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The Impact of Rising 401(k) Pension Coverage on Future Pension Income

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SEDAP Research Paper No. 9

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THE IMPACT OF RISING 401(k) PENSION COVERAGE ON FUTURE PENSION INCOME

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ABSTRACT

Using data from the 1992 Health and Retirement Survey and the 1992 Survey of Consumer Finances, this study compares the level of benefits in 401(k), non-401(k) defined contribution (DC), and defined benefit (DB) plans. Based on current pension information regarding pension contribution rates or benefit formulas, it is shown that a shift to 401(k) plans will reduce the average level of pension benefits for low income workers but have relatively small effects on middle and high income workers. A shift to 401(k) plans would also increase the variance of benefits among low income workers, though the effect would be negligible for middle and high income workers.

The Impact of Rising 401(k) Pension Coverage on Future Pension Income.*

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1. Introduction.

Since passage of the Revenue Act of 1978 and the subsequent issuance of clarifying regulations by the Internal Revenue Service (IRS) in 1981, the 401(k) plan has become extremely popular. The importance of the 401(k) plan is documented in several recent studies. For example, the Employee Benefit Research Institute (EBRI 1995) reports that only 19 percent of workers covered by a private pension were included in a 401(k) plan in 1984, but 46 percent were covered by 1990.[1] The Pension Welfare and Benefits Administration (PWBA) et al. (1994) report that as of 1993, 53 percent of pension covered workers were included in 401(k) plans. The growing popularity is also reflected by the rapid growth in 401(k) assets and contributions. According to PWBA (1996), 401(k) assets grew from $91.7 to $553.0 billion between 1984 and 1992 and 401(k) contributions as a percent of all pension contributions rose from 18 ($16.2 billion) to 50 percent ($64.3 billion) over the same period.

The growth of the 401(k) plan has several important implications for future retirement income security. First, as demonstrated in Even and Macpherson (1994), the emergence of the 401(k) has reduced participation in employer-sponsored pension plans, particularly among young and low income workers. Second, pre-retirement lump sum distributions are likely to become more common. This could potentially have a large influence on future retiree income since, as noted by Fernandez (1992) and EBRI (1997), many workers spend rather than save their preretirement distributions. For example, EBRI tabulations of the April 1993 Current Population Survey indicate that 38 percent of the people receiving a lump sum distribution spent at least part of it on consumption. However, it is worth noting that the larger distributions were less likely to

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[1] Participants in 401(k) plans might also be included in another type of plan. PWBA et al. (1994) reports that 63 percent of 401(k) participants are included in no other pension plan.

be spent on consumption.[2] Third, workers have more control over the investment allocation of their pension assets and must absorb a greater share of the rate-of-return risk associated with pension saving. Fourth, the fact that 401(k) plans are more portable than defined benefit plans will alter the distribution of retiree income and may influence the extent of labor turnover in the economy. Finally, saving rates in 401(k) plans may be lower than in the defined benefit (DB) and defined contribution (DC) plans of the past.

Samwick and Skinner (1994) provide a comparison of benefit generosity across plan types using the 1983 and 1989 Pension Provider Survey of the Survey of Consumer Finances. They conclude the following: First, the "representative" DC plan will provide at least the same benefits as the representative DB plan.[3] Second, the potential loss in retirement income from switching jobs is nearly identical in DB and DC plans. In DB plans, the benefit formula penalizes turnover whereas in DC plans many workers spend lump sums that they receive when they quit. Third, DB plans can be riskier in terms of the level of benefits provided than DC plans. The reason is that wage uncertainty (which affects DB benefits) can exceed rate of return uncertainty (which affects DC benefits).

While Samwick and Skinner provide some analysis of the role of 401(k) plans in affecting benefit generosity, variations in contribution rates and/or participation levels across types of workers are not addressed. Because of the voluntary nature of contributions in 401(k) plans, the rising variance of benefit levels becomes increasingly important.

This paper provides forecasts of pension benefits based upon the type of pension plan. It relies primarily upon data from the 1992 Survey of Consumer Finances (SCF) and the 1992

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[2] For example, the percentage of lump sum distributions that were at least partly spent on consumption was 60 percent for distributions of less than $500, but only 13 percent among distributions of $50,000 or more. (EBRI 1997, Table 17.2).

[3] Representative pension benefits are calculated by computing the average benefit estimated for the combination of approximately 1700 different pension plans and a variety of earnings histories.

Health and Retirement Study (HRS). The paper addresses important questions regarding the influence of 401(k) plans on future retirement income security and provides insights into how both the range and average level of pension benefits will be affected.

Some of the major conclusions are as follows: First, there is substantial variation in expected pension benefits among workers currently covered by a pension. Moreover, this variation exists even after controlling for differences in worker earnings and years of coverage. Second, the 401(k) plan is projected to replace a smaller fraction of pre-retirement income than DB or non-401(k) DC plans -- particularly for low income workers. Third, compared to DB and non-401(k) DC plans, the 401(k) is projected to result in a greater variance of pension benefits. The increased variance will take on two forms primarily: (i) an increase in the variance of benefits among low income workers; (ii) greater differences in the fraction of pay replaced between high and low income workers.

The projected consequences of a shift to 401(k) plans on the level and distribution of benefits are consistent with the expected consequences of giving workers greater discretion in the amount of pension saving. In earlier DC plans, contribution rates were frequently fixed for all employees. In DB plans, workers' benefits were determined by a formula that was applied to all workers. Thus, for a given income history, workers at a given firm will receive the same benefits. The only source of variation was differences in plan designs across firms.

The remainder of the paper is organized as follows: The data and methods for forecasting benefits are described in sections 2 and 3. The type of plan coverage, projected benefit levels, and the distribution of benefits by type of coverage are presented in sections 4 and 5. To isolate the effect of plan type on future benefits from other factors (e.g. labor turnover, earnings

levels, rate of return risk), section 6 presents the result of simulations that forecast future benefit levels for DB, 401(k) and non-401(k) DC plans.

2. Data.

The analysis of pension benefit levels relies primarily on Wave I of the Health and Retirement Survey (HRS) and the 1992 Survey of Consumer Finances (SCF). Wave I of the HRS was started in 1992 and surveyed persons born between 1931 and 1941 regarding their health, retirement and economic status. The sample includes responses from 12,652 people in 7,702 households. Our analysis restricts attention to "age-eligible" respondents (i.e. those born between 1931 and 1941) that worked more than 1000 hours in the past year, whose wage rate equals or exceeds the minimum wage of $4.25, and are not self-employed. This resulted in a sample of 4,612 individuals. For the analysis on pension benefits, restricting the sample to those covered by a pension, currently or in the past reduces the sample to 3,641. Further restricting the sample to those with usable responses to the necessary pension questions reduces the sample to 2,316 individuals.

The 1992 SCF provided detailed information on the financial status of U.S. households. The sample includes responses from 6,470 persons in 3,906 households. The sample includes 1,450 households representing an oversample of wealthier households. The SCF imputes values for missing data. To capture the underlying variance associated with the imputed values, each observation is repeated 5 times in the data set to reflect the underlying variance in imputed values.[4] Following the recommendation of Montalto and Sung (1996), all 5 data sets are

[4] That is, for example, if income is imputed for an individual, the value of income will take on 5 different values for that person to reflect the variance in the estimate of income. If income is not imputed for an individual, it will take the same value for that person 5 times.

employed in our analysis. The resulting sample consists of 32,350 observations. Our analysis restricts attention to individuals working more than 1000 hours per year, whose wage rate equals or exceeds the minimum wage of $4.25, and are not self-employed. This resulted in a sample of 11,851 observations.[5]

3. Methods for Forecasting Benefit Levels.

To allow for comparison of the generosity of defined benefit and defined contribution plans, benefits for a retirement at age 65 are estimated. For defined benefit plans, this requires that the benefit formula be applied to a forecast of earnings at age 65. For defined contribution plans, account balances must be projected for a retirement at age 65 and then an annuity factor is applied to convert the balance into a life annuity.

In the HRS and SCF, information is provided on pension coverage from current and past jobs. For current jobs, both data sets indicate the type of plan(s) that the worker has, the number of years in the plan, and other information that we use to forecast future retirement income at age 65.

In the case of DB plans, workers are asked when they expect to retire and the benefits they will receive at retirement. Benefits may be reported as either a percentage of final pay or as an absolute amount. To estimate what benefits are to be received at age 65, we take the following steps. First, we project earnings at retirement by assuming a 1.1 percent annual growth rate in real wages. To translate this into a benefit at age 65, we first compute a "generosity

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[5] Notice that the sample size of 11,851 includes many individuals five times. However, since some of the variables that we delete on may be imputed (e.g. the wage rate), some individuals will not appear five times. The imputed value for a given variable may cause the observation to be excluded in some cases but not in others.

factor" (the percentage of final pay replaced per year of service) by dividing expected benefits at retirement by the product of years in plan and salary at retirement.[6] We then estimate benefits for an age 65 retirement as the product of the age 65 value of forecast earnings, number of years of service at 65, and the generosity factor.

For DC plans, information is provided on the current balance in the plan and the amount that the employer and employee contribute. To project the balance in the pension plan at age 65 in 1992 dollars, the current balance is compounded forward with real interest rates to age 65. The real interest rate is assumed to be equal to the yield on indexed Treasury bills in February 1998 (3.7 percent). Between 1992 and the year that the worker reaches age 65, it is assumed that both employer and employee contributions remain at the same percent of pay and that real salary growth continues at 1.1 percent.

We assume that all workers live to age 65 with certainty and compare benefits in DB and DC plans by converting projected DC balances into a single life annuity that begins at age 65. In the case of benefits that a worker expects to receive from prior pension plans, both the HRS and SCF indicate the type of pension (i.e. DB or DC). However, when a lump sum was received or a person is currently receiving a benefit, only the HRS provides information on the type of pension. In both cases, it is possible to tell whether a person received a lump sum distribution at some point in the past, is currently receiving benefits, or expects to receive benefits in the future. In the HRS, workers receiving lump sums indicate whether they saved or spent it. Only those balances that were saved are counted as benefits from past pensions. Unfortunately, in the SCF, no such information is available. To adjust for this, estimates of the percentage of workers that save lump sum distributions by age of receipt, provided by EBRI (1997), are used to randomly

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[6] Our methodology assumes that people report expected benefits in 1992 dollars.

assign workers into categories indicating whether they saved their lump sum distributions. [7] For those with lump sum that was saved (or we impute was saved), an equivalent age 65 annuity is computed as follows: (1) the lump sum is compounded forward to 1992 assuming historical interest rates;[8] (2) the 1992 balance is compounded forward from 1992 to the year the person reaches age 65 using an assumed real interest rate of 3.7 percent (the rate on indexed Treasury bills); (3) the lump sum is converted into an annuity at age 65.[9] The annuity calculation assumes constant nominal payments and uses an assumed nominal interest rate beyond 1992 equal to that on 10 year Treasury bills in 1992 (7.0 percent) and the mortality table for group annuitants provided by the Society of Actuaries.[10] Using these assumptions, we estimate that a $100 payment at age 65 would buy a life annuity of $9.63 per year.[11]

Separate calculations are required for pension benefits that workers have already received or expect to receive from a past job. For workers that report they are currently receiving benefits, we calculate the age 65 equivalent annuity as follows: First, we compute the present value (in 1992 dollars) of benefits received between the starting age and 65. Second, we compute the

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[7] Using table 17.3 of EBRI (1997), we estimated the percentage of workers that used all of their lump sum for either (i) tax qualified saving; (ii) non-tax qualified saving; or (iii) a mix of the two. This is a conservative estimate of the percentage of lump sums saved. The fraction of lump sums saved, by age group, are: 8.3 percent for 16-20 year olds; 21.7 for 21-30 year olds; 35 for 31-40 year olds; 40.2 for 41-50 year olds; 56.8 for 51-60 year olds; 57.6 for 61-64 year olds; and 21.4 for those 65 and over.

[8] Interest rates prior to 1992 (the survey dates in HRS and SCF) are assumed equal to the rates observed on one-year U.S. Treasury bills plus .28 percent. We added .28 percent to the 1 year treasury rate to allow for the fact that returns on pension contributions will likely reflect interest rates on a longer term investment. The .28 percent per year is one-half of the average premium that 5 year bonds paid relative to one year bonds between 1953 and 1992.

[9] When a worker receives cost-of-living adjustments, the real interest rate is used to compute the annuity rate. Otherwise, nominal rates are used.

[10] The source of the mortality rates is Society of Actuaries Group Annuity Valuation Task Force (1996), Table 13. The group annuitant mortality tables provide gender specific mortality rates. We compute an average mortaility rate by taking a weighted average of the gender specific mortality rates where the weights represent the predicted fraction of the population of a given gender based on their mortality experience assuming each sex is half of the population at age 65.

[11] It is worth noting that we ignore differences between DB and DC plans in terms of survivor or disability benefits. In DC plans, the survivor has the right to the account balance. In DB plans, the survivor benefit is generally specified according to some formula tied to the worker's years of service and final salary.

lump sum cost of a life annuity starting at age 65 equal to the annual benefit paid by the pension. These two parts are added and then converted into an age 65 life annuity. When the benefits are indexed for inflation, appropriate adjustments are made to reflect the growth in nominal benefits over time.[12]

For workers that expect a future benefit, it may be either a lump sum or an annual benefit. For annual benefits that start before age 65, we estimate the expected present value of the annuity assuming the person lives with certainty to age 65 and has survivor probabilities given by the group annuitant mortality tables beyond age 65. For a person that expects to receive benefits starting after age 65, we estimate the expected present value of the annuity (again accounting for survival probabilities beyond age 65) and discount back to age 65. When cost-of-living adjustments are expected with future benefits are adjusted for inflation, appropriate adjustments are made in evaluation of the annuity.

4. Coverage Rates and Benefit Levels.

Pension coverage rates and the type of pension coverage for the SCF and HRS are presented in table 1. For the purpose of calculating these statistics, the sample is restricted to those that are employed 1000 or more hours per year, earn at least the minimum wage ($4.25 in 1992), are not self-employed, and in the case of the HRS are "age-eligible" (i.e. born between 1931 and 1941). To allow for comparison between the HRS and SCF, statistics are also

[12] Inflation prior to 1992 is measured by historical movements in the Consumer Price Index. Inflation beyond 1992 is assumed equal to 2.7 percent which equals the difference between the nominal yield on 10 year bonds and the real yield on indexed Treasury bills in 1998. When evaluating an annuity that is indexed for inflation, the real interest rate is used instead of the nominal rate.

presented for the subsample of the SCF between the ages of 51 and 62. This sub-sample is referred to as the SCF:51-62.[13]

The HRS over-samples blacks, Hispanics, and residents of Florida. In the SCF, high income workers are over-sampled. To adjust for this, all statistics presented below employ weights provided in the samples to make the results more representative.

The weighted percentage of workers covered by a pension on the current job are identical in the HRS and the SCF:51-62 samples -- 69.4. Given that coverage rates generally rise with age, it is not surprising that coverage rates are slightly lower (58.7) in the SCF sample with all workers 16 and over.

The HRS and SCF coverage rates are higher than found in the April 1993 CPS for civilian nonagricultural wage and salary workers. Based upon April 1993 CPS data, EBRI (1997) reports that 59 percent of the civilian labor force aged 51-60 is covered by a pension. The higher coverage rates found in the SCF and HRS samples of 51-62 year olds could be accounted for by the fact that we restrict analysis to those with 1000 or more hours of employment since coverage rates are directly related to hours worked.[14]

The distribution of current pension coverage by plan type is also quite similar in the HRS and the SCF:51-62. Among workers currently covered by a pension, 47.8 (46.0) percent are covered by only a DB plan in the HRS (SCF:51-62); 29.3 (35.6) are covered by only a DC plan; and 22.9 (18.4) are covered by both a DB and a DC plan.

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[13] Age-eligible workers in the HRS were born between 1931 and 1941 and would thus be between the ages of 51 and 61 when the interview began in 1992. However, some people in the HRS were not interviewed until 1993, so age-eligible workers at the time of the survey ranged between 51 and 62 in age.

[14] The EBRI (1997) tabulations (Table 10.5) indicate coverage rates of 9.9 percent for workers aged 16 and over working between 500 and 999 hours. Coverage rates are 22.5, 42.9 and 58.5 for those working 1000-1499, 1500-1999, and 2000 or more hours, respectively.

This distribution of coverage by plan type differs from that found in tabulations of the April 1993 CPS issued by the PWBA et al. (1994, table B13). The coverage distribution reported there for all private sector workers (full and part-time) indicates that 23 percent are covered by only a DB, 44 percent are covered by only a DC, and 18 percent covered by both a DB and DC.[15] Compared to the HRS and SCF results, this suggests a larger percentage covered by only a DC plan and a smaller percentage covered by only a DB. One possible explanation is that workers in the HRS and SCF:51-62 are older than the working population as a whole and DC plans could be less common since they are "newer" than DB plans. Evidence in support of this is that when the SCF is expanded to all workers, the DC share increases. An additional explanation is that our samples of the HRS and SCF include workers from the public sector where DB plans are more common.

In addition to pension coverage on the current job, a significant share of workers expect benefits from past employers. Among those currently covered by a pension plan, 26.5 (20.9) percent of those in the HRS (SCF:51-62) have either received, are receiving, or expect to receive a benefit from a past job. [16] When both past and current pensions are counted, the percent of workers covered rises to 78.9 in the HRS and 72.9 in the SCF:51-62.

Table 2 presents estimates of mean and median benefit levels. [17] All benefits have been converted into age 65 annuity equivalents using the methods described earlier. Median benefits are always less than means reflecting the fact that there are a small number of observations with

[15] These percentages add to less than 100 percent because some workers did not know the type of coverage.

[16] This excludes workers that received and spent a lump sum from a past pension.

[17] In computing these statistics, we discarded observations that we considered "unreasonable." For example, people indicating that a contribution rate (employer and employee combined) of more than 35 percent of pay to a defined contribution plan, and those that indicate they will receive more than three times their final pay are omitted from the sample. In the HRS some people indicate they contribute 100 percent of their pay to a DC pension. We expect this is a misinterpretation of the question and that they are reporting what percentage of contributions are made by the worker. For those who report that they will receive more than three times final pay from a pension, we expect it is either a coding error or their current income is low relative to their career average.

very large benefits. Among all workers covered by a pension from either a current or past pension, the median benefit expected from a current pension is $8,811 per year in the HRS and $10,272 in the SCF:51-62. For workers of all ages in the SCF, median benefits from a current pension are projected to be $14,548. The higher benefits in the expanded sample are expected since the forecasts for these workers assume continuous participation in their current pension until retirement and no allowance is made for portability losses or spending lump sum distributions.

Adding benefits from past pensions to those from current pensions, the median benefit increases to $12,240 in the HRS and to $11,782 in the SCF:51-62. The median replacement rate (annual benefits as a percent of final pay) from past and current pensions combined is 35.2 percent in the HRS, 34.0 percent in the SCF:51-62, and 42 percent in the SCF.

These estimates of annual benefits are significantly larger than those found in the March 1993 CPS for the population aged 65 and over receiving a benefit from a pension [EBRI 1995, table 4.2]. According to those statistics, among those 65 or older receiving a private pension, the median benefit was only $4,040. For those receiving a public pension (not Social Security), the median benefit was $9,600. The private pension benefit is substantially lower than that forecast for 65 year olds in the HRS and SCF:51-62. The lower benefit level among current retirees could reflect: (i) increases in the generosity of pensions over time; (ii) benefits that started prior to the CPS survey date that were not adjusted for inflation; (iii) the fact that DC plans that are not converted into an annuity will not be counted as a pension benefit by the CPS in later years; or (iv) the fact that the HRS and SCF statistics assume no turnover or retirement prior to age 65.

Pension benefits by type of pension coverage on current job are presented in table 3. Benefit levels are presented for four groups: (1) those with only a DB plan on their current job; (2) those with only a DC plan on their current job; (3) those with both a DB and a DC plan on their current job; and (4) those with no pension on their current job, but expecting or receiving a benefit from a past job.[18] The first three groups include workers with current pension coverage regardless of whether they have coverage from a past job.

Using benefits normalized to what would be expected at an age 65 retirement, there are marked differences in pension benefits by the type of coverage on the current job. In the HRS sample, median expected age 65 benefits (in 1992 dollars) are $4,372 for those covered by only a DC, $15,619 for those covered by only a DB, and $26,168 for those covered by both a DB and a DC. In the SCF:51-62 sample, median benefit levels are $7,159, $9,600, and $34,932, respectively . Thus, annual expected benefits for workers covered by only a DB are substantially larger than for those covered by only a DC in both the HRS and SCF:51-62. The size of the difference is much larger in the HRS, however.

There are at least four reasons that DC plans could generate less retirement income than DB plans: (1) the percentage of pay contributed to the plan could be lower; (2) the average pay of workers in DC plans could be lower; (3) the number of years in the plan could be lower; or (4) implicit rates of return in DB plans could exceed the explicit rates of return in DC plans.

To control for differences in worker income across plan types, the percentage of final pay replaced by pension benefits (the "replacement rate") was estimated. The median replacement rate in the HRS is 13.6 percent for workers covered by only a DC, 45.2 for those covered by only a DB, and 56 for those with both DB and DC coverage. In the SCF:51-62, these statistics are

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[18] This includes workers that received a lump sum from a prior pension but did not spend it.

20.8, 32.4, and 61.9. These results also suggest that DB plans are more generous than DC plans, and that coverage by both a DB and DC plan results in the greatest benefit -- even after controlling for income level.

The number of years in the plan is another possible cause of differences in pension generosity. In the HRS, the median number of years in the plan if employed until age 65 is 11 for those covered by only a DC, 31 for workers covered by only a DB, and 30 for those covered by both a DB and DC. In the SCF:51-62, the corresponding figures are 18, 27, and 31. The relatively small number of years in the plan for workers covered by only a DC plan will contribute to the lower replacement rates and benefit levels. Also, the fact that the number of years in DC plans is much lower in the HRS than the SCF:51-62 could be responsible for the lower DC benefits in the HRS.

To determine whether the number of years in the plan can explain the lower benefits of workers covered by only a DC plan, the "generosity rate" of current pensions is computed. It is calculated as the replacement rate divided by the number of years in the pension plan and can be thought of as the percentage of final pay replaced per year of service -- a common element in DB formulas.

In the HRS, the median generosity rate is 1.28 for workers covered by only a DC; 1.55 for workers covered by only a DB; and 1.98 for workers covered by both a DB and DC.[19] Thus, compared to workers covered by only a DC, workers covered by only a DB in the HRS can expect nearly four times as much in benefits but realize a generosity rate that is less than twice as high. In the SCF:51-62, the median generosity rate is 1.10 for workers covered by only a DC;

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[19] The generosity rate for DB plans is in line with EBRI (1995, table 5.15) where it is reported that the median generosity rate for medium and large private establishments is in the range of 1.50 to 1.74 for firms with terminal earnings formulas.

1.43 for workers covered by only a DB; and 2.08 for workers covered by both. These generosity rates are slightly lower than those found in the HRS for DB and DC plans, but slightly higher for DB/DC combinations.[20]

The general conclusions to be drawn from the above discussion are as follows: (1) DC plans generate lower benefit levels than DB plans and coverage by both a DB and DC generates the highest benefit level. (2) Compared to the HRS, the SCF:51-62 results in a higher estimate of DC benefits and a lower estimate of DB benefits -- though this appears to largely be due to the fact that HRS workers have fewer years in their DC plans.[21] (3) Controlling for differences in income levels and years in the plan reveals that stand-alone DB plans will generate about 1.2 times as much pension income as a stand-alone DC plan. Workers covered by both a DB and DC can expect a benefit that is approximately 1.5-1.8 times as large as would be generated by a stand-alone DC plan.

5. Distribution of Benefits.

Among workers covered by a pension currently, there is substantial variation in the level of expected benefits. Table 4 provides evidence on the extent of variation. In the HRS, the expected benefit if the worker retires at age 65 ranges from $1,800 at the 10th percentile to $43,902 at the 90th percentile; the replacement rate ranges from 7.0 to 86.2 percent, and the generosity rate ranges from 0.5 to 3.2 percent of final pay per year of service. Much of the variation in benefits is due to differences in income and years in plan. This is made evident by

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[20] Consistent with the explanation that number of years in the plan is largely responsible for the gap between the HRS and SCF:51-62 benefits is the fact that the median contribution rates (percent of pay contributed to the plan) are similar in the two data sets -- 9.0 in the HRS and 10.9 in the SCF.

[21] Given that the standard deviation of years of service is 11.5 in the HRS, the difference between the SCF and HRS estimates of years of service could easily be the result of sampling error.

the fact that the 90-10 ratio[22] is 24.4 for annual benefits, 12.3 for replacement rates, and only 6.4 for generosity rates. The corresponding 75-25 ratios are 5.7, 4.1, and 2.5 Thus, variation in benefit levels is reduced substantially when pay is controlled for (as in the replacement rate), and even more so when both pay and years of service are controlled for (as in the generosity rate). The same qualitative results hold in the SCF:51-62.

The statistics presented in table 4 make it clear that much of the variation in pension income can be explained by differences in worker income and years of coverage, though substantial variation remains after controlling for such differences. An interesting question is why such variation exists. One obvious explanation is that workers are in different types of plans that are intended to generate different levels of retirement income. Among workers covered by DB plans, generosity factors could differ. Among workers covered by DC plans, the percentage of pay contributed and the rate of return earned on investments could differ.

The range of benefits generated by DB and DC plans is presented in table 5 for workers currently covered by a pension. In both the HRS and SCF:51-62, the benefit level at any percentile point in the distribution of benefits is lowest for workers covered by only a DC and highest for workers covered by both a DB and DC.

Using the 90-10 or 75-25 ratio as a measure of the variation in benefits, both the HRS and SCF:51-62 imply that the DB/DC combination creates the least variation in benefits. The 90-10 ratios suggest that DC plans have greater variance than DB plans in both data sets, though the 75-25 ratios give conflicting results across data sets.

The variation in benefit levels within a given type of plan will reflect differences in the generosity of the plan, and the workers' earnings and years of coverage in the plan. A

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[22] The 90-10 ratio for a variable is the ratio of its value at the 90th percentile to its value at the 10th percentile.

comparison of generosity rates provides controls for earnings and years of coverage. Not surprisingly, the 75-25 and 90-10 ratios are substantially lower for generosity rates than for benefit levels. In the HRS, the 75-25 ratio in the HRS is 5.15 for benefits and 3.19 for generosity rates in DC plans; 4.25 and 2.36 for DB plans; and 3.28 and 1.81 for DB/DC combinations. For all three plan types, varying levels of pay and years of service contribute to the wide range of benefits. In the SCF:51-62 a similar pattern holds. The 90-10 and 75-25 ratios are lower for generosity rates than benefit levels.

When plan types are compared on the basis of generosity rates, the SCF:51-62 and HRS give conflicting evidence regarding how the range in benefit levels corresponds to plan type. In the HRS, 90-10 and 75-25 ratios are highest among workers with only a DC plan. In the SCF, the ratios are highest among workers with only a DB plan.

In summary, there is substantial variation in expected pension benefits among older workers currently covered by a pension. While a good share of the variation can be accounted for by differences in earnings and years of pension coverage, substantial variation remains even after controlling for such differences. The variation in generosity rates across plan types is fairly similar for DB and DC plans, though the source of variation is likely to be different.

6. Benefit Simulations and the Impact of the 401(k) plan.

The share of pension coverage accounted for by DC plans has risen substantially over time and the 401(k) plan is an important source of this growth. It is not clear what level of retirement income the 401(k) plan will generate. The statistics presented earlier on DC benefits for 51-62 year olds do not provide an accurate picture since 401(k) plans are relatively new and workers have relatively few years in such plans. To provide some evidence on how the 401(k)

will affect the level and distribution of benefits in the future, we apply simulations to forecast future benefit levels from DB, non-401(k) DC, and 401(k) plans.

To perform the simulation of benefits, the following assumptions are made: (1) workers start with a firm at age 35 and stay with that firm until age 65; (2) worker wage growth corresponds to the cross-sectional age-profile of wages among workers with pension coverage found in the SCF; and (3) the real interest rate earned on contributions to DC plans is 3.7 percent.

In addition to the above assumptions, a distribution of parameters for each of the plan types must be estimated. For each type of plan, we rely on the SCF to estimate a distribution of relevant parameters for 5 year age cohorts. For example, for workers covered by either a non-401(k) DC or a 401(k) plan, we estimate percentile points for the distribution of contribution rates (employer and employee combined) for the six age cohorts between the ages of 35 and 65. We assume that the life-cycle profile of contribution rates for a given person is always at the same percentile point in the distribution of contribution rates. Thus, for example, a person who contributes at the median rate at age 35 will continue to contribute at the median rate until retirement at 65. The median contribution rate will, however, change as the person ages.[23] An identical procedure is used for workers covered by only a non-401(k) DC plan. This assumption is supported by evidence in Kusko, Poterba and Wilcox (1994) that most employees in 401(k) plans maintain the same participation status and contribution rate year after year.

For DB plans, we estimate the distribution of generosity rates for workers covered by only a DB in the SCF between the age of 35 and 65. Benefit levels at age 65 are then calculated as the product of pay at age 65, 30 years of service, and the generosity factor.

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[23] One complication with calculating the distribution of contribution rates in 401(k) plans using SCF data is that information is not available to determine the fraction of workers eligible but not participating in a 401(k) plan. An estimate of this fraction is generated for each age group using the April 1993 Benefit Supplement to the Current Population Survey.

The variation in benefits that results from the simulations will reflect differences in contribution rates in 401(k) or other DC plans, and generosity rates in DB plans. The simulations intentionally purge any variation in benefits associated with rate of return risk, earnings differences, years of plan participation, or decisions to spend pension savings prior to retirement. It is thus important to recognize that the variation in benefit levels predicted by the simulations is likely a lower bound on the variation that will emerge in reality. It is conceivable, however, that variation in these different factors may be partially offsetting. For example, a worker that receives a below average rate of return on investments may respond by increasing his or her saving rate.

The total contribution rates (employer plus employee) to 401(k) and non-401(k) DC plans employed for the simulations are presented in table 6.[24] A few points are worth noting. First, in both 401(k) and non-401(k) DC plans, mean contribution rates generally rise with age until the worker approaches age 60. Second, mean contribution rates in 401(k) plans are lower than those for other DC plans for each age group. Much of the difference between mean contribution rates can be accounted for by the zero contribution rates for workers that are eligible for 401(k) plans but choose not to participate.

The projection of benefits for workers in 401(k), non-401(k) DC, and DB plans is presented in table 7. All projections are for a worker that has an age-earnings profile matching the cross sectional age profile of wages for the six five-year age cohorts between age 35 and 65. For 401(k) and DC plans, the distribution of contribution rates are applied to the wage profile to generate a lifetime of contributions. The 3.7 percent real rate of return is applied to generate a lump sum value of the contributions at age 65. The lump sum is then annuitized assuming

[24] Since an earlier draft of this paper performed simulations for a case where workers start with the employer at age 25, contribution rates and generosity factors are reported for the 25-30 and 30-35 year old age groups as well.

mortality rates for group annuitants and interest rates on 10 year treasuries. For DB plans, projected benefits are generated by multiplying earnings at age 65, years of service (30 in our simulations), and the generosity factor. A distribution of benefits is generated from the distribution of generosity factors.

The mean benefit projected for a worker retiring at age 65 is $18,235 in a 401(k) plan, $22,737 in a non-401(k) DC plan, and $19,968 in a DB plan. All three projections are based upon 30 years of service and earnings at retirement of $40,890. The mean percentage of final pay replaced by pensions is projected to be 44.6 percent in 401(k) plans, 55.6 percent in non-401(k) DC plans, and 48.8 percent in DB plans. Thus, 401(k) plans are projected to generate less retirement income and replace a smaller fraction of final pay than DB or non-401(k) DC plans.

The 75-25 and 90-10 benefit ratios provide some evidence on how 401(k) plans will affect the range of retirement benefits. The 90-10 ratios are infinity, 7.5 and 16.3 for 401(k), non-401(k) DC plans, and DC plans.[25] The corresponding 75-25 ratios are 3.2, 2.7 and 3.7. This suggests that 401(k) plans will increase the range of retirement benefits at the extremes (i.e. the 90-10 ratios) but have relatively little affect on the middle range of benefits (i.e. the 75-25 ratio).

Further insight into how 401(k) plans affect retirement income is gained by examining benefit levels by income level. The same type of simulation as described above is performed for workers in the bottom, middle, and top third of the earnings distribution.[26] The means of income for the 60-65 age groups are $16,924, $33,242, and $70,843 for workers in the bottom, middle, and top third of the earnings distribution.

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[25] The ratio of infinity results because the 10th percentile of benefits in 401(k) plans is zero.

[26] To assure adequate sample size for this exercise, we combined 55 to 65 year olds into a single age category to calculate contribution rates.

Table 8 presents the benefit levels and replacement rates that are projected for each income group. Several interesting results emerge. First, for each income group, the mean pension income generated by 401(k) plans is projected to be less than that for non-401(k) DC plans. However, pension income from 401(k) plans is projected to be less than that from DB plans in only the lowest income group.

The difference between 401(k) and other plans is greatest among the low income group. Average benefits from non-401(k) DC plans are projected to be 60 percent higher than 401(k) benefits in the low income group; 13 percent higher in the middle income group; and 15 percent higher in the high income group. Compared to 401(k) plans, DB benefits are 35 percent higher in the low income group; 8 percent lower in the middle income group; and 7 percent lower in the high income group.

Earlier it was noted that 401(k) plans may generate a greater variance in benefits. The analysis by income groups makes it clear that the greater variation in benefits is primarily among low income workers. The 75-25 ratio of benefits is higher for 401(k) plans than either DB or non-401(k) DC plans in the low income group. However, in the middle income group, 401(k) plans have 75-25 and 90-10 ratios lower than in DB plans, but higher than in DC plans. In the high income group, 401(k) plans have lower 75-25 and 90-10 ratios than DB or non-401(k) DC plans. The underlying source of this is that the variation in 401(k) saving drops rapidly as income rises whereas the variation in DB and non-401(k) DC plan benefits is fairly stable with increases in income. For example, the 75-25 ratio of benefits in 401(k) plans is 22.9 in the low income group, 2.8 in the middle income group, and 1.9 in the high income group. The corresponding statistics are 2.7, 2.3, and 2.5 in non-401(k) DC plans; and 3.1, 3.7, and 4.5 in DB plans.

An alternative way to examine the impact of plan type on the distribution of benefits is presented in table 9. These figures indicate the ratio of benefit levels and replacement rates across income groups at different percentile points. The statistics reveal how the plan type affects the distribution of pension benefits across income groups.

Comparing replacement rates across income groups provides an indication of whether pension income rises more or less than proportionately as income rises. If a given type of plan replaces the same percentage of income for workers at all income levels, the ratios would be unity.

Several interesting patterns emerge in the data. First, the ratio of replacement rates across income groups is quite close to unity in both non-401(k) DC and DB plans. The case for 401(k) plans is quite different, however. The ratio of middle income to low income replacement rates is 8.7 at the 25th percentile; 2.1 at the 50th percentile; and 1.1 at the 75th percentile. Similar declines are found in the ratios of high income to low income replacement rates. The implication of these results is that replacement rates rise rapidly with income in 401(k) plans, but are fairly stable in DB and non-401(k) DC plans.

The ratios of replacement rates across income groups also suggest that much of the reason that 401(k) plans have the lowest replacement rates for low income workers is that replacement rates are extremely small among some low income workers. In fact, at the tenth percentile of low income workers, a zero replacement rate is projected. At the 25th percentile, the replacement rate is only 3.0 percent for low income workers. Moving upward in the distribution of 401(k) replacement rates, however, leads to much more equal replacement rates across income groups.

7. Relaxation of Assumptions.

Numerous simplifying assumptions were made in the above simulations. Adjusting the assumptions will affect the relative generosity of plans and the variance in benefits. This section desribes some of the likely consequences.

Rate of return assumptions are important in the calculation of both the level and variation of benefits in DC plans. We have assumed that all workers receive identical rates of return on investment and that it matches the risk free rate of return on governement bonds. To the extent that there is variance in the rate of return, the variance of DC benefits will increase. However, it is conceivable that workers that experience below average rates of return may compensate by increasing contribution rates.

The calculations also assume zero worker turnover. If workers in DC plans switch to new firms with DC plans this will have little effect on mean benefits. However, turnover in DB plans will reduce benefit levels and increase the variance in benefits.

Wage growth assumptions affect the growth rate in DC contributions and the estimate of final earnings in DB plans. Hence, if our wage growth assumption is too low, our estimate of benefits in both DB and DC plans will be too low. However, the impact on DB benefits is likely to be higher given the importance of the final wage in the benefit calculation.

Finally, the simulations assume that there are no lump sum distributions from pensions spent prior to retirement. To the extent that such distributions are more common in DC plans, accounting for LSDs would reduce DC benefits by a larger amount.

7. Summary and Conclusions.

This paper presented evidence on how the growth of 401(k) plans will impact the level and distribution of benefits among future retirees. Data from the 1992 Health and Retirement Survey (HRS) and the 1992 Survey of Consumer Finances (SCF) were used to examine the distribution of benefits that workers between the ages of 51 and 62 in 1992 can expect to receive if they retire at age 65. The paper also simulated what benefits a worker could expect if they start in a pension at age 35 and retire at 65 with 30 years in a pension plan based on the behavior observed among workers in different types of plans today.

Among workers between the ages of 51 and 62 in 1992 that were expecting to receive a pension benefit, the median benefit expected from a current pension was $8,811 per year in the HRS and $10,702 in the SCF:51-62. In the HRS, workers covered by both a DB and a DC plan had the highest median benefit expected from their current employer ($26,168); those with only a DB plan were second ($15,619); and those with only a DC plan expected only $4,372. The ranking of benefit levels across plan types was identical in the SCF sample of 51 to 62 year olds.

Pension benefits were found to differ substantially across workers. Although controlling for differences in years of service and earnings reduces the variation in benefits substantially, the 75th percentile is still projected to receive benefits 2.5 to 3.0 times higher than the 25th percentile. The SCF and HRS give conflicting evidence on whether DB or DC plans create a larger variation in benefit levels among 51-62 year olds in 1992 after controlling for years and earnings. However, the ratio of the 75th to 25th percentile in replacement rates is fairly similar across plan types.

Since 401(k) plans are relatively new and the experience of 51 to 62 year olds in such plans is probably not a good indicator of what younger workers will do, pension information for workers between the ages of 25 and 65 in the SCF are used to simulate future benefits for DB,

401(k), and non-401(k) DC plans. The simulations were performed for workers that were in the bottom, middle, and top third of the income distribution for pension covered workers.

Given that 401(k) plans give workers greater discretion in choosing their contribution rates than the DB or non-401(k) DC, we expected to find that the 401(k) plan would generate lower replacement rates among low income workers and a greater variation in replacement rates across income groups.

The simulations support our hypotheses. First, mean and median benefits in 401(k) plans are projected to be less than in non-401(k) DC plans among low, middle, and high-income workers. However, 401(k) plans generate lower benefits than DB plans for only low income workers. Second, the relationship between income and pension benefits is strongest among 401(k) plans and the gap in replacements across plan types is greatest among low income workers. Third, among low income workers, the range of pension benefits is greatest for 401(k) plans. Among middle and high income workers, 401(k) plans generate a lower range of benefits than DB plans, and a range similar to non-401(k) DC plans.

The conclusions from the study should be tempered by recognition that several simplifying assumptions were imposed. For example, all the simulations assume 30 years of service, constant wage growth across workers, identical rates of return on investment, and persistence in contribution rates to 401(k) plans. Relaxing these assumptions to match reality will impact the distribution and level of benefits differentially in DB and DC plans. For example, a higher wage growth rate will increase the benefits of all plan types, though the effect would likely be greatest on DB plans given the back-loaded feature. Alternatively, a higher rate of return on investments would increase the benefits in 401(k) and DC plans, but leave DB benefits unchanged. If workers with low contributions early in life compensate with higher

contributions later in life, the variance in benefits in 401(k) plans would be lower. Finally, allowing for labor turnover and expenditure of pre-retirement distributions will affect the distribution and level of benefits. Hence, the results of this study must be interpreted in the context of the simplifying assumptions.

With the above caveats in mind, the major conclusion to be made from this study is that the growth of 401(k) plans is likely to alter the level and distribution of pension benefits among workers with pension coverage. It will likely lead to a lower mean pension benefit among low income workers. Moreover, it will likely lead to greater variation in the level of benefits among low income workers with pensions.

It is important to recognize, however, that while the 401(k) plan may lead to lower pension benefits for workers covered by pensions, it is less clear how it will impact the distribution of benefits among the population as a whole. It is possible that creation of the 401(k) plan has led to greater levels of coverage in the population, though there is no good evidence on this point. Consequently, while it may lead to a lower benefit level among workers covered by a pension, it may result in greater levels of coverage.

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Table 1: Employee Pension Coverage Rates and Type of Coverage.[a]

	HRS	SCF:51-62	SCF
Percentage of workers covered by a pension on current job.	69.4	69.4	58.7
Of those covered on current job, percentage that are covered by:			
Only a defined benefit plan.	47.8	46.0	43.5
Only a defined contribution plan.	29.3	35.6	41.8
Both a defined benefit and defined contribution plan.	22.9	18.4	14.7
Percentage of workers covered by a pension on current job that expect benefits from a past job.	26.5	20.9	12.8
Percentage covered by a pension on either current or past job.	78.9	72.9	63.0
Sample size	4612	2238	11851

[a] All statistics are calculated using sample weights to make the samples representative.

Table 2: Expected Pension Benefits of Workers Currently Expecting a Pension Benefit.[a]

	HRS		SCF: 51-62		SCF: all ages	
	mean	median	mean	median	mean	median
Annual benefits from current pension.	15,153	8,811	20,111	10,272	23,964	14,548
Annual benefits from past pensions	4,041	0	1,818	0	1,238	0
Annual benefits from past and current pensions	20,194	12,240	21,929	11,782	25,202	15,903
Percentage of pay at age 65 replaced by current pensions.	35	26.6	40	28.9	48.9	39.1
Percentage of pay at age 65 replaced by past and current pensions.	47.3	35.2	44.8	34	52.3	42
Number of years in current pension.	22.1	20	15.3	15	9.5	7
Percentage of pay at age 65 replaced per year in current pension.	1.55	1.32	1.71	1.3	1.64	1.08
Sample Size	2,316		1,570		7,078	

[a] All statistics are calculated using sample weights to make the samples representative. Benefits are calculated assuming retirement at age 65 and in 1992 dollars.

Table 3: Pension Benefits by Type of Pension Coverage.[a]

	HRS		SCF:51-62		SCF: All Ages	
	Mean	Median	Mean	Median	Mean	Median
Annual benefits from current pension.						
DB only	19692	15619	16734	9600	21824	14400
DB & DC	34494	26168	42100	34932	48739	41002
DC only	8764	4372	16154	7159	21856	12762
Annual benefits from past pensions						
DB only	2068	0	899	0	905	0
DB & DC	3243	0	1755	0	710	0
DC only	2974	0	2445	0	993	0
Only a past pension.	10954	3591	6026	3324	5527	1289
Annual benefits from past and current pensions.						
DB only	21760	17006	17633	10593	22729	15775
DB & DC	37737	27512	43855	38255	49449	41989
DC only	11738	5691	18599	8697	22849	13566
Percentage of pay at age 65 replaced by current pension.						
DB only	48	45.2	43.5	32.4	52.2	41.2
DB & DC	62.5	56	65.5	61.9	80.8	72.2
DC only	19	13.6	27.9	20.8	42.9	33.5

Table 3: Pension Benefits by Type of Pension Coverage.[a]

	HRS		SCF:51-62		SCF: All Ages	
	Mean	Median	Mean	Median	Mean	Median
Percentage of pay at age 65 replaced by all pensions.						
DB only	53.8	49.1	46	35.1	55	43.5
DB & DC	68.6	61.2	69.3	64.3	82.1	73.5
DC only	25.3	17.6	33.9	24.3	45.3	36.8
Only a past pension.	42	13.9	21.7	13.6	16.9	4.9
Number of years in current plan if retire at age 65.						
DB only	29.5	31	26.5	27	34.1	35
DB & DC	29.6	30	30.4	31	34.8	37
DC only	12.7	11	19.9	18	31.2	32
Percentage of pay at age 65 replaced per year in current plan.						
DB only	1.71	1.55	1.8	1.43	1.59	1.25
DB & DC	2.22	1.98	2.36	2.08	2.4	2.24
DC only	1.9	1.28	1.32	1.1	1.35	1.17

[a] All statistics are calculated using sample weights to make the samples representative. Benefits are calculated assuming retirement at age 65 and in 1992 dollars.

Table 4: Distribution of Pension Benefits Among Workers Currently Covered by a Pension.[a]

	Annual Benefit	Replacement rate.	Generosity Rate
HRS			
mean	19,554	42.4	1.9
10th percentile	1,800	7.0	0.5
25th percentile	4,800	15.5	0.9
50th percentile	13,063	35.0	1.6
75th percentile	27,365	63.1	2.2
90th percentile	43,902	86.2	3.2
75th/25th	5.7	4.1	2.4
90th/10th	24.4	12.3	6.4
SCF:51-62			
mean	20110	40.0	1.7
10th percentile	978	3.8	0.3
25th percentile	4080	12.5	0.7
50th percentile	10272	28.9	1.4
75th percentile	27270	57.2	2.1
90th percentile	48470	87.3	3.6
75th/25th	6.7	4.6	3.0
90th/10th	49.6	23.0	12.0

[a] All statistics are calculated using sample weights to make the samples representative. Benefits are calculated assuming retirement at age 65 and in 1992 dollars and exclude pensions from past jobs.

Table 5: Annual Benefits and Generosity Rate by Type of Pension Coverage.[a]

	HRS			SCF:51-62		
Type of coverage:	DC	DB	DB and DC	DC	DB	DB and DC
Annual benefits from current pension.						
Mean	8,764	19,692	34,494	16,154	16,734	42,100
10th percentile	966	2,412	8,043	1,053	1,732	11,181
25th percentile	2,044	6,760	13,891	3,544	4,340	19,544
50th percentile	4,372	15,619	26,168	7,159	9,600	34,932
75th percentile	10,518	28,735	45,500	14,977	22,800	49,786
90th percentile	20,102	42,404	66,372	38,534	37,296	88,004
75th percentile/25th	5.15	4.25	3.28	4.23	5.25	2.55
90th percentile/10th	20.81	17.58	8.25	36.59	21.53	7.87
Generosity rate from current pension.						
Mean	1.90	1.71	2.22	1.32	1.80	2.36
10th percentile	0.36	0.51	1.00	0.30	0.21	0.98
25th percentile	0.70	0.89	1.44	0.66	0.66	1.45
50th percentile	1.28	1.55	1.98	1.10	1.43	2.08
75th percentile	2.23	2.10	2.60	1.84	2.00	3.31
90th percentile	3.93	2.78	3.65	2.62	3.81	3.83
75th percentile/25th	3.19	2.36	1.81	2.79	3.03	2.28
90th percentile/10th	10.92	5.45	3.65	8.73	18.14	3.91

[a] All statistics are calculated using sample weights to make the samples representative. Benefits are calculated assuming retirement at age 65 and in 1992 dollars.

Table 6: Contribution Rates by Age and Plan Type for Defined Contribution Plans.[a]

401(k) Plans

Age group:	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 65
Mean	5.53%	7.19%	7.85%	7.66%	9.52%	10.65%	10.19%	7.06%
10th percentile	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
25th percentile	0.00%	0.00%	2.00%	3.00%	4.50%	5.00%	8.00%	2.00%
50th percentile	4.00%	5.00%	6.67%	7.87%	9.00%	9.00%	10.00%	6.04%
75th percentile	9.00%	12.00%	12.00%	10.66%	14.00%	16.60%	12.00%	9.60%
90th percentile	11.00%	15.00%	17.71%	16.39%	20.00%	20.00%	20.57%	15.00%
Participation Rate	60.78%	74.30%	80.76%	81.04%	84.05%	87.71%	85.23%	81.16%

Other Defined Contribution Plans

	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 65
Mean	9.03%	8.65%	10.08%	10.87%	10.37%	11.16%	13.05%	10.83%
10th percentile	1.54%	2.40%	3.00%	1.86%	2.50%	2.87%	4.17%	2.87%
25th percentile	5.00%	3.56%	4.93%	4.50%	5.00%	5.85%	7.50%	6.00%
50th percentile	7.67%	7.06%	8.00%	10.00%	9.13%	10.00%	13.00%	8.61%
75th percentile	12.00%	12.17%	13.52%	17.04%	12.73%	16.50%	17.00%	13.00%
90th percentile	19.15%	16.00%	20.00%	20.91%	20.00%	24.08%	20.00%	20.00%

[1a] All contribution rates are calculated using sample weights to make the sample representative.

Table 7: Simulated Annual Benefits, Generosity and Replacement Rates by Plan Type.[a]

	Annual Benefits		
	401(k)	Non-401(k) DC	DB
Mean	18,235	22,737	19,968
10th percentile	0	5,826	2,502
25th percentile	8,065	11,371	7,224
50th percentile	16,721	20,012	16,257
75th percentile	26,121	31,058	26,492
90th percentile	37,998	43,390	40,811
75th percentile/25th percentile	3.24	2.73	3.67
90th percentile/10th percentile	a	7.45	16.31
	Generosity Rate		
Mean	1.11%	1.39%	1.63%
10th percentile	0.00%	0.36%	0.20%
25th percentile	0.49%	0.70%	0.59%
50th percentile	1.02%	1.22%	1.33%
75th percentile	1.60%	1.90%	2.16%
90th percentile	2.32%	2.65%	3.33%
75th percentile/25th percentile	3.24	2.73	3.67
90th percentile/10th percentile	a	7.45	16.31
	Replacement Rate		
Mean	44.60%	55.61%	48.83%
10th percentile	0.00%	14.25%	6.12%
25th percentile	19.72%	27.81%	17.67%
50th percentile	40.89%	48.94%	39.76%
75th percentile	63.88%	75.96%	64.79%
90th percentile	92.93%	106.12%	99.81%
75th percentile/25th percentile	3.24	2.73	3.67
90th percentile/10th percentile	a	7.45	16.31

[a] All calculations assume workers start at age 35 and remain employed until age 65 at the same firm. The final salary is $40,890 (the average salary for 60-65 year old pension workers in the SCF).
[b] Infinity since 10th percentile figure is 0.

Table 8: Simulated Annual Benefits and Replacement Rates by Plan Type and Income Class[a]

	Annual Benefits		
Bottom Third of Income Distribution	401(k)	Non-401(k) DC	DB
Mean	6.444	10.297	8.722
10th percentile	0	2,481	1,083
25th percentile	506	5,114	3,371
50th percentile	4,069	8,579	5,957
75th percentile	11,610	13,809	10,577
90th percentile	18,106	21,026	18,692
75th percentile/25th percentile	22.94	2.70	3.14
90th percentile/10th percentile	a	8.47	17.25
Middle Third of Income Distribution			
Mean	16,857	19,109	15,424
10th percentile	4,753	6,199	1,995
25th percentile	8,638	10,989	5,873
50th percentile	16,893	16,946	13,477
75th percentile	23.955	24.676	21.920
90th percentile	29,675	35,702	28,960
75th percentile/25th percentile	2.77	2.25	3.73
90th percentile/10th percentile	6.24	5.76	14.52
Top Third of Income Distribution			
Mean	36,754	42,425	34,077
10th percentile	14,106	14,574	5,298
25th percentile	25,028	23,342	10,493
50th percentile	33,065	37,020	31,486
75th percentile	48,034	57,425	47,054
90th percentile	71,175	74,634	68,009
75th percentile/25th percentile	1.92	2.46	4.48
90th percentile/10th percentile	5.05	5.12	12.84

Table 8: Simulated Annual Benefits and Replacement Rates by Plan Type and Income Class.[a]

	Replacement Rates		
Bottom Third of Income Distribution	401(k)	Non-401(k) DC	DB
Mean	38.08%	60.84%	51.54%
10th percentile	0.00%	14.66%	6.40%
25th percentile	2.99%	30.22%	19.92%
50th percentile	24.04%	50.69%	35.20%
75th percentile	68.60%	81.59%	62.50%
90th percentile	106.99%	124.24%	110.45
75th percentile/25th percentile	22.94	2.70	3.14
90th percentile/10th percentile	a	8.47	17.25
Middle Third of Income Distribution			
Mean	50.71%	57.48%	46.40%
10th percentile	14.30%	18.65%	6.00%
25th percentile	25.99%	33.06%	17.67%
50th percentile	50.82%	50.98%	40.54%
75th percentile	72.06%	74.23%	65.94%
90th percentile	89.27%	107.40%	87.12%
75th percentile/25th percentile	2.77	2.25	3.73
90th percentile/10th percentile	6.24	5.76	14.52
Top Third of Income Distribution			
Mean	51.88%	59.89%	48.10%
10th percentile	19.91%	20.57%	7.48%
25th percentile	35.33%	32.95%	14.81%
50th percentile	46.67%	52.26%	44.45%
75th percentile	67.80%	81.06%	66.42%
90th percentile	100.47%	105.35%	96.00%
75th percentile/25th percentile	1.92	2.46	4.48
90th percentile/10th percentile	5.05	5.12	12.84

[a] Calculations assume workers start at age 35 and remain employed until age 65 at the same firm. The final salaries for bottom third, middle third, and top third are $16,924, $33,242, and $70,843, respectively.
[b] Infinity since 10th percentile figure is 0.

Table 9: Ratio of Benefits and Replacement Rates of Top Third and Middle Third to Bottom Third of Income Distribution by Plan Type.[a]

	Annual Benefits		
Middle Third/Bottom Third Income	401(k)	Non-401(k) DC	DB
Mean	2.62	1.86	1.77
10th percentile	a	2.50	1.84
25th percentile	17.07	2.15	1.74
50th percentile	4.15	1.98	2.26
75th percentile	2.06	1.79	2.07
90th percentile	1.64	1.70	1.55
Top Third/Bottom Third of Income			
Mean	5.70	4.12	3.91
10th percentile	a	5.87	4.89
25th percentile	49.46	4.56	3.11
50th percentile	8.13	4.31	5.29
75th percentile	4.14	4.16	4.45
90th percentile	3.93	3.55	3.64
		Replacement Rates	
Middle Third/Bottom Third Income			
Mean	1.33	0.94	0.9
10th percentile	a	1.27	0.94
25th percentile	8.69	1.09	0.89
50th percentile	2.11	1.01	1.15
75th percentile	1.05	0.91	1.06
90th percentile	0.83	0.86	0.79
Top Third/Bottom Third of Income			
Mean	1.36	0.98	0.93
10th percentile	a	1.4	1.17
25th percentile	11.82	1.09	0.74
50th percentile	1.94	1.03	1.26
75th percentile	0.99	0.99	1.06
90th percentile	0.94	0.85	0.87

Calculations assume workers start at age 35 and remain employed until age 65 at the same firm. The final salaries for bottom third, middle third, and top third are $16,924, $33,242, and $70,843, respectively

[1b] Infinity since 10th percentile figure is 0.

Appendix Table 1: Contribution Rates for 401(k) Plans by Age Group and Income Class

Bottom Third of Income Distribution

	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 65
Mean	2.59%	4.96%	5.76%	5.72%	7.49%	8.13%	5.43%
10th percentile	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
25th percentile	0.00%	0.00%	0.00%	0.00%	0.00%	3.39%	0.00%
50th percentile	0.00%	2.50%	4.50%	4.00%	6.15%	4.50%	2.00%
75th percentile	4.40%	9.00%	12.00%	10.00%	14.00%	13.91%	8.58%
90th percentile	9.00%	15.00%	13.00%	16.00%	20.00%	22.00%	20.57%
Participation Rate	45.02%	59.22%	70.59%	66.53%	72.90%	78.85%	61.25%

Middle Third of Income Distribution

	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 65
Mean	5.42%	9.41%	7.99%	8.23%	9.46%	12.91%	10.32%
10th percentile	0.00%	0.00%	0.00%	0.00%	5.10%	2.50%	6.04%
25th percentile	0.00%	4.50%	2.00%	3.24%	6.00%	8.40%	6.04%
50th percentile	4.00%	10.00%	7.00%	7.43%	9.00%	13.29%	12.00%
75th percentile	9.00%	15.00%	12.00%	11.00%	12.36%	19.00%	15.00%
90th percentile	10.00%	18.00%	19.00%	16.00%	14.50%	20.00%	15.00%
Participation Rate	61.29%	86.11%	81.07%	84.65%	91.80%	92.66%	91.48%

Top Third of Income Distribution

	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 65
Mean	8.70%	8.74%	10.66%	9.84%	12.65%	10.71%	9.65%
10th percentile	0.00%	0.00%	2.00%	6.00%	1.15%	6.00%	5.00%
25th percentile	3.16%	5.00%	6.00%	7.00%	8.00%	6.89%	8.00%
50th percentile	9.00%	8.00%	10.00%	9.00%	10.00%	9.00%	9.60%
75th percentile	11.00%	12.00%	15.44%	12.00%	19.41%	11.62%	11.67%
90th percentile	25.00%	15.00%	18.00%	18.00%	30.00%	25.00%	15.00%
Participation Rate	78.10%	85.60%	92.02%	95.52%	90.85%	96.04%	94.74%

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