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

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Abstract: Over the past two and a half decades there has been a fundamental change in saving for retirement in the United States, with a rapid shift from employer-managed defined benefit pensions to defined contribution 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. We project the 401(k) assets at age 65 for cohorts attaining age 65 between 2000 and 2040. We also project the total value of assets in 401(k) accounts in each year through 2040 and we project the value of 401(k) assets as a percent of GDP over this period. We conclude that cohorts that attain age 65 in future decades will have accumulated much greater retirement saving (in real dollars) than the retirement saving of current retirees.

Over the past two and a half decades there has been a fundamental change in saving for retirement in the United States, with a rapid shift from saving through employer-managed defined benefit pensions to defined contribution retirement saving plans that are largely controlled by employees. In 1980, 92 percent of private retirement saving contributions 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. Following the 2000 stock market decline, this proportion declined somewhat as employers made "catch-up" contributions to under-funded DB plans.

In this paper we consider how the change in the way people save for retirement will affect the well-being of future retires. We project the future growth of assets in self-directed personal retirement plans. The most important of the large number of personal retirement plans is the 401(k). We consider not only 401(k) plans *per se* but 403(b), section 457, and related tax-deferred retirement saving plans, as well as traditional defined contribution plans. We refer to all of these plans collectively as "401(k)" or as "401(k)-type" plans. In a companion paper, Poterba, Venti and Wise (2007a), we consider the future decline of assets in defined benefit plans.

Our analysis is based on cohort data on individual 401(k) participation rates. We use these data as a foundation from which to project 401(k) participation rates and asset accumulation in the future. These projections are combined 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. And we project the accumulated 401(k) assets at age 65 for all cohorts attaining age 65 between 2006 and 2040

Other studies have also based projections on individual data. Holden and VanDerhei (2002a, 2002b) project the evolution of the proportion of pre-retirement income that will be replaced by 401(k) asset accumulations. The studies simulate 401(k) assets by projecting the future accumulation of assets held in 2000. Because their sample consists only of plan participants, their projections do not consider the future increase in 401(k) participation rates and do not consider future demographic trends. Two studies by the Congressional Budget Office (2004a, 2004b) develop a framework to project asset flows into and out of defined benefit (DB), defined contribution (DC), and IRA plans. These analyses are based primarily on the 1997 Information Returns Master file from the IRS, supplemented with data from the Survey of Consumer Finances, Form 5500 data, and other sources. The studies project DC balances by assuming that future participation and contribution rates will equal the age-specific rates observed in 1997. These studies also do not consider the future spread of

401(k) plans or the effects of demographic trends on the accumulation in personal retirement plans.

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, as well as withdrawal patterns once 401(k) participants reach retirement. In section 3 we present projections of 401(k) assets at retirement (age 65) for each cohort that retires between now and 2040. In addition we project the total value of assets in 401(k) plans by year, through 2040. We also compare projected assets in 401(k) plans with the declining benefits from DB plans. In section four, we summarize our results and discuss the implications of the findings.

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

We use data from the Survey of Income and Program Participation (SIPP) to track the spread of 401(k) plans over the past two decades 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 SIPP survey is a random cross-section sample of the population. The cross-section data from the SIPP surveys can be used to create "synthetic" cohorts. For example, to construct cohort data for the cohort that was age 25 in 1984 we use the 1984 panel to obtain data for persons 25 in that year, 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 the age of the cohort in 1984 and sometimes by the year in which the cohort attains age 65. For example, the cohort that is age 25 in 1984 attains age 65 in 2024 and is referred to as the C25 or the R2024 cohort.

The unit of observation in the SIPP is the individual and most of our calculations are performed at the level of 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. Eligibility data for 9 cohorts
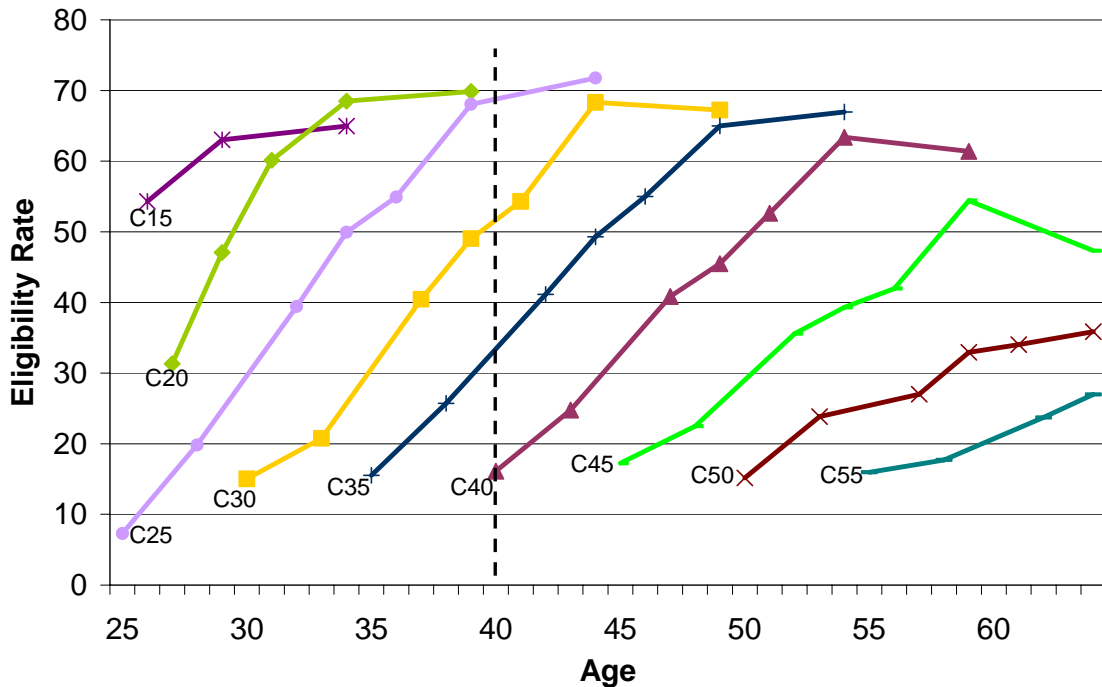
We first consider data on family eligibility, organized by cohort. The SIPP provides some data for 54 cohorts. Figure 1-1a shows these data for 9 cohorts, five years apart, denoted by the age of the cohort in 1984. Consider cohort C25 that was 25 years old in 1984. In 1984, about 7 percent of the C25 cohort families were eligible for a 401(k) plan. By 1987, the percent of this cohort that was eligible for a 401(k) plan had risen to about 20 percent. By 2003 this cohort is over 40 years old and 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. Cohort C40 was 40 years old in 1984 and about 16 percent of the C40 cohort was eligible for a 401(k) at age 40. Cohort C35 attained age 40 in 1989 and about 34 percent of the C35 cohort was eligible for a 401(k) plan at age 40. The C25 cohort was age 40 in 1999 and almost 70 percent of the C25 cohort was eligible for a 401(k) plan at age 40. Similar increases in eligibility are evident at other ages.

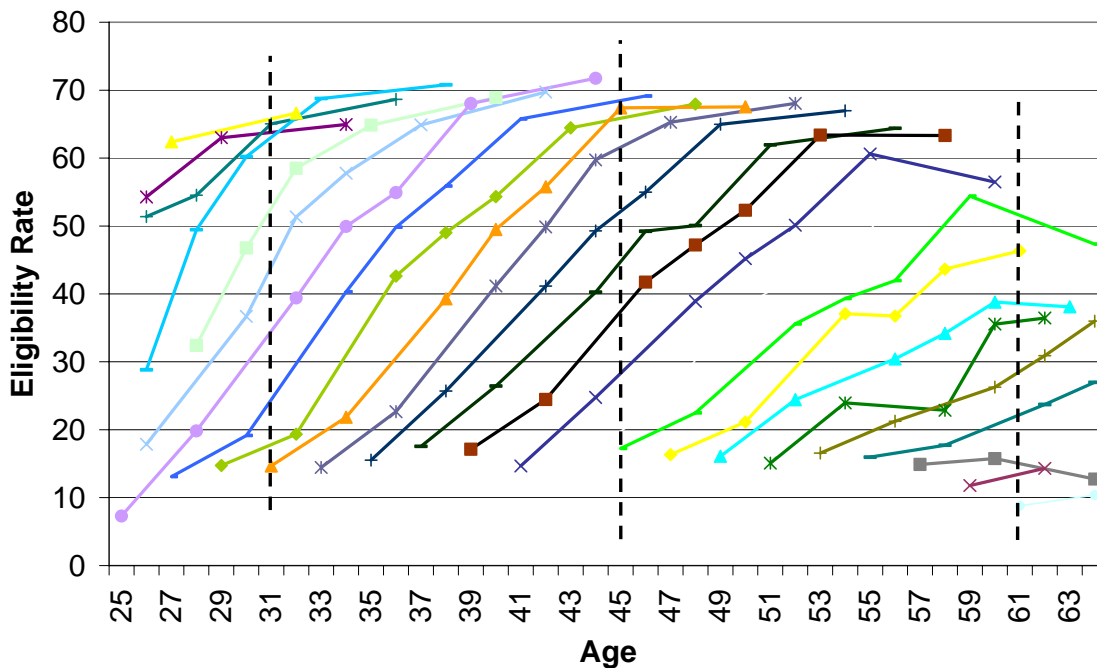**Figure 1-1b. Eligibility data for every other cohort**

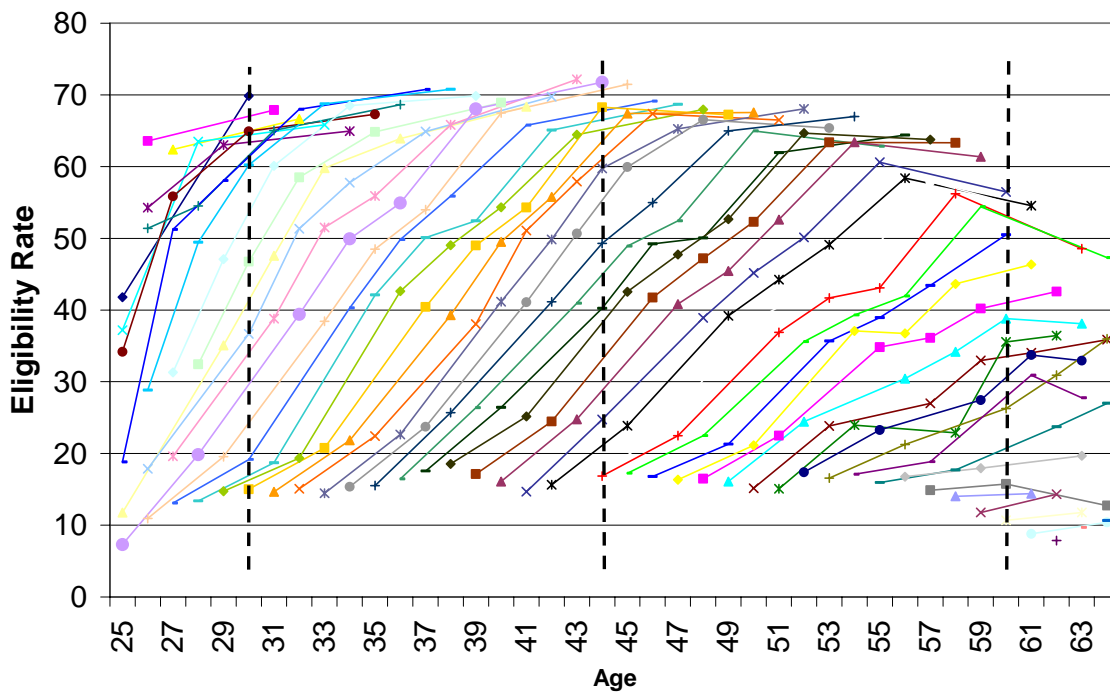**Figure 1-1c. Eligibility data for all cohorts**

Figure 1-1b shows eligibility data for every other cohort for which data can be obtained from the SIPP. Figure 1-1c shows data for every cohort, from C11 to C64. The youngest cohorts are shown in the upper left of the figure and the oldest are shown in the upper right.[1] Again, the dashed vertical lines highlight increases in eligibility for cohorts that reached given ages in successively later years. In Figure 1-1b, it is clear that with few exceptions cohorts that reached a given age in successively later years had successively higher 401(k) eligibility rates. The same pattern is shown in Figure 1-1c, with surprisingly few "cross-overs" in the individual cohort trends even though in this figure each successively younger cohort, from bottom-right to top-left in the figure, is only one year younger than the prior cohort.

The increase in eligibility rates reflects the spread of 401(k) plans to more firms and especially to smaller employers. As described in Poterba, Venti, and Wise (2004), for example, a large fraction of employers who first adopted 401(k) plans in the early and mid-1980s also offered DB plans; few of these employers discontinued the 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, 1-2b, and 1-2c. As in the eligibility Figures 1-1a, 1-1b, and 1-1c, 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 age 40 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. More detail is shown in Figures 1-2b and 2c. Figure 1-2b shows participation rates for every other cohort and Figure 1-2c shows participation rates for each of the cohorts for which data are available in the SIPP.

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[1] Data on 401(k) eligibility are not available for persons under the age of 25 in the SIPP. The C11 cohort in Figure 1c 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 are thus observed only once (in 2003). These cohorts are not shown in the figure.

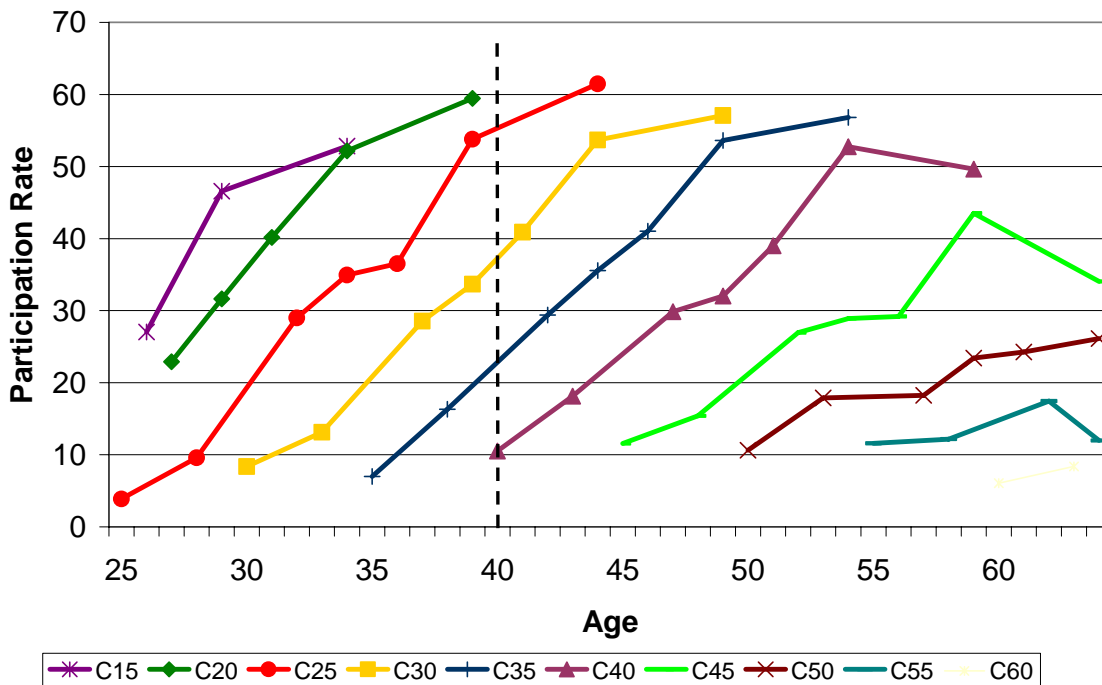**Figure 1-2a. Participation data for 9 cohorts**

Legend: C15 C20 C25 C30 C35 C40 C45 C50 C55 C60

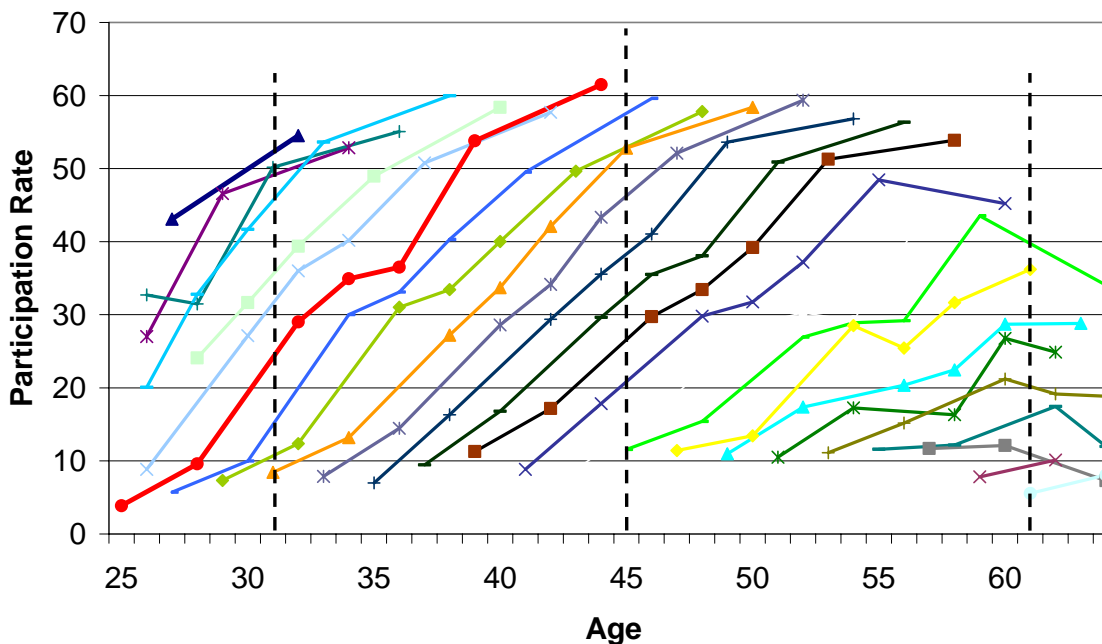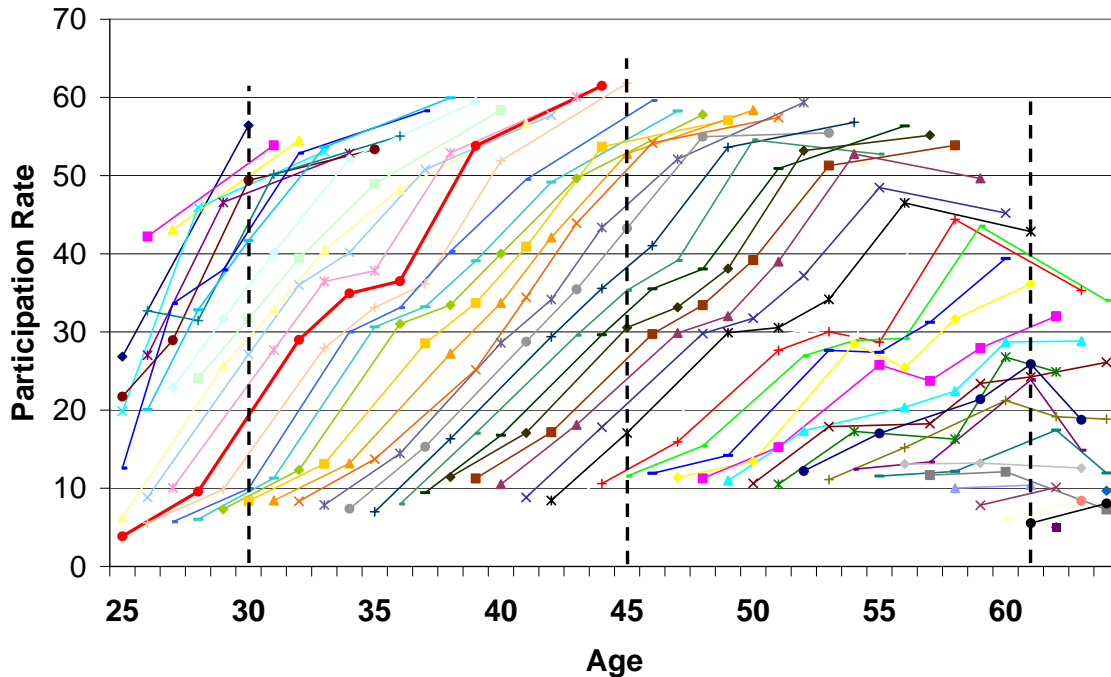**Figure 1-2b. Participation data for every other cohort**

**Figure 1-2c. Participation data for all cohorts**

The cohort figures show a very large increase in 401(k) eligibility and participation rates between 1984 and 2003. In particular, cohorts that reached a given age in successively later years had successively higher eligibility and participation rates. The increase in eligibility and participation rates at selected ages between 1984 and 2003 is summarized in Table 1-1. The table shows the eligibility rate and the participation rate for cohorts in the age intervals 30-34, 45-49 and 60-64 in 1984 and 2003. While only 14.8 percent of the cohort age 30-34 in 1984 was eligible for a 401(k) plan, 66.8 percent of the cohort that attained age 30-34 in 2003 was eligible. Only 8.2 percent of the cohort that attained age 30-34 in 1984 participated in a 401(k) plan, but 53.9 percent of the cohort that attained this age by 2003 participated.

The table also shows the percent of those eligible who participated in 1984 and 2003. For each age, the participation rate given eligibility increased very 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 also participated. Of 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. Family eligibility and participation rates by year attained selected ages (in percent)			
Eligibiliy /		Age	
Participation	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

More detail on participation given eligibility is shown in Figure 1-3. The figure shows that, given eligibility, the participation rate increased between 1984 and 2003 for all age groups, especially for younger age groups. The figure also shows that 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. The data also suggest that participation rates given eligibility are higher for younger cohorts.

Figure 1-3. Participaton percent given eligibility by age, 1984 and 2003.
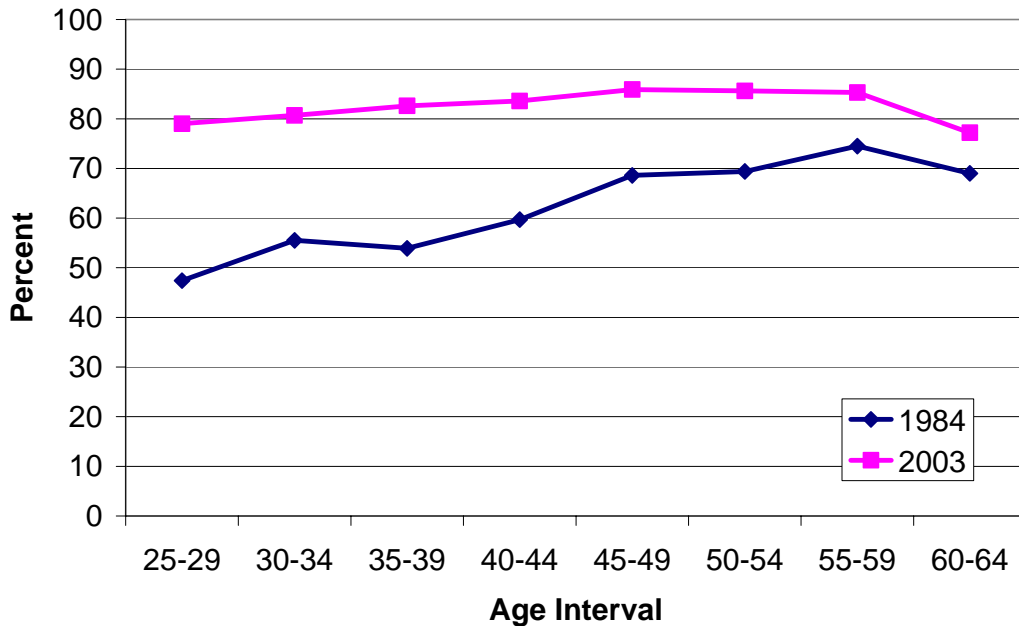
The rapid spread of 401(k) eligibility and participation rates has resulted in very rapid growth in aggregate contributions to 401(k) plans. Figure 1-4 shows contributions to 401(k) plans and, for comparison, to all other private pension

plans from 1975 to 2002.[2] Contributions to 401(k) plans are shown by the lined bars.   Contributions to 401(k) plans were first made in 1982. By 2000, total contributions to 401(k) plans had reached $182 billion and accounted for 73 percent of contributions to all private pension plans. Counting IRA, Keogh, and traditional employer provided non-401(k) DC plans, 87 percent of contributions were to personal accounts. This percentage fell to 61 percent by 2002 because of unusually large DB catch-up contributions triggered by the decline in the stock market.

Figure 1-4. Private pension plan contributions, 1975-2002
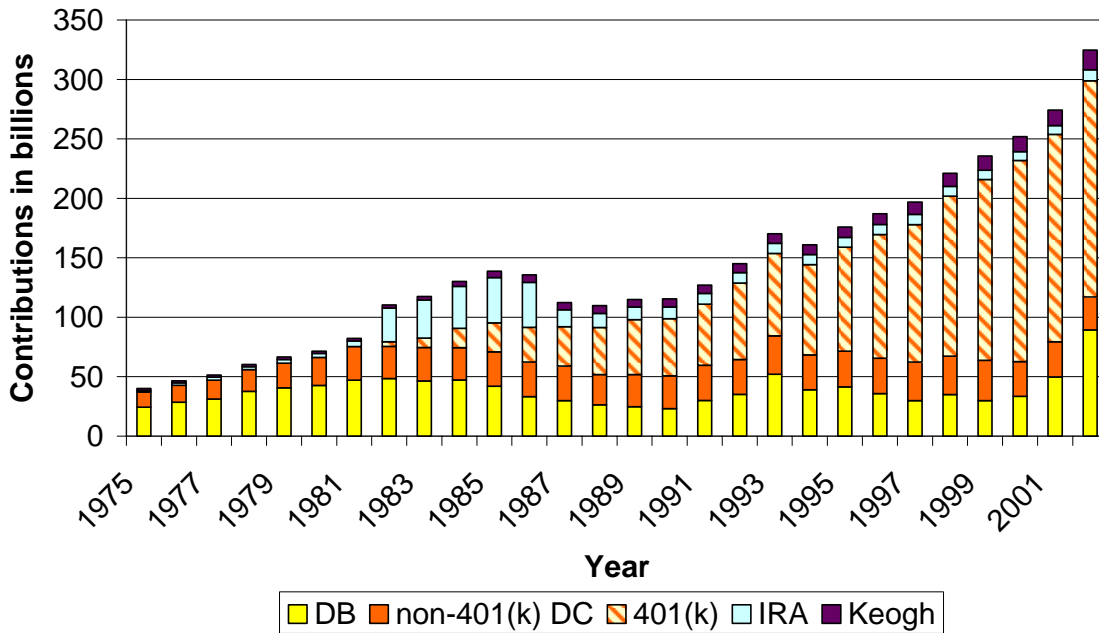
The increase in total pension plan contributions between 1982 and 2000 was accounted for almost entirely by the increase in contributions to 401(k) plans. Contributions to defined benefit (DB) plans fluctuated substantially over this period, but were about $15 billion, or 31 percent, lower in 2000 than in 1981 before increasing in 2001 and 2002 in response to the stock market decline. 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 of the inflows to IRAs today are roll-overs of previous accumulations in defined contribution accounts, rather than traditional contributions.

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[2] More recent data from Form 5500 filings are not available.

2. Projecting Future 401(k) Contributions

We first set out the calculations that are the basis for our projections of 401(k) wealth. We denote persons by the subscript i. Cohorts are denoted by subscript c. Associated with each person in each cohort is a lifetime earnings profile. The 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 is denoted be C (expressed as a proportion of earnings). The value of the 401(k) assets held by person i in cohort c at age a is given by

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

where $C_{ci}(a-t) = E_{ci}(a-t) \cdot P_{ci}(a-t) \cdot r$ and where r is the contribution rate. This calculation is made for every person (i.e. earnings history) for every age in every cohort. In practice, separate calculations are made for wealth in stocks and bonds and the assumed rates of return do not vary by individual. In particular, the 401(k) wealth of person i in cohort c at 65 is given by

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

This accumulation is calculated for each person (earnings history) in our sample.

We then obtain the average wealth held by the population of all persons age 65 for a cohort c. 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} (to be determined by population projections). Then the average of 401(k) assets held by all persons in cohort c at age 65 is given by

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

where J is the number of persons (earnings histories) in the sample. In practice, we don't have population forecasts associated with each earnings history in the sample. Instead, we project total assets using population projections for groups of persons with the same demographic characteristics. The Office of the Actuary of the Social Security Administration has developed population projections by calendar year and age and by gender and marital status. Each earnings history in our sample can also be identified by the gender and marital status of the person. We first calculate the average of $W_{ci}(65)$ separately for each of the four gender-marital status pairs and denote this average by $\bar{W}_{c,gm}$. Then the average wealth at 65 for each cohort is determined by

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

where the sum is over the four gm (gender-marital-status groups) and the number of persons in each of these groups is taken from the Social Security Administration demographic projections.

We also present projections of total 401(k) assets in each year through 2040. To do this, we use the identity that the wealth of person i in cohort C in calendar year y is given by

$$(5) \qquad W_{ci}(y) = W_{ci}(a \equiv y - c + 65)$$

Then, the total value of assets held in 401(k) accounts in year y is given by

$$(6) \qquad W_y = \sum_{c=1}^{C} \bar{W}_c(a \equiv y - c + 65)$$

To implement these calculations we need to develop projections of future 401(k) participation rates and earnings and we need to make assumptions about

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future 401(k) contribution rates, rates of return, cash-out probabilities, and 401(k) withdrawals. We begin by describing projections of average 401(k) participation rates for each cohort. We then describe the other assumptions that are needed to obtain estimates of 401(k) asset accumulation.

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 develop projections of future 401(k) participation rates. We sometimes label a cohort by the age of the cohort in 1984 and sometimes by the year in which the cohort attains age 65. For example, the cohort that is age 25 in 1984 attains age 65 in 2024 and is referred to as the C25 or the R2024 cohort. These calculations are based on the person data as reported in the SIPP. For the figures discussed above we combined these person data to form families.

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 will use these data to project 401(k) participation at ages 25 through 65 for a large number of cohorts, ranging from the cohort that attains age 65 in 1982 through the cohort 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. We know that eligibility rates have increased very rapidly over the past two decades, and that participation, given eligibility, increased substantially over the 1984 to 2003 period, as shown in PVW (2004). We have not found a compelling way to formally project future rates of eligibility or participation conditional on eligibility. Thus we have simply made "plausible" 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. Person Participation Rate by Cohort
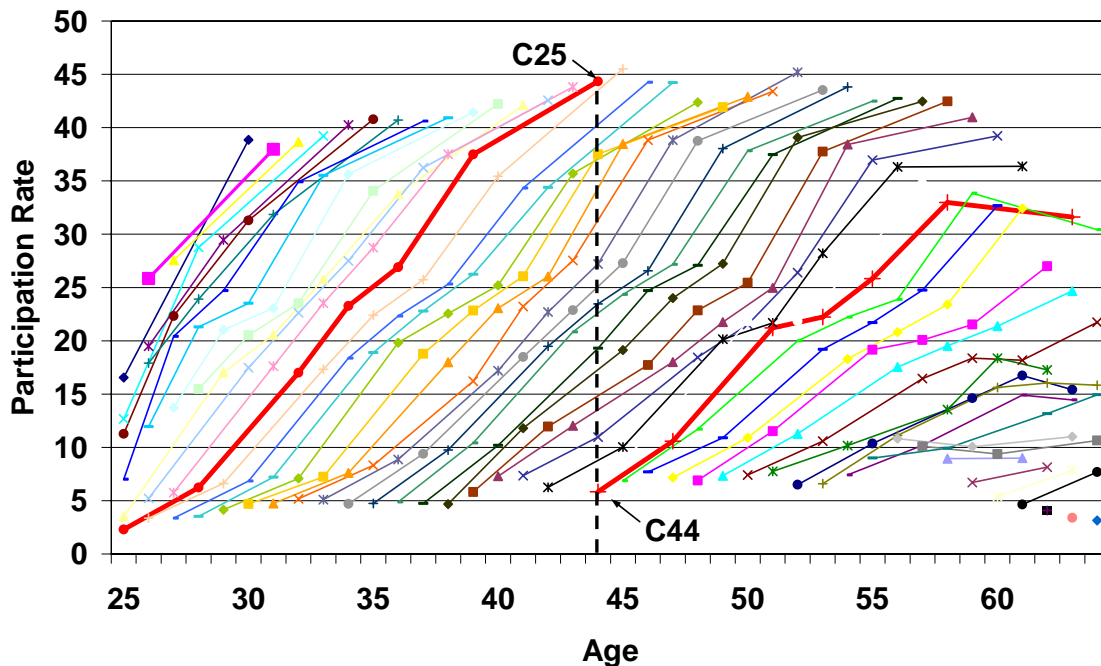
Simple extrapolations of the cohort data are likely to yield implausibly large participation rates. Consider, for example, the participation rates at age 44 highlighted by the vertical dashed line in Figure 2-1. The C44 cohort attained age 44 in 1984 and had a participation rate of 5.8 percent at that 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 rate to continue, the participation rate of the C12 cohort at age 44 (that the C12 cohort will attain in 2016) would be 70.3 percent (44.3+13x2). We suspect that this estimate of the future participation rate is too high, because 401(k) plans have already diffused through the segments of the corporate population that have workforces that find these plans most attractive, and that have the lowest per-employee administrative costs of implementing a plan.

Estimation of cohort effects by fitting the above profiles 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 rate will be smaller than that between 1998 and 2003. In particular, we assume that the future annual rate of increase declines by 0.12 percent per year. With this assumption, the projected future participation rates for the C25 and the C12 cohorts would be as 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, compared to 44.3 percent for the C25 cohort, which attained age 44 in 2003. At age 64, the participation rate would be 56.6 percent for the C25 cohort and 69.4 percent for the C12 cohort.

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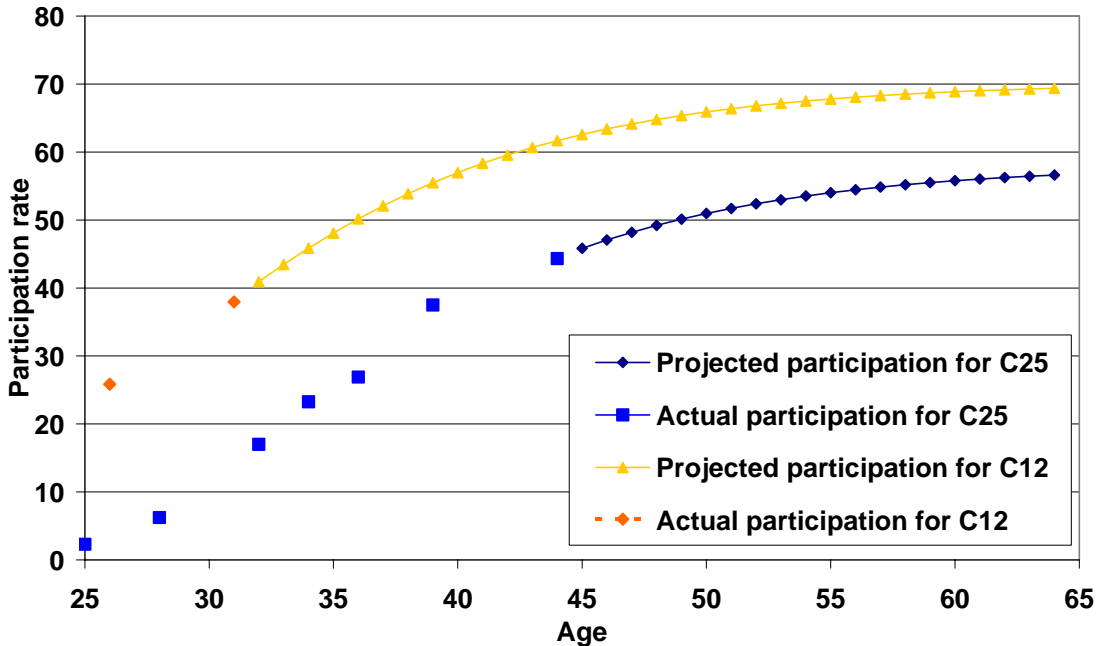

Figure 2-3 shows the projected average participation rates after 2003 for selected cohorts from one of the youngest cohorts, C11 (R2038), to one of the oldest cohorts, C64 (R1985). The figure also shows the interpolated participation rates between the years for which data are available prior to 2003. The decline in the rate of growth of 401(k) participation between 1998 and 2003 (the last two years for which SIPP data are available) is noticeable 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).

Participation rates also vary by the level of earnings, given age and cohort. We have incorporated this variation in our projections but we do not report projections of 401(k) assets by earnings decile in this paper. Variation in 401(k) asset accumulation by earnings is the focus of Poterba, Venti and Wise

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(2007b). A detailed explanation of the procedure used to project participation rates by earning decile is presented in that paper.

Figure 2-3. Interpolated (1982-2003) and projected (2004-2040) participation rates for selected cohorts
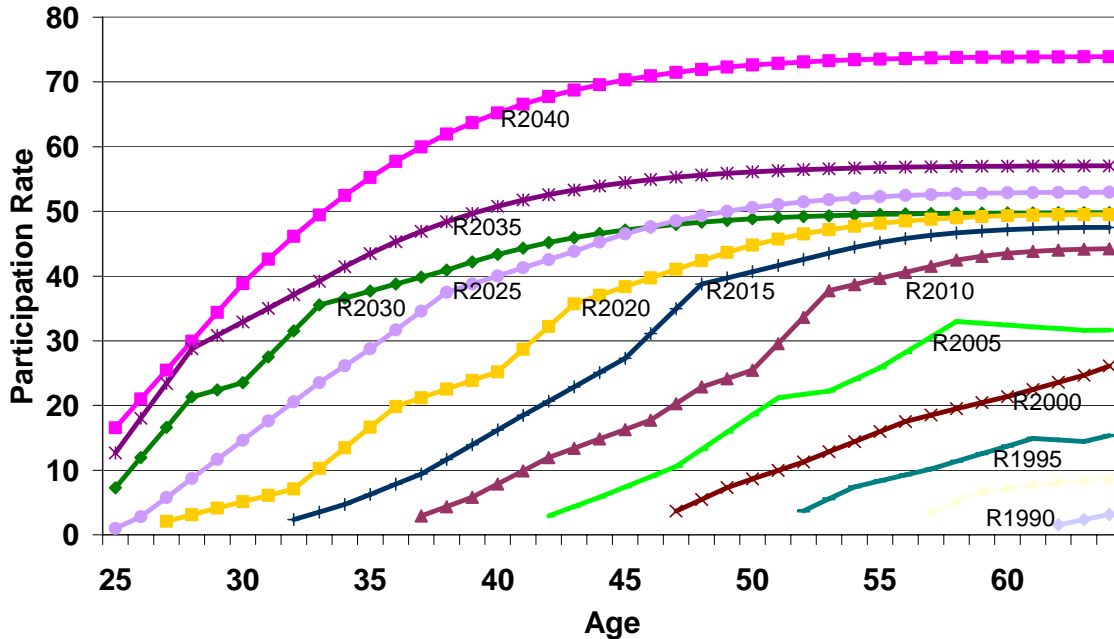
Allocation and Rate of Return: We assume that 60 percent of 401(k) contributions are allocated to large-capitalization equities and 40 percent to corporate bonds. The projections use actual annual pre-tax returns through 2005. Beginning in 2006 we make projections based on two rate of return assumptions. First, we assume that the average annual nominal return on equities is 12 percent and that the average nominal return on corporate bonds is 6 percent. Ibbotson Associates (2006) reports that the historical arithmetic mean of pretax returns on long-term corporate bonds has been 6.2 percent per year, while large-capitalization stocks have returned an average of 12.3 percent over the period 1926-2005. Second, we assume that the rate of return on equities is 300 basis points less than the historical rate. These returns are the pretax returns available on a portfolio with no management fees. We have not as yet accounted for asset management fees. The average dollar weighted management fee on stock funds is currently about 70 basis points.

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. Job separation rates are estimated from the 1998 SIPP for five-year age intervals. These rates are shown in the first column of Table 2-3. 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. A similar projection algorithm, with an identical treatment of transitions in and out of 401(k) participation, is described in Poterba, Venti, and Wise [2001].

The probability that a 401(k) accumulation is cashed out is determine by the job separation rate, the probability that the employees takes a lump sum distribution (LSD), and the probability that a lump sum distribution is cashed out rather than rolled over into an IRA. That is, the probability of a cashout is given by:

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

The probabilities associated with each of the components of the cashout decision are shown in Table 2-1.

Table 2-1. Cashout: probability of job separation, probability of LSD | job separation, and probability of cashout | 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 they may decide to take a LSD. The SIPP only provides information on the disposition of a LSD. Thus we are unable

to obtain the probability of a LSD given job separation by age from the SIPP. We use the average rate of 57 percent obtained by Hurd, Lilliard, and Panis based on data from the Health and Retirement Survey (HRS). On average, the probability of a cashout in a given year is (.151) x (.570) x (.272) = 0.0234.

This cashout probability differs from the probability in Poterba, Venti, and Wise (2001). In that paper, we used an estimated average of about 0.0108. The principle reason for the difference is the job separation rates. In the earlier paper we used estimates based on retrospective information in the HRS. The average separation rate based on that source was 0.048, compared to the average rate of 0.151 based on the SIPP estimates.[3] 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 used here is somewhat smaller: (.570) x (.272) = 0.155.

Withdrawals: The projections reported here assume a crude withdrawal scheme. Annual withdrawals are assumed to be 2 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 likely overstate amounts withdrawn from 401(k) plans. Berkshadker and Smith [2005] show that over 50 percent of current IRA holders do not make their first withdrawal before age 70.

Earnings: To estimate the 401(k) contributions of a cohort, 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 that 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. The implicit assumption in our analysis is that the distribution of earnings histories that will be realized by younger cohorts will be similar to the 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.[4] 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

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[3] The estimate of 15.1 percent is approximately 5 percent lower than estimates reported by Stewart [2002], based on Current Population Survey data.

[4] We used a two-limit tobit specification (with a separate equation for each year) to impute SS earnings for persons censored at the upper Social Security earnings limit.

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. (The "R2000" cohort contains some female spouses who were not 65 in 2000.)

To make projections for 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 a sample of earnings for older cohorts we deflate the earning of the "R2000" cohort based on the Social Security average wage index. This method does not account for any potential change in 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. The mean rates may be substantially affected by reporting errors.

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

Poterba, Venti, and Wise (1998) reported contribution rates based on the 1993 Current Population Survey (CPS). The average employee contribution rate was 7.1 percent and the average employer rate was 3.1 percent. Holden and VanDerHei (2001) analyzed 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, however, the contribution rate in future years is uncertain. One reason for uncertainty about future contribution rates is the effect of increases in contribution limits. Legislation over the past several years has increased contribution limits very substantially and now future increases are indexed to inflation. The legislated increases in 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 eleven percent of participants with incomes over $40,000 contributed at the legislated maximum, thirteen percent of those with incomes between $70,000 and $80,000, and eighteen percent of those with incomes between $80,000 and $90,000 contributed at the legislated maximum. Thus one question is 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 report that 52 percent of participants in 1999 faced employer imposed limits below the legislated maximum. The number of participants that is constrained by these limits is unknown. And how the limits set by employers might change in the future is also unknown.

In addition, we have not accounted for the recent Pension Protection Act of 2006 that gives employers latitude to set more "saving friendly" defaults in 401(k) plans. Beshears, Choi, Laibson, and Madrian (2006) 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. Thus our 401(k) projections may underestimate the actual accumulation of assets in these plans. Finally, the legislated increases in contribution limits may affect participant decisions of how much "should" be saved for retirement. The government-set limits may serve to "frame" employee decisions. .

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

We first show 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: The average <u>per person</u> of 401(k) assets at age 65 (in 2000 dollars) is shown in Figure 3-1, for cohorts R1982 to R2040. Two profiles are shown, one assuming the average historical rate of return for equities and the other assuming the historical rate less 300 basis points. The projected average increases very substantially over the next 35 years. If the historical rate of return on equities is assumed, the average increases from about $29,700 in 2000, to $137,000 in 2020, to $452,000 by 2040. Assuming the historical rate of return on equities less 300 basis points, the average increases from $29,700 in 2000 to $269,000 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 401(k) contributions were possible for successively younger cohorts. 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.

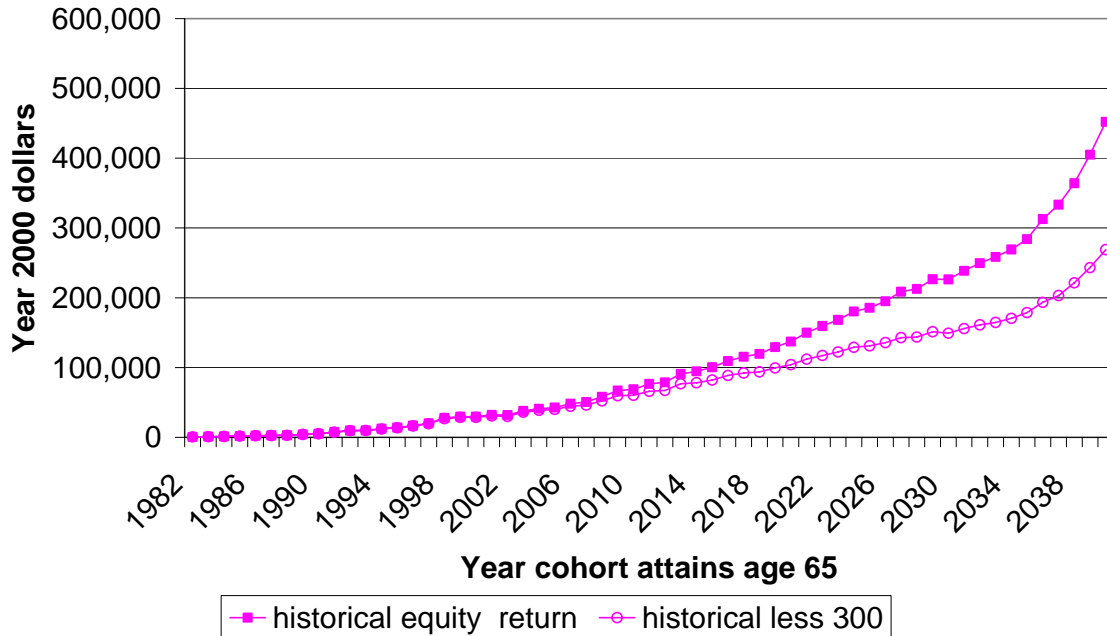### Figure 3-1. Average 401(k) assets at age 65, by year of retirement, all persons.

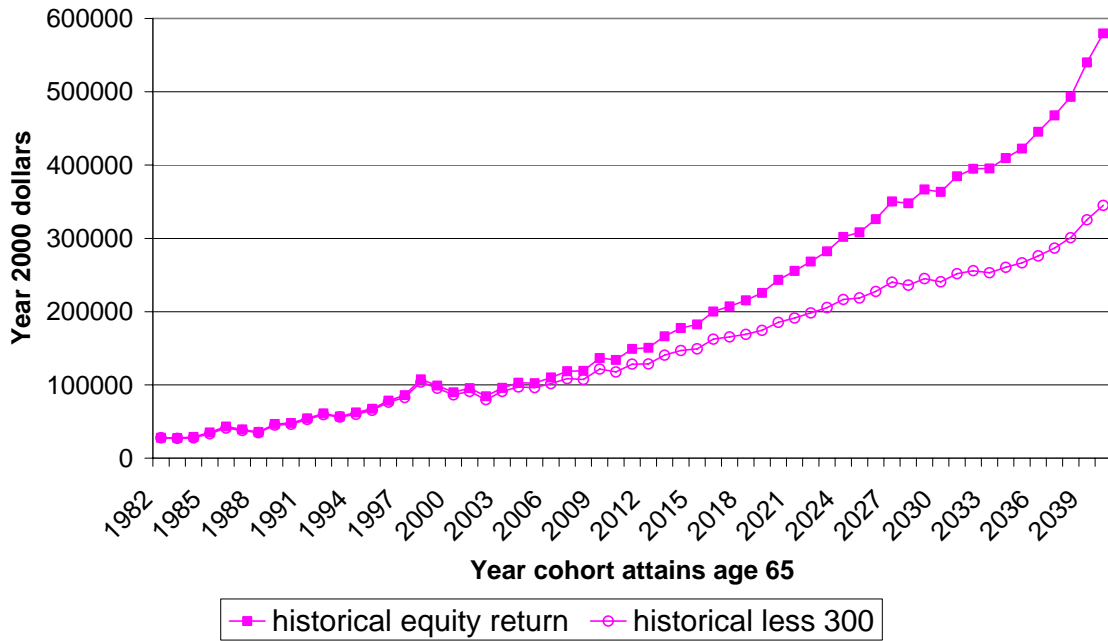## Figure 3-2. Average 401(k) assets at age 65 for persons with a 401(k), by cohort.

Figure 3-2 shows the average of 401(k) assets at retirement for persons who have 401(k) plans. For persons with plans, the average increases from about $87,000 in 2000 to $580,000 by 2040 (in 2000 dollars) assuming historical rates of equity returns to and $335,000 assuming historical returns less 300 basis points.

**Figure 3-3. Average 401(k) assets at age 65 and the
PV of DB benefits at age 65, all persons.**
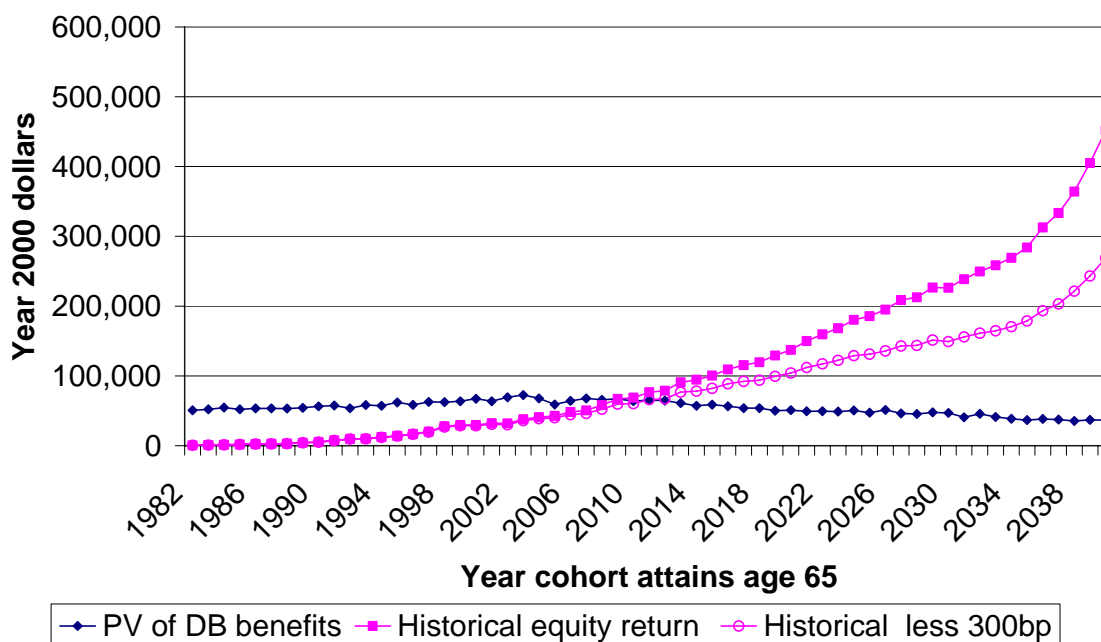
For comparison, the maximum average (over all persons) of the present value of DB benefits at age 65 was about $73,000, attained in 2003. Thereafter benefits in DB plans decline, based on the projections in Poterba, Venti, and Wise (2007a). The comparison is shown in detail in Figure 3-3 that is the same as Figure 3-1 but with the addition of the DB projections.

To check our projection algorithm, we compared our estimate 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, compared to our projected mean of $29,708. However, the mean 401(k) balance in the HRS excludes amounts that were originally 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 IRA plans are "rollovers" from 401(k) plans. Many new retirees "rollover" 401(k) assets into an IRA plan when they retire. For example, 89 percent of flows into IRA accounts were rollovers in 1996, 89 percent in 1997, 93 percent in 1998, 95 percent in 1999, and 96 percent were rollovers in 2000.[5] Thus it appears that our projection is quite plausible compared to the HRS mean.

Total 401(k) Assets by Year: Figure 3-4 shows the total value of assets in 401(k) plans by year. Assuming the historical rate of equity return, the total reaches $36.2 trillion by 2040 and grows to $22.8 trillion assuming historical returns less 300 basis points (both in year 2000 dollars). Thus these projections

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[5] See Figure 5 in Holden et. al. [2005]

suggest a very substantial increase in retirement saving over the coming decades. To place these values in a broader economic context, Figure 3-5 shows the total value of 401(k) assets as a proportion of the Social Security Administration intermediate projections of future GDP, also 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 155 percent of GDP in 2040 assuming historical equity returns and 98 percent of GDP assuming the historical equity return less 300 basis points. Both projections show a slowdown in the rate of 401(k) asset growth relative to GDP following the retirement of the last of the baby boom cohorts around 2030.

Figure 3-4. Projected 401(k) assets by year
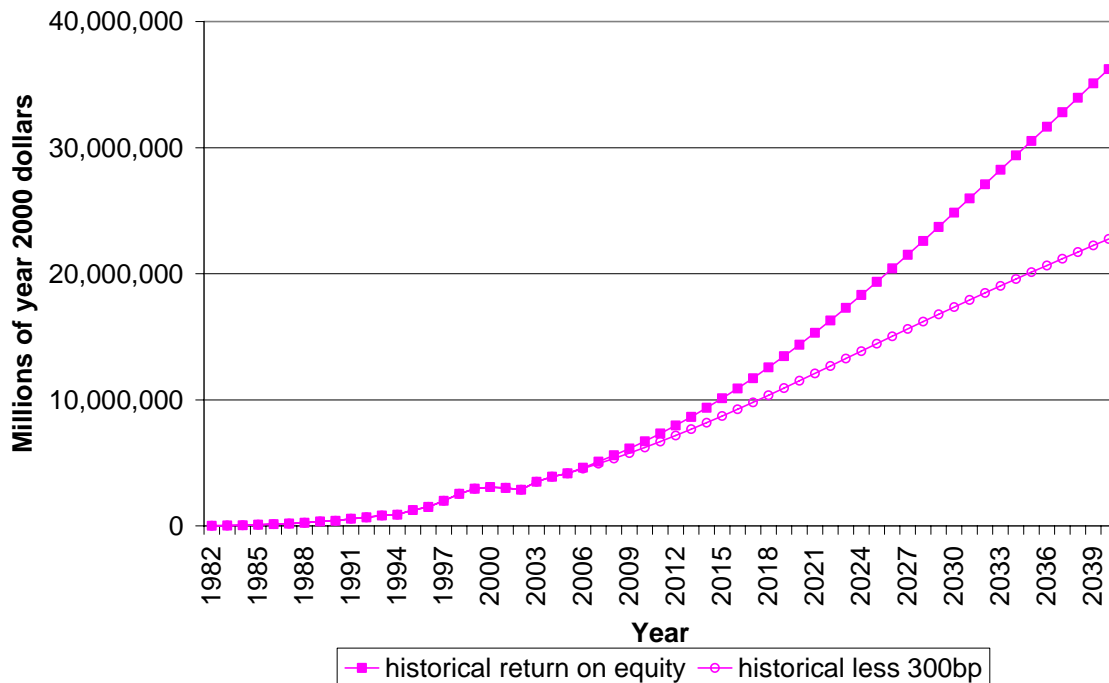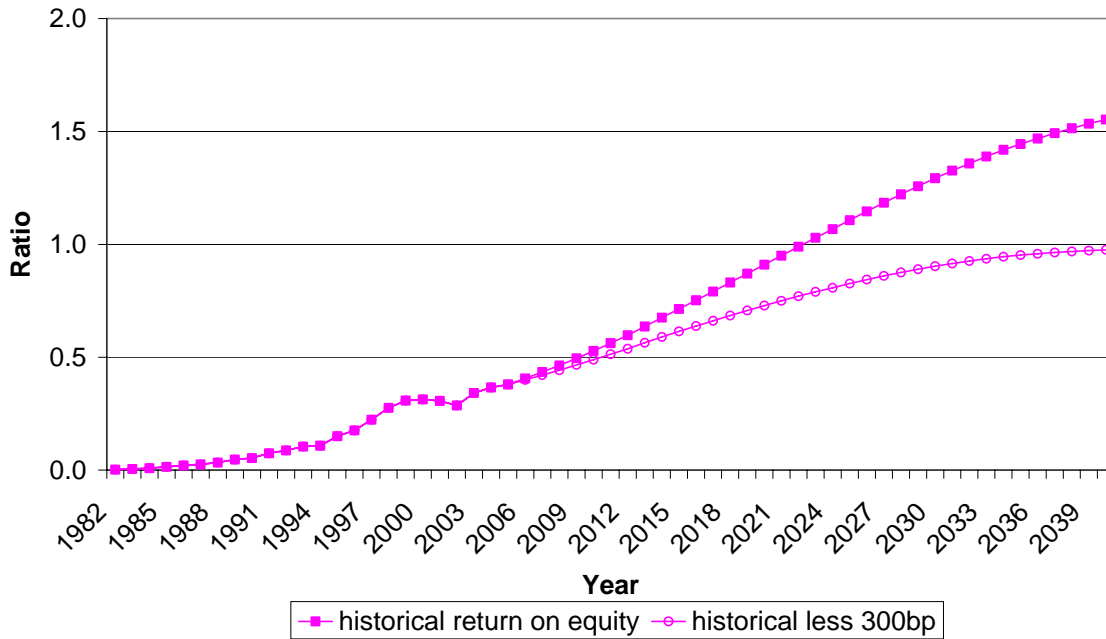
Figure 3-5. Ratio of projected 401(k) assets to projected GDP by year

The rise in 401(k) saving and the decline in DB pension savings also means that 401(k) pensions will dominate the pension landscape in the future. Figures 3-6 and 3-7 show the value of 401(k) assets together with projected assets held by DB plans. The DB projections are taken from Poterba, Venti, and Wise (2007a).   Again, both are shown as a proportion of the Social Security Administration intermediate projections of future GDP, also in year 2000 dollars. Figure 3-6 is based on the average historical equity return and Figure 3-7 is based on the historical return less 300 basis points. It is clear from both of these figures that the share of total pension assets accounted for by 401(k) plans grows steadily over time, from well under one-half today to 87 percent in 2040 assuming historical equity returns and 81 percent in 2040 assuming historical returns less 300 basis points.

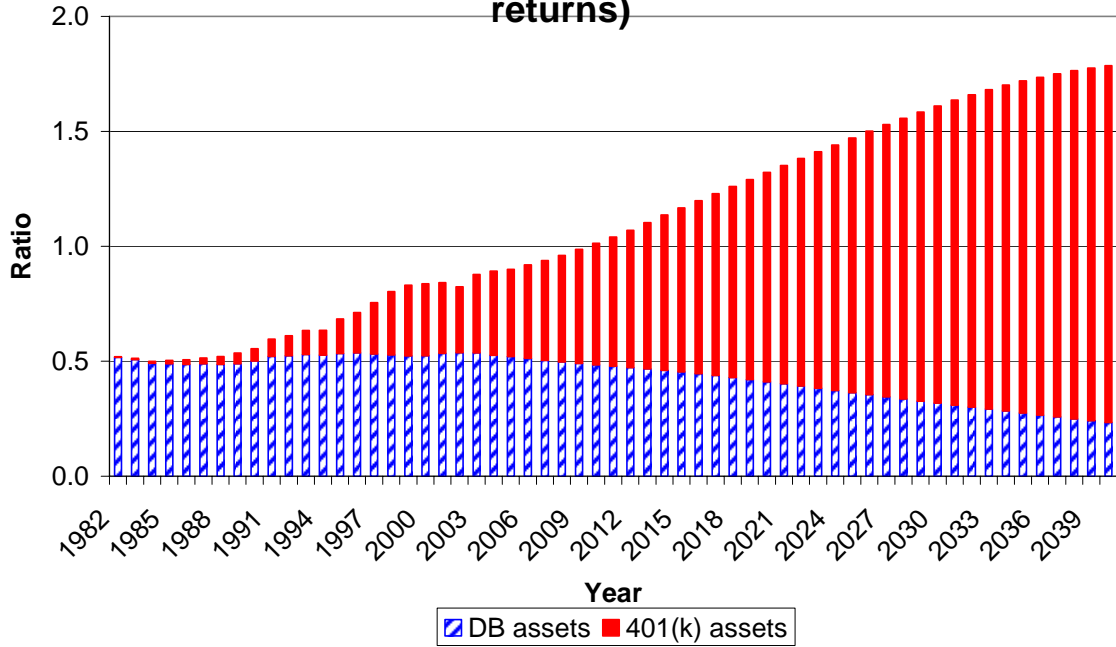**Figure 3-6. Ratio of projected 401(k) and DB assets to projected GDP by year (historical equity returns)**

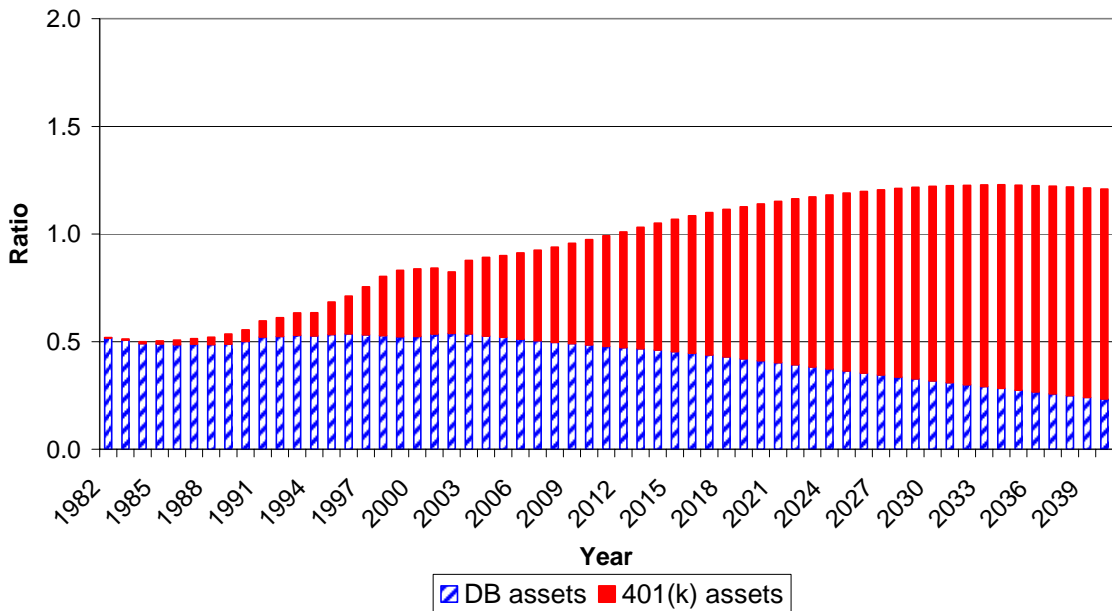Legend: ⊘ DB assets ■ 401(k) assets

X-axis: Year
Y-axis: Ratio

Figure 3-7. Ratio of projected 401(k) and DB assets to projected GDP by year (historical returns less 300bp)

Legend: ⊘ DB assets ■ 401(k) assets

X-axis: Year
Y-axis: Ratio

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, with a rapid shift from saving through employer-managed defined benefit pensions to 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 indicate 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. If the historical rate of return on equities continues in the future, the average (over all persons) increases from about $29,700 in 2000 to $452,000 by 2040 (both in year 2000 dollars). Assuming the historical rate of return on equities less 300 basis points, the average increases from $29,700 in 2000 to $269,000 by 2040. There are three principal reasons for the growth of 401(k) assets between 2000 and 2040. 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 7. Beginning in about 2020 retirees working for employers offering a 401(k) will have been able to contribute for their entire working lives. Second, future retirees will benefit from real wage growth, assumed to be 1.1 percent per year in our projections. Third, we project continued growth of 401(k) coverage, albeit at a 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.

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 155 percent of GDP in 2040 assuming historical equity returns and 98 percent of GDP assuming the historical equity return 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 179 percent of GDP assuming historical rates of equity return, and to 121 percent of GDP assuming historical rates less 300 basis points. Thus we conclude that the increase in the pension assets of future retirees will be much greater than the assets of current retirees.

References

Bershadker, Andrew and Paul Smith. 2005. "Cracking open the Nest Egg: IRA Withdrawals and Retirement Finance." Mimeo. Federal Reserve Board of Governors.

Congressional Budget Office. 2004b. "Tax-Deferred Retirement Savings in Long-Term Revenue Projections." CBO Paper, May.

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

Engelhardt, Gary and Christopher Cunningham, "Federal Tax Policy, Employer Matching, and 401(k) Saving: Evidence from HRS W-2 Records," National Tax Journal. Vol. LV No. 3. pp 617-645. September 2002.

Holden, Sarah, Kathy Ireland, Vicky Leonard-Chambers, and Michael Bogdan, "The Individual Retirement Account at Age 30: A Retrospective," *Perspective*. Investment Company Institute. vol. 11, no. 1, February

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

Holden, Sarah and Jack VanDerhei. 2002a. "Can 401(k) Accumulations Generate Significant Income for Future Retirees?" *Perspective*. Investment Company Institute. vol. 8, no. 3, November

Holden, Sarah and Jack VanDerhei. 2002b. "Appendix: EBRI/ICI 401(k) Accumulation Projection Model" *Perspective*. Investment Company Institute. vol. 8, no. 3a, November

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, 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, 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, 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."

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.

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

Personal retirement accounts were initiated in 1982. More recent legislations 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 has increased to $15,000, the combined dollar limit had increased to $40,000, and the percentage limit is now 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 it increased in steps until it reaches $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. One consequence of this difference is 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 $150,000 to $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 for IRAs is not indexed to inflation after 2006.

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.