Munnell, Alicia H. and Annika Sunden, 2006, "401(k) Plans are Still Coming Up Short," Issue Brief 43 (Boston: Boston College Center for Retirement Research).

Poterba, James, Joshua Rauh, Steven Venti, and David Wise. 2006. "Lifecycle Asset Allocation Strategies and the Distribution of 401(k) Retirement Wealth," forthcoming in D. Wise, ed., Developments in the Economics of Aging (Chicago: University of Chicago Press). (NBER Working Paper 11974)

Poterba, James, Steven Venti, and David A. Wise, 1998, "Implications of Rising Personal Retirement Saving," In D.A. Wise, (ed.), Frontiers in the Economics of Aging (Chicago: University of Chicago Press).

Poterba, James, Steven Venti, and David A. Wise, 2001, "Preretirement Cashouts and Foregone Retirement Saving: Implications for 401(k) Asset Accumuluation," In D.A. Wise, (ed.), Themes in the Economics of Aging (Chicago: University of Chicago Press).

Poterba, James, Steven Venti, and David A. Wise, 2004, "The Transition to Personal Accounts and Increasing Retirement Wealth: Macro and Micro

Evidence," In D.A. Wise, (ed.), Perspectives on the Economics of Aging (Chicago: University of Chicago Press).

Poterba, James, Steven F. Venti, and David A. Wise, (2007a) "The Decline of Defined Benefit Retirement Plans and Asset Flows." NBER Working Paper #12834.

Poterba, James, Steven F. Venti, and David A. Wise, (2007b), "The Rise of 401(k) Plans, Lifetime Earnings, and Wealth at Retirement." NBER Working Paper 13091.

President's Commission to Strengthen Social Security (2001). Strengthening Social Security and Creating Pesonal Wealth for All Americans. Washington: President's Commission to Strengthen Social Security.

Purcell, Patrick (2007). "Retirement Saving Accounts: Fees, Expenses, and Account Balances," Congressional Research Service, Washington D.C.

Stewart, Jay, 2002, "Recent trends in Job Stability and Job Security: Evidence from the March CPS," U.S. Department of Labor, Office of Employment and Unemployment Statistics, Working Paper No. 356.

U.S. Department of Labor, Employee Benefits Security Administration, 2007. Regulation Relating to Qualified Default Investment Alternatives in Participant-Directed Individual Account Plans. Washington: U.S. Department of Labor.

Vanguard Group, 2006, How America Saves 2006 (Malvern, PA: Vanguard Group).

Yamaguchi, Takeshi, Olivia Mitchell, Gary Mottola, and Steven Utkus. 2007. "Winners and Losers: 401(k) Trading and Portfolio Performance," Michigan Retirement research Center Working Paper 2007-154.

Appendix: Tax Legislation and Retirement Saving Options: 401(k) and Other Personal Retirement Accounts

Broad access to personal retirement accounts began in 1982. More recent legislation has aimed to further increase personal retirement saving. In particular, both the Taxpayer Relief Act of 1997 and the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA) included provisions that were designed to induce more retirement saving, principally through tax-deferred personal retirement accounts. These bills established Roth IRAs and increased contribution limits to traditional IRAs, 401(k) plans, and other personal accounts. EGTRRA also introduced tax credits for low-income taxpayers who make contributions to IRAs, Roth IRAs, 401(k) plans, and other personal accounts. We describe here some of the more important recent changes to the IRA and 401(k) programs.

Contribution Limits for 401(k) Plans: In 2001 there were three restrictions on the amount that could be contributed to a 401(k) plan: (1) a $10,500 dollar limit on the employee's annual contribution, (2) a $35,000 limit on combined employee and employer contributions, and (3) combined employee and employer contributions were limited to 25 percent of total compensation. By 2006, the annual limit on the employee's contribution had increased to $15,000, the combined dollar limit had increased to $40,000, and the percentage limit had increased to 100 percent of compensation. Both of the dollar limits will be indexed to the CPI beginning in 2007.

Catch-up Contributions to 401(k) Plans: The 2001 legislation also contains a catch-up provision for participants age 50 or older. The allowable catch-up contribution was $1,000 for 2002, and the allowable amount increased in steps to $5,000 in 2007. After 2007, the catch-up contribution for 401(k) is indexed to inflation.

Contribution Limits for Traditional IRAs: Contribution limits to a traditional IRA were originally set in 1981 at $2,000 per working spouse and $250 for a nonworking spouse. A provision in the Small Business Job Protection Act of 1996 raised the deduction available to a non-working spouse from $250 to $2,000 effective in 1997, thus increasing the combined deduction for a family with a non-working spouse from $2,250 to $4,000. The limits have since been raised to $4,000 per person in 2006. The dollar limit will be indexed to the CPI beginning in 2007. The tax-deductibility of the traditional IRA is phased out for persons covered by an employer pension with incomes in excess of $50,000 for single persons and $75,000 for married persons in 2006.

Roth IRA: The Roth “back-loaded” IRA was introduced in 1997. Contributions to the Roth IRA are not tax deductible, but no tax is paid upon withdrawal if the funds are held for at least five years and if the recipient is over age 59½. Like the “front-loaded” (traditional) IRA, the investment return in a Roth

IRA accrues tax-free. Contribution limits and allowances for penalty-free withdrawals are the same as for the traditional IRA. However, the Roth IRA contribution limit is specified in after-tax dollars whereas the traditional IRA limit is in pre-tax dollars. This means that the potential accumulation of retirement saving is higher under the Roth IRA. In addition, the income at which eligibility begins to be phased-out is much higher for the Roth IRA ($95-110,000 for single persons and $150-160,000 for married couples) than for the traditional IRA.

Catch-up Contributions for Traditional and Roth IRAs: The catch-up provision in the 2001 legislation allowed persons age 50 or older to contribute an extra $500 per year between 2002 and 2005 and an extra $1000 per year beginning in 2006. The catch-up contribution amount for IRAs is not indexed to inflation.

Saver's Tax Credit: Beginning in 2002 and continuing until the end of 2006, taxpayers who make contributions to personal retirement saving plans—401(k), 403(b), 457(b), traditional or Roth IRAs, and other plans—may receive a tax credit of up to 50 percent on the first $2,000 contributed. Eligibility for the deduction is determined by income. For joint tax filers, the deduction is 50 percent for those with incomes less than $30,000 and is phased out at $50,000. For single tax filers the deduction is 50 percent for those with incomes less than $15,000 and is phased out at $25,000.