

# **Forecasting Retirement Needs and Retirement Wealth**

Edited by Olivia S. Mitchell,  
P. Brett Hammond, and Anna M. Rappaport

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## Chapter 4

# **Making the Most of 401 (k) Plans: Who's Choosing What and Why?**

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Robert L. Clark, Gordon P. Goodfellow,  
Sylvester J. Schieber, and Drew Warwick

Pension assets grew faster than total wealth in the United States during the 1980s, leading one researcher to conclude that “pensions are how America saves” (Shoven 1995). At the same time that pension wealth has grown in importance, there has been a revolution in the pension industry as defined contribution plans in general, and 401(k) plans in particular, have become the pensions of choice. During the late 1970s, there were approximately twice as many active participants in private defined benefit plans as in private defined contribution plans. Today, the situation is almost exactly reversed. This shift from defined benefit to defined contribution pension plans has been accompanied by a shift in the responsibility for financing and managing retirement accruals from firms to individuals. By the end of the 1980s, three-fourths of the contributions going into private pension plans went into defined contribution plans, and nearly half of these contributions went into plans partly dependent on voluntary contributions by workers. Projecting trends on pension contributions, the U.S. Department of Labor (1997) concluded that it will not be long before more money is going into private 401(k) plans than all other private pension plans combined, if we are not there already. Most of the contributions to these plans will be directly from workers.

During the same period, there was a similar shift in the responsibility for managing assets in employer-sponsored retirement plans. Defined benefit plan sponsors assume the responsibility of managing the pension assets in their retirement trusts, since they bear the risks associated with investment performance of pension funds. Today, the overwhelming majority of workers participating in 401(k) plans (and their public and nonprofit sector counterparts) are required to manage the investment of their retirement savings directly. In this new world, not only do workers have to determine

when to start saving for their retirement and how much to contribute to their retirement accounts, they also have to decide the allocation of pension funds across various types of assets.

Because of these fundamental changes in retirement plans and the importance of individual decision-making, we developed a new data file of the participants in 87 401(k) plans. This unique data file enabled us to examine individual savings and investment choices associated with these plans. Specifically, we examined who participated in these plans, how much they contributed when they did, and how they managed their assets as they accrued them.

We first describe the data file used in this analysis and present the characteristics of the participants in the plans. Next, we assess the factors related to participation and contribution rates in these plans, and then evaluate the general level of assets being accumulated. The next step is to examine the portfolio allocations and the associated characteristics of workers related to variations in asset allocations. Finally, we look at how participation, contribution rates, and asset allocations vary by the sex of the participants in these plans.

## **Description of the Data**

Our analysis of individual contribution and investment decisions in 401(k) plans was based on administrative records of 87 plans in operation during 1995. All information reported covered the 1995 calendar year. Of these plans, 41 were administrative recordkeeping clients of Watson Wyatt Worldwide; 46 were not. The smallest plan in the group had just under 25 participants, and the largest plan had approximately 15,000 participants. The plans analyzed here were not chosen on a random probability basis, but there is no reason to believe that the variation in characteristics of these plans was dissimilar to that of 401(k) plans generally.

A total of 234,573 workers were employed at some time during 1995 by the sponsors of these plans. Information for each worker included age, annual pay, 1995 contributions to the 401(k) plan, 1995 account balances, amount of funds in each investment option provided by the plan sponsor, years of service with the company, and employee's name.<sup>1</sup> Not all the employees were included in the sample used in the analysis for a variety of reasons. Workers under age 20 or over age 64 were omitted, as were part-year employees. Also eliminated were workers who did not have at least one year of service, because some plans had a one-year-of-service participation standard. In addition, employees with annual earnings of less than \$10,000 per year were deleted from the sample, because we were interested in examining the behavior of full-time workers and the administrative records did not include an hours measure that could be used for such screening. After these deletions, the base file used in the analysis contained 156,376 workers eligible to participate in the 401(k) plans in 1995.

## Utilization of 401(k) Plans

Since employee contributions to 401(k) plans are voluntary, workers must decide whether or not to designate a portion of pre-tax earnings as contributions to the plan. In general, individuals are free to select any contribution amount from zero up to the maximum annual level specified by the firm or the legal limit (\$9,240 in 1995). In evaluating the effectiveness of voluntary contributory retirement plans, analysts have been concerned about variations in the participation and contribution rates in these plans by workers at different levels of annual earnings. Part of the policy concern is to avoid providing higher-income workers a disproportionate share of the advantages of the preferential tax treatment afforded these plans.<sup>2</sup> Of course, there is also some interest in the potential of these plans to provide adequate retirement security to a broad cross-section of workers. Earlier research using similar data has concluded that the decision to participate in these plans and the amounts contributed vary with plan characteristics and with worker's age and earnings (Clark and Schieber 1998). That is where we begin the current analysis.

Policymakers concerned about the growth of voluntary retirement plans have also focused on the willingness of other specific groups of individuals to participate in 401(k) plans and on how the management of retirement assets varies across socioeconomic groups. For example, some argue that young people may not begin to save early enough or may save too little to accumulate sufficient assets by the time they retire. Others believe that low-wage workers and women might be overly risk averse and thus tend to invest too conservatively. For these reasons, it is important to examine carefully the investment choices of workers of different ages, sexes, and levels of earnings. The age and earnings distribution of persons employed by the sponsors of these 87 plans is shown in Table 1. These data indicate that half of the entire sample had annual earnings of \$15,000 to \$34,999 in 1995 and an additional third of the employees had earnings of between \$35,000 and \$74,999. Younger workers were more likely to have had lower earnings—82 percent earned less than \$35,000 per year, while persons 40 to 59 years of age were more likely to have had higher earnings.

### Participation in 401(k) Plans

Young, low-income workers were much less likely to participate in a 401(k) plan than older, high-income individuals. For example, fewer than half of all workers age 20–29 earning less than \$15,000 per year contributed to their 401(k) plan. In contrast, over 92 percent of workers aged 50 and older with earnings in excess of \$60,000 participated in their company plan. It is important to recognize that pension participation varies with both age and income. Furthermore, it should be recognized that older workers were more

TABLE 1: Age and Earnings Distribution of Employees (%)

<i>Age group</i>	<i>Annual Earnings (\$000)</i>							
	<i>10.0-14.9</i>	<i>15.0-24.9</i>	<i>25.0-34.9</i>	<i>35.0-44.9</i>	<i>45.0-59.9</i>	<i>60.0-74.9</i>	<i>75.0-99.9</i>	<i>100+</i>
20-29	12.4	37.8	31.4	12.1	5.0	0.8	0.4	0.2
30-39	6.1	21.8	27.0	18.8	14.1	5.9	3.5	2.7
40-49	6.5	20.5	22.8	16.2	14.7	7.7	5.8	5.9
50-59	8.2	23.0	22.4	13.9	13.5	6.8	5.7	6.5
60-65	10.4	28.1	21.6	12.9	11.0	6.0	4.4	5.6
All ages	7.7	24.4	25.5	15.9	12.6	5.8	4.1	4.0

Source: Authors' calculations from a file containing data on 87 401(k) plans and 156,376 persons employed by plan sponsors and eligible to participate in the plans in 1995.

likely to be participating in the pension plan than the average of all workers. This indicated that the number of people who will accumulate pension accounts sometime during their life is greater than that shown by a single cross-section of the proportion of workers who are participating in a plan during that year.<sup>3</sup>

Table 2 reports the proportion of eligible workers who contributed to their 401(k) plans during 1995 by various ages and levels of annual earnings. These data reveal important earnings and age patterns in the proportion of earnings contributed to the 401(k) plan. The effect of increases in annual earnings on the likelihood that a worker will participate in the plan was also clearly shown in these data. Only 60 percent of all workers with annual earnings between \$10,000 and \$14,999 participated in the 401(k) plans, while approximately three quarters of those earning between \$15,000 and \$34,999 made contributions during 1995. Over 80 percent of workers with annual earnings between \$35,000 and \$59,999 participated, and over 90 percent of those earning in excess of \$60,000 made contributions. Holding age constant, the proportion of workers who participated in the plan increased rapidly with income up to the earnings level of \$60,000 to \$74,999. Further increases in income did not seem to affect participation.

Participation rates also rose with age, from 66 percent for those aged 20–29 to 79 percent for 30–39-year-olds, and over 80 percent of workers aged 40 and over. This age-related increase in participation was much larger among low-income workers. For most workers, their earnings increases as they age. Therefore, a lifecycle pattern of participation is best viewed as a movement along the diagonals of the table.

Multivariate statistical analysis of participation in a 401(k) plan produced estimates of the partial effects of earnings, age, and tenure on the probability of workers making contributions to their 401(k) accounts in 1995. Since the information in Table 2 suggested that these variables had a non-linear effect, the estimated equation included age and age squared, tenure and tenure squared, and earnings and earnings squared. In addition, the equation included dichotomous variables indicating the worker's sex and a series of dichotomous variables identifying the 401(k) plan in which the person was enrolled.<sup>4</sup>

The estimated marginal effects indicated that the probability of participation in the plan increases with age, tenure, and earnings, but at a decreasing rate. Given the nonlinearity of the relationships between participation and age, tenure, and earnings level, the best method of assessing their effects was to plot the implied participation probabilities as age, tenure, and earnings vary. Figure 1 shows the increase in the probability of 401(k) participation with increases in earnings for a hypothetical male worker age 40 and having 10 years of tenure employed by the largest plan sponsor in our sample.<sup>5</sup> The probability of 401(k) participation for such a worker earning less than \$25,000 was approximately 55 percent, while a similar worker earning

TABLE 2: 401(k) Participation Rates by Age and Earnings (%)

<i>Age group</i>	<i>Annual Earnings (\$000)</i>								<i>All Earnings</i>
	<i>10.0-14.9</i>	<i>15.0-24.9</i>	<i>25.0-34.9</i>	<i>35.0-44.9</i>	<i>45.0-59.9</i>	<i>60.0-74.9</i>	<i>75.0-99.9</i>	<i>100+</i>	
20-29	43.5	61.7	71.4	79.5	86.3	91.3	91.0	91.1	66.2
30-39	59.3	71.5	76.6	81.2	87.7	91.3	93.6	89.0	78.6
40-49	63.7	76.0	78.8	81.8	86.1	90.3	92.0	89.2	81.1
50-59	73.8	81.5	82.4	85.0	87.8	92.9	95.1	92.3	84.7
60-65	75.9	82.0	80.9	84.9	90.5	96.6	93.1	92.4	84.4
All ages	59.6	72.1	77.1	81.8	87.2	91.4	93.2	90.2	78.6

Source: See Table 1.

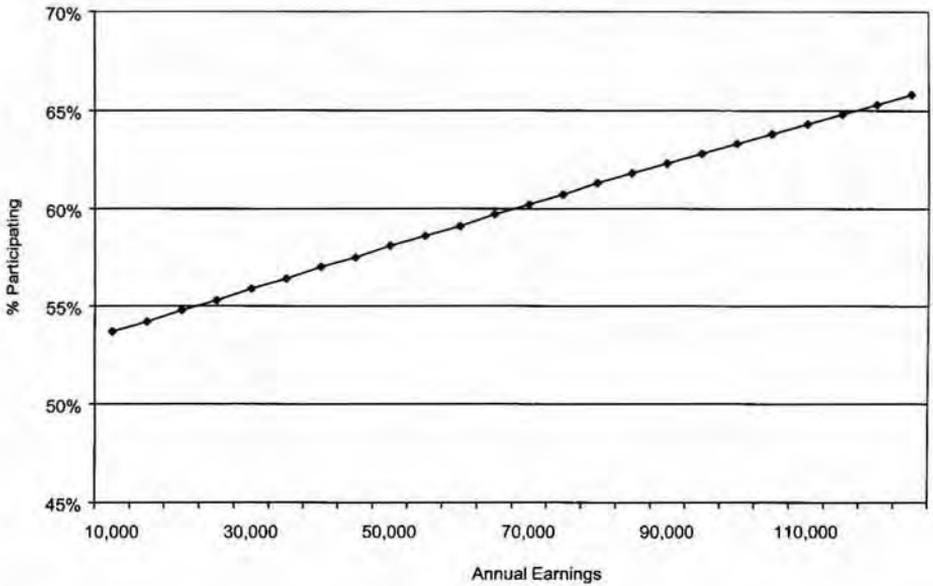


Figure 1. 401(k) participation rates for men by earnings (%). Values are based on the logit regression in column 2, Appendix Table 1. Values are for employees of the largest plan sponsor, age 40, with 10 years tenure.

\$75,000 had a participation probability of about 60 percent. Participation rates for men with annual earnings of \$125,000 exceeded 65 percent. The estimation procedure constrained the participation probabilities for women to have the same relationship with increases in annual earnings as that shown for men in Figure 1; however, the probability of participation was predicted to be about 2 percentage points higher at each level of income.

The effects of advancing age and tenure on 401(k) participation probabilities are shown in Figure 2 for two different earnings levels, \$25,000 and \$75,000. In this case, the profiles are for a man hired by the firm at age 30; thus as age increases by one year, so does tenure. The profiles show that the probability of participation in the plan at age 30 was just under 50 percent for men earning \$25,000, and about 53 percent for those with \$75,000. These probabilities rose slightly with age until the mid-40s and then declined. The predicted participation rates for women had the same age pattern as that shown in Figure 2, they were slightly higher at each age.

An alternative specification used to examine the participation decision introduced two company-specific pension variables that were expected to influence whether a worker would participate in the 401(k) plan. Specifically, we hypothesized that a worker will be more likely to make a contribu-

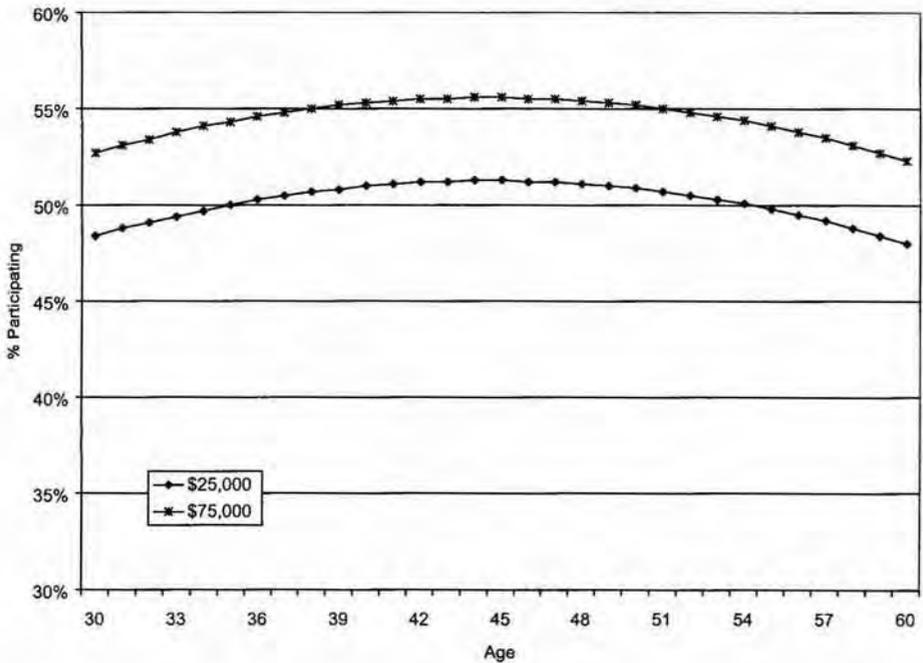


Figure 2. 401(k) participation rates for men by age and earnings (%). Values are based on the logit regression in column 2, Appendix Table 1. Values are for employees hired at age 30 by the largest plan sponsor, with either \$25,000 or \$75,000 annual earnings.

tion to the plan when the company provides a matching contribution, and the higher the match rate, the more likely a worker will be to participate in the plan. We also argue that the existence of a company defined benefit plan will influence 401(k) participation. Hence, we asked whether the projected age-65 replacement rate from the defined benefit plan affects the likelihood that a worker will make a contribution to the 401(k) plan.<sup>6</sup> The individual 401(k) plan indicators were not included in this specification of the participation equation.

The estimates indicate that workers were, in fact, more likely to participate in the 401(k) plan the higher the company match rate. The estimated effects indicated that each 10 percentage point increase in the match rate increased the probability of 401(k) participation by 3 percentage points. This finding is consistent with workers responding to the economic incentive of a higher return on their own investment when the match is included (Clark and Schieber 1998). The estimated effects of a higher defined bene-

fit replacement rate indicated that a 10 percentage point higher projected rate at age 65 reduced the probability of participating in the 401(k) plan by 0.4 percentage points. This finding suggested that workers had a target level of retirement savings in mind when they decided whether to participate in these plans, so that employees covered by more generous defined benefit plans desired to save less in their 401(k) plans.

### Contribution Rates by 401(k) Participants

Annual employee contributions as a percent of salary are shown in Table 3 by various age and earnings groups. The entries indicate the average percentage of earnings contributed to the plan by those workers who made a contribution during 1995. The table also reports combined employee and employer annual contributions. For all participants with annual earnings under \$45,000, employee contributions were between 6 and 7 percent of earnings, while combined contributions represented about 10 percent of compensation. For workers earning \$45,000–\$99,999, employee contributions totaled 7–8 percent of earnings, and combined contributions amounted to 11–12 percent. Finally, contributions as a percent of earnings were lower for persons earning in excess of \$100,000. The decline in the contribution rate for highly compensated workers was presumably driven by the maximum contribution rates imposed by the company and/or the tax code.

Among those workers contributing to a plan, age effects were greater than the earnings effects described above. The contribution rates increased with age for all workers and within each income category. Participants age 20–29 contributed 5 percent of their earnings, while those age 30–39 contributed almost 7 percent. The contribution rate continued to increase with age, as persons age 50–59 contributed 8 percent of earnings and those age 60–65 contributed 9 percent.

A multivariate analysis of contribution rates enables us to determine how these rates vary with age, tenure, earnings, sex, and dichotomous variables indicating the plan in which the person was enrolled (see the first two columns of Appendix Table 2).<sup>7</sup> The analysis of contribution rates included only persons who made a contribution in 1995 to their 401(k) plan. The results show that contributions as a percent of pay were flat up to the \$65,000 earnings level. Above \$65,000, discrimination limits and dollar cap limits imposed by the tax code reduced contribution rates relative to workers' pay.

Figure 3 plots the interacting effects of age and tenure on the probability of men participating in a 401(k) plan, derived from the same multivariate analysis. The values were calculated for a 401(k) participant earning \$40,000 per year, who was hired at age 30. The combined effects of increasing age and tenure on the contribution rate to the plan were strongly posi-

TABLE 3: 401(k) Contribution Rates by Age and Earnings (% of Annual Earnings)

Age group	Annual Earnings (\$000)								
	10.0-14.9	15.0-24.9	25.0-34.9	35.0-44.9	45.0-59.9	60.0-74.9	75.0-99.9	100+	All Earnings
<i>Employee contributions as a percentage of earnings</i>									
20-29	4.4	4.4	4.9	6.1	6.8	7.5	5.6	4.2	5.0
30-39	6.4	6.4	6.1	6.5	7.2	7.5	7.2	5.5	6.6
40-49	7.5	7.3	6.6	6.8	7.3	7.6	7.4	5.9	7.0
50-59	8.2	9.1	8.1	8.1	8.3	8.4	7.6	6.0	8.2
60-65	9.3	10.4	8.9	9.2	9.4	8.8	7.9	5.6	9.2
All ages	6.9	6.9	6.4	6.9	7.5	7.8	7.4	5.8	6.9
<i>Employee contributions plus employer match as a percentage of earnings</i>									
20-29	6.8	7.6	8.5	9.6	10.5	10.9	8.1	5.7	8.4
30-39	9.6	9.9	9.7	10.1	11.1	11.5	11.1	8.2	10.2
40-49	10.7	10.9	10.2	10.2	11.1	11.5	11.5	9.2	10.6
50-59	11.4	13.0	12.0	11.8	12.2	12.2	11.7	9.3	12.0
60-65	12.1	14.5	13.3	12.7	13.5	13.0	11.7	8.5	13.1
All ages	9.9	10.4	10.1	10.4	11.3	11.7	11.4	8.9	10.5

Source: See Table 1.

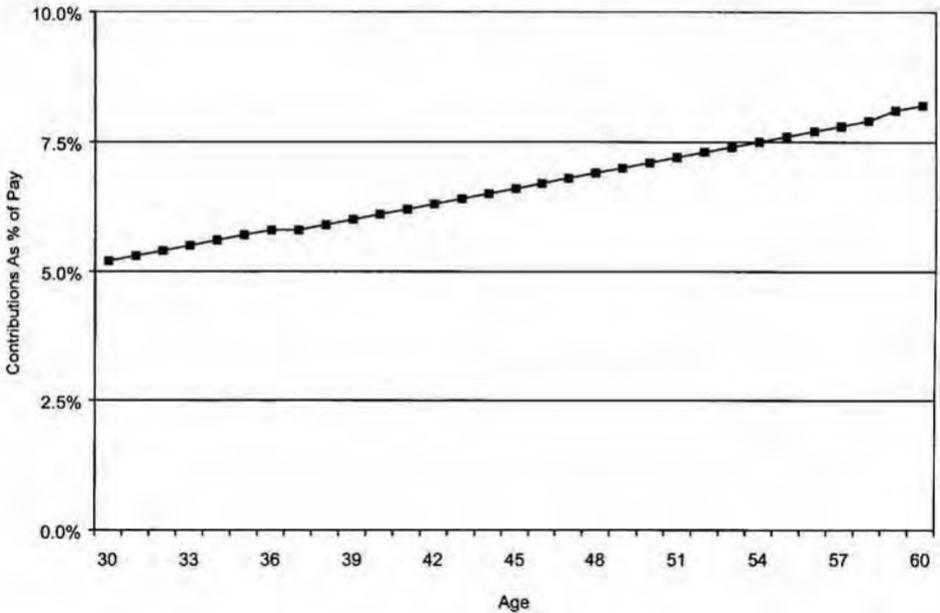


Figure 3. 401(k) contribution rates for men by age (as % of annual pay). Values are based on the OLS regression shown in column 2, Appendix Table 2. Values are for employees hired at age 30 by the largest plan sponsor, with annual earnings of \$40,000.

tive, with contributions rising from 5 percent to 8 percent between age 30 and age 60.

We also developed an alternative specification of the contribution rate equation that included the 401(k) match rate and the level of generosity of the defined benefit plan where there was one. The results are shown in the third and fourth columns of Appendix Table 2. The negative coefficient on the match rate provided further support for the target saving hypothesis. The estimated coefficient indicates that each 10 percentage point increase in the match rate was associated with a reduction in the contribution rate of 0.4 percentage points. In this equation, the replacement rate from the defined benefit plan had a positive effect on the 401(k) contribution rate, was at odds with the target savings model. This finding is, however, consistent with Ippolito's (1997) hypothesis of saving preferences. This model predicts that workers with high saving preferences will want both defined benefit and defined contribution retirement savings plans. The coefficient indicated that each 10 percentage point increase in the projected replacement rate from the defined benefit plan increased the contribution rate by 2 percentage points.

TABLE 4: Average Account Balance by Age and Earnings

Age group	Annual Earnings (\$000)								
	10.0-14.9	15.0-24.9	25.0-34.9	35.0-44.9	45.0-59.9	60.0-74.9	75.0-99.9	100+	All Earnings
<i>Balances from employee contributions</i>									
20-29	1,258	2,128	3,646	6,811	10,862	15,000	13,444	14,799	4,026
30-39	2,802	4,238	7,003	11,423	17,813	26,875	34,106	43,745	12,411
40-49	4,661	6,234	9,804	16,726	25,755	39,919	52,644	73,109	21,884
50-59	6,811	9,759	15,677	26,221	38,689	55,534	71,594	117,054	32,145
60-65	8,290	14,442	20,908	30,732	46,830	64,523	80,600	145,358	36,082
All ages	4,184	5,711	8,920	15,276	24,673	38,700	51,945	81,367	18,562
<i>Total balances</i>									
20-29	2,200	3,907	6,781	11,881	18,783	23,834	19,810	21,928	7,169
30-39	5,328	7,539	12,762	20,454	30,905	44,944	55,993	68,937	21,409
40-49	8,226	10,974	17,461	29,131	44,731	65,955	89,316	121,279	37,359
50-59	11,304	16,506	26,430	42,934	63,941	88,733	119,121	202,854	53,770
60-65	13,081	23,318	34,391	50,655	78,417	103,810	123,932	239,431	58,797
All ages	7,250	9,908	15,731	26,342	42,168	63,413	86,537	136,447	31,511

Source: See Table 1.

## Investment Patterns of 401 (k) Assets

Participating in a 401 (k) plan and contributing reasonable amounts to the plan play an extremely important role in determining the amount of money that these plans will produce for retirement income purposes. Thus, it is important to examine retirement fund balances attributable to employee contributions as well as total 401 (k) accumulations. Table 4 reports the 401 (k) account balances of all workers who had contributed to one of the sample plans in the past (even though they might not have done so during 1995).<sup>8</sup> Not surprisingly, Table 4 reveals a strong relationship between earnings, age, and 401 (k) plan balances. In the bottom three earnings classes, which include workers with earnings up to \$35,000 per year, the average cumulative total balances in the plans were roughly equal to one-half a year's earnings. Average account balances rose steadily with increases in earnings until they approached annual earnings for workers earning between \$75,000 and \$100,000. Fund balances across different age groups varied significantly with earnings. For example, accumulated balances of workers in their mid-60s with earnings up to \$25,000 were roughly 6 times those of workers in their 20s with similar earnings. For those earning \$35,000 to \$75,000, the differential for these age groups dropped to only 4 times. At earnings levels above \$75,000, the differential ranged from 8 to 10 times.

To examine the investment choices of plan participants, the 87 firms were divided into two groups, depending on whether the 401 (k) plan offered company stock as an investment option in the plan. In our sample of plans, 58 did not offer company stock as an investment option for plan participants, and 29 companies did. Plans with company stock options employed one of three types of investment options: 16 plans simply offered company stock as an investment option that participants could invest in if they so chose without any incentives or requirements that they do so; 9 plans contributed matching contributions only to the company stock account and allowed plan participants free choice as to whether they wanted to invest their own contributions in company stock; and 4 plans required that employee contributions be made to the company stock account in order to qualify for matching employer contributions that also went to the company stock account.

Focusing first on the 58 plans without any company stock investment option, Table 5 reports the proportion of total 1995 contributions allocated to the purchase of equities and fixed-income assets. Two consistent patterns emerge from these data. First, the proportion of contributions allocated to fixed-income assets increased with age. The proportion of new contributions devoted to fixed-income assets increased from approximately 43 percent for workers under age 40 to about 55 percent for participants age 50 and older. The increase in fixed assets with age was observed within each of the earnings categories. Second, as annual earnings increased, the propor-

TABLE 5: Allocation of 401(k) Contributions by Age and Earnings; 401(k) Plans without Company Stock as an Investment Option (%)

Age group	Annual Earnings (\$000)								All Earnings
	10.0–14.9	15.0–24.9	25.0–34.9	35.0–44.9	45.0–59.9	60.0–74.9	75.0–99.9	100+	
<i>Percent of contributions in equities</i>									
20–29	53	53	59	63	68	68	69	74	58
30–39	46	49	54	61	63	67	70	75	57
40–49	46	48	47	56	58	60	64	70	54
50–59	38	42	43	49	53	57	58	66	47
60–65	37	35	37	43	45	58	51	61	41
All ages	45	48	50	57	60	62	64	70	54
<i>Percent of contributions in fixed-income assets</i>									
20–29	47	47	41	37	32	32	31	26	42
30–39	54	51	46	39	37	33	30	25	43
40–49	54	52	53	44	42	40	36	30	46
50–59	62	58	57	51	47	43	42	34	53
60–65	63	65	63	57	55	42	49	39	59
All ages	55	52	50	43	40	38	36	30	46

Source: Authors' calculations. Allocations are calculated only for employees making a contribution in 1995. Plan information is from a file containing data on 58 401(k) plans that did not provide the option of investing in company stock.

tion of new contributions designated for the purchase of fixed-income assets declined. Workers with annual earnings under \$35,000 allocated slightly more than half their contributions to fixed-income assets, while individuals with earnings in excess of \$60,000 put only 30 to 40 percent of their contributions in fixed-income accounts.

Among participants in the 29 plans that offered or required some purchase of company stock, we found that these workers designated much less of their 401(k) contributions to fixed-income assets (33 percent in Table 6 compared to 46 percent in Table 5). This was true for each of the age/earnings entries shown in the two tables. The first panel of Table 6 shows that low earners (those with earnings between \$10,000 and \$15,000) allocated 38 percent of their contributions to company stock; at earnings of \$15,000 to \$25,000 the share contributed to company stock dropped to 28 percent; and it peaked at 41 percent for those earning \$45,000 to \$60,000. The proportion of contributions devoted to company stock declined slightly at earnings levels over \$75,000. In general, the proportion of contributions allocated to company stock rose with age until 50 to 59, and then declined.

We also examined summary investment information for 401(k) aggregate account balances reported in Table 7. The data show that the individual portfolio composition of account balances was remarkably close to the allocation of 1995 contributions. Workers with earnings in excess of \$15,000 held less of their 401(k) balances in fixed-income assets as annual earnings increased. Also, workers without a company stock investment option consistently put 10 to 15 percentage more of their 401(k) contributions and total account balances in fixed-income asset accounts, as compared to those with a company stock option.

To clarify how the availability of company stock as an investment option affected 401(k) asset allocations between equities and fixed-income assets, we estimated Tobit equations (reported in Appendix Tables 3 and 4). The investment in fixed-income assets was clearly different between plans that offer company stock as an investment option and those that did not. For both sets of plans, there was a negative relationship between earnings level and investment in fixed-income assets, although it was much stronger in the case of plans with company stock than in those without it (see Figure 4). The combined effects of age and tenure reflected in Figure 5 was positive for both sets of plans, although it was somewhat more so for plans with company stock.

In plans that provided an employer match in company stock (but the employee was not constrained to put his or her own contributions in the company stock fund), the percent of participant contributions to fixed-income assets increased by 12 percent relative to plans where company stock investment was totally voluntary. Among the plans that required the employee to contribute to the company stock fund in order to qualify for a

TABLE 6: Allocation of Contributions by Age and Earnings: Plans with Company Stock as an Investment Option (%)

Age group	Annual Earnings (\$000)								All Earnings
	10.0-14.9	15.0-24.9	25.0-34.9	35.0-44.9	45.0-59.9	60.0-74.9	75.0-99.9	100+	
<i>Percentage of contributions in company stock</i>									
20-29	26	23	28	37	36	34	17	12	28
30-39	40	30	32	37	38	37	37	30	35
40-49	44	31	33	39	41	41	39	39	37
50-59	41	30	32	39	46	48	44	42	39
60-65	39	28	30	37	39	35	31	28	33
All ages	38	28	31	38	41	41	39	38	35
<i>Percentage of contributions in other equities</i>									
20-29	39	32	34	36	43	48	71	72	35
30-39	35	32	31	33	38	41	45	55	35
40-49	31	29	29	30	33	36	41	45	32
50-59	29	25	24	25	27	28	36	39	27
60-65	29	24	22	22	22	34	40	46	27
All ages	33	30	30	31	34	36	41	45	32
<i>Percentage of contributions in fixed-income assets</i>									
20-29	35	45	38	27	21	18	12	16	37
30-39	25	38	37	30	24	22	18	15	31
40-49	25	40	38	31	26	22	21	16	31
50-59	30	45	44	36	27	24	20	19	34
60-65	32	48	48	41	39	31	29	26	41
All ages	29	42	39	31	25	23	20	17	33

Source: Authors' calculations. Allocations are calculated only for employees making a contribution in 1995. Plan information is from a file containing data on 29 401(k) plans that did provide the option of investing in company stock.



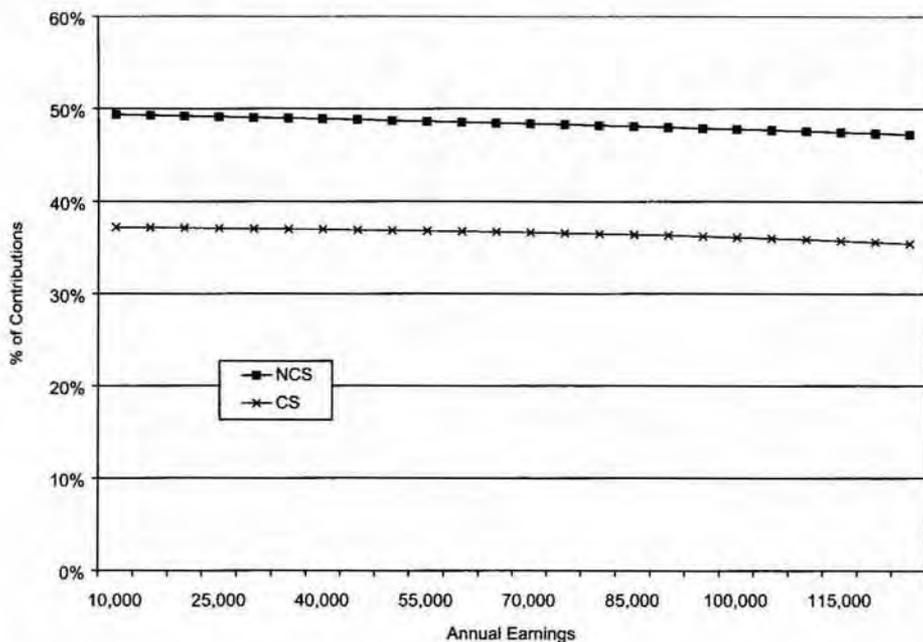


Figure 4. Allocation of 401(k) contributions to fixed-income assets by men by earnings, for plans with and without company stock investment options (%). Values are based on the Tobit estimates in columns 2 and 3, Appendix Table 3. Values are for employees age 40 with 10 years of tenure. Intercepts should not be interpreted as representing an average difference between plans with and without company stock. CS/NCS refer to plans that respectively do or do not offer company stock as an investment option.

match, participant contributions to fixed-income assets were reduced by 25 percent. In this latter case, it was clear that forcing employees to take company stock to qualify for a match caused participants to substitute out of fixed-income assets.

Examining only plans that include company stock as an investment option, we estimated the allocation of participant contributions to company stock and other equities. The relationship between earnings level and investment in both company stock and other equities was positive, although somewhat less so in the case of company stock. Estimates indicated that plan requirements that a portion of 401(k) contributions be invested in company stock were successful in getting participants to invest funds in that fashion. Our analysis indicated that the more restrictive the constraint, the more effective it was in increasing the allocation to company stock. In the case of

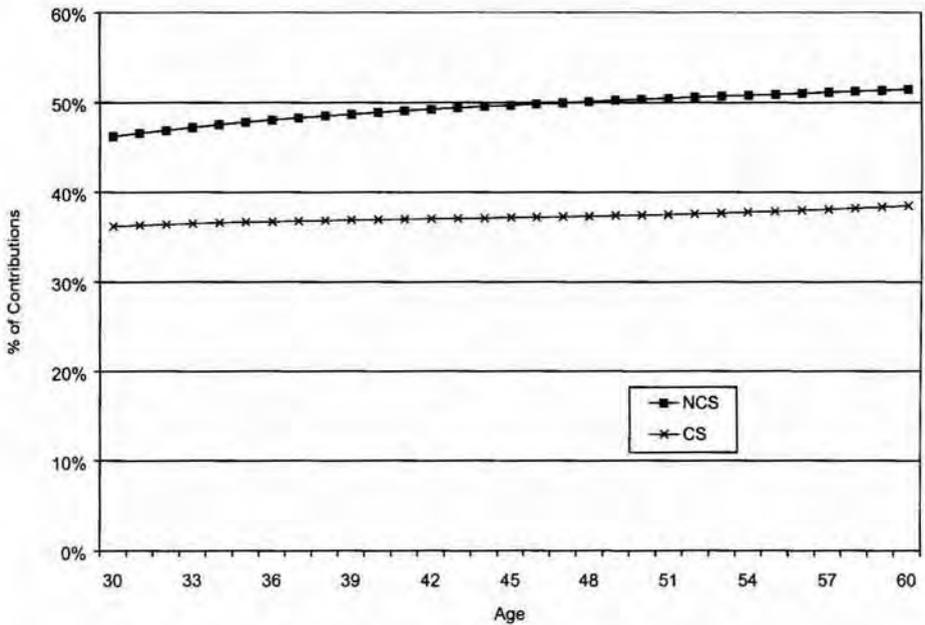


Figure 5. Allocation of 401(k) contributions to fixed-income assets by men by age, for plans with and without company stock investment (%). Values are based on the Tobit estimates in columns 2 and 3, Appendix Table 3. Values are for employees hired at age 30 with annual earnings of \$40,000. Intercepts should not be interpreted as representing an average difference between plans with and without company stock. CS/NCS refer to plans that respectively do or do not offer company stock as an investment option.

the other equities equation, it was clear that company stock constraints pushed people out of other equity holdings.

### Sex Differences in 401(k) Decisions

One area that is of particular interest to analysts of defined contribution plans is the relative behavior of men and women. For example, several studies based on a small number of pension plans have reported that women demonstrate greater risk aversion in allocating assets within their self-directed defined contribution plans than men (Bajtelsmit and VanDerhei 1997; Hinz, McCarthy, and Turner 1997), and that women are even less likely than men to allocate wealth into defined contribution plans (Jianakopulos, Bernasek, and Bajtelsmit 1998). To shed some light on the relative participation and investment behavior of men and women, we created a subfile of workers that

includes the sex of each employee.<sup>9</sup> Out of the original 156,376 workers used in the analysis, the sex was determined for 142,543. Of these, 46 percent were classified as female. The women were disproportionately represented in the earnings categories below \$35,000 per year, as were women in their 20s.

Our earlier analysis as well as research by others indicated that women behave differently from men in deciding to participate in 401(k) plans, in the amount they contribute, and in the allocation of their pension funds. Using our newly developed data file, we were able to examine the 401(k) choices of men and women in much more detail than previous studies had done. Our findings indicated that women were not more reluctant 401(k) participants, and they did not seem to be more risk averse in investing their self-directed defined contribution assets.

### Sex Differences in 401(k) Participation

A summary of participation rates by sex, age, and earnings categories is presented in Table 8. In general, women were slightly more likely to participate (80 percent) in their companies' 401(k) plans than men (78 percent). A greater proportion of women participated in the plan in every age and income category for workers with less than \$60,000 per year. Of the 40 age/earnings categories shown in Table 8, the male participation rate exceeded the female rate in only eight categories, with four of these being for workers with annual earnings in excess of \$100,000 (shown in boldface).

One reason that women generally participated in 401(k) plans more frequently than men may relate to differences in household income. Our administrative data did not include information on marital status of workers, total household income, or the working status of spouses. But in an analysis not reported in detail here we examined the March 1996 Current Population Survey and found that working women were likely to be in families with higher overall family income levels than working men with equivalent annual earnings.<sup>10</sup>

The difference in family income level between men and women at comparable earnings levels means that some of the differential in how women behave in 401(k) plans compared to men may be a factor of variables we cannot measure here. If the decisions about participating, contributing, or investing in a 401(k) plan were made on the basis of total resources available to workers, viewing these factors on the basis of earnings alone might be misleading. For example, comparing working men and women at earnings levels between \$25,000 and \$35,000, the women's mean family income tended to be about \$15,000 higher than for men. If 401(k) usage is based on family income instead of individual worker's earnings level, it suggests that we should be comparing a woman with annual earnings of \$25,000 in 1995 with a man earning closer to \$40,000 rather than one earning \$25,000. Since we do not know other family resources for workers in this analysis, we decided

TABLE 8: Participation Rates by Sex, Age, and Earnings (%)

Age group	Annual Earnings (\$000)								All Earnings
	10.0-14.9	15.0-24.9	25.0-34.9	35.0-44.9	45.0-59.9	60.0-74.9	75.0-99.9	100+	
<i>Women</i>									
20-29	47.8	65.2	77.9	87.5	90.9	90.0	86.7	100.0	68.7
30-39	63.8	74.7	82.0	88.4	91.7	94.3	93.3	78.9	80.1
40-49	68.0	79.5	83.5	88.1	91.9	94.9	94.0	82.0	82.4
50-59	78.0	84.6	87.8	92.8	93.8	97.6	97.7	87.8	86.5
60-65	79.8	87.7	88.9	93.3	92.2	91.7	100.0	78.6	87.6
All ages	64.3	76.0	82.7	89.0	92.0	94.8	94.1	81.8	79.9
<i>Men</i>									
20-29	34.1	56.1	64.6	76.4	85.3	<b>92.4</b>	<b>93.6</b>	84.6	63.8
30-39	49.3	65.9	72.1	77.8	86.2	90.7	<b>93.8</b>	<b>91.4</b>	77.7
40-49	53.4	67.1	73.4	78.2	84.5	89.3	91.5	<b>90.1</b>	80.2
50-59	62.1	73.8	75.8	81.1	86.0	92.2	94.6	<b>92.5</b>	83.4
60-65	69.2	70.2	71.3	82.0	89.9	<b>97.0</b>	92.2	<b>93.3</b>	82.3
All ages	48.8	64.6	71.4	78.3	85.6	90.7	92.9	91.2	77.7

Source: See Table 1.

Note: Entries for men in boldface show age and earnings cells where men's participation rate is greater than women's.

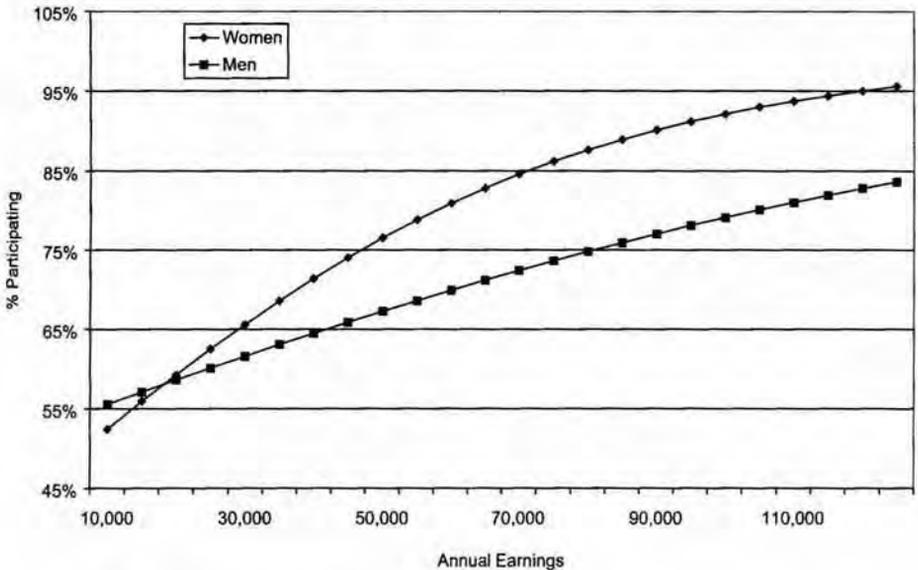


Figure 6. 401(k) participation rates by sex and earnings (%). Values are based on the logit estimates in column 2, Appendix Table 5. Values are for employees of the largest plan sponsor, age 40, with 10 years tenure.

that it would be most appropriate to estimate probability models of participation, contributions, and account management separately for men and women.

Sex differences in the decision to participate in a 401(k) plan were examined by estimating separately the participation equation for men and women (results are shown in Appendix Table 5). The estimates indicate that age, tenure, and annual earnings were all important determinants of participation for both men and women and that each of these effects was nonlinear. Figure 6 shows the estimated effect of earnings by sex on 401(k) participation for hypothetical male and female workers age 40 with 10 years of earnings. A somewhat surprising finding is that the probability of participating in a 401(k) plan was higher for women than for men, for annual earnings in excess of \$15,000. Furthermore, this difference widened at higher levels of annual earnings. Women with earnings over \$75,000 had a probability of participating in the plan over 12 percentage points higher than for men.

Patterns of participation also differed by sex and age (Figure 7). For workers with earnings of \$40,000 per year, the predicted probability of making a 1995 contribution to the 401(k) plan increased with age and tenure for both men and women until the early 50s and then declined slightly.

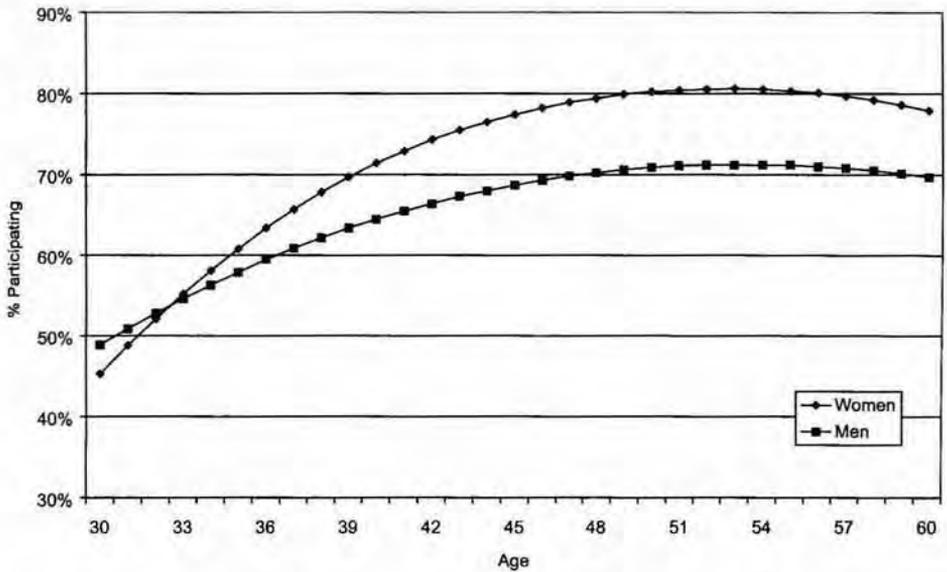


Figure 7. 401(k) participation rates by sex and age (%). Values are based on the logit estimates in column 2, Appendix Table 5. Values are for employees of the largest plan sponsor, hired at age 30, with annual earnings of \$40,000.

Among young workers, men were more likely to participate in their plans; however, for persons over age 33, women had a higher probability of participation. The sex gap in participation reached 10 percentage points by age 50.

### Sex Differences in 401(k) Contribution Rates

Another surprising result is that women contributed a higher proportion of earnings to 401(k) plans than did men with similar earnings. Average contribution rates by age, sex, and earnings are shown in Table 9. These data reveal an interesting pattern of age/earnings differences in contribution rates by sex. The bold entries in the second half of the table indicate that the contribution rate for that age/earnings level was greater for men than for women. Men at low earnings levels contributed a higher proportion of their earnings than did women at similar earnings levels at all ages. Some of these age/earnings differences in contribution rates were in excess of two percentage points of earnings. For workers with earnings in excess of \$25,000, men age 20 to 29 continued to contribute at higher levels than women; however, for older workers, women contributed a greater proportion of their annual pay.

Multivariate model of contribution rates was estimated separately for men

TABLE 9: 401(k) Contribution Rates by Sex, Age, and Earnings (% of Annual Earnings)

Age group	Annual Earnings (\$000)								All Earnings
	10.0-14.9	15.0-24.9	25.0-34.9	35.0-44.9	45.0-59.9	60.0-74.9	75.0-99.9	100+	
<i>Women</i>									
20-29	4.2	4.2	4.5	5.6	6.8	6.0	5.3	2.9	4.5
30-39	6.0	6.1	6.1	6.6	7.6	7.5	6.9	5.3	6.4
40-49	6.8	7.0	6.8	7.4	8.1	8.2	8.1	5.9	7.1
50-59	7.7	8.9	8.3	9.2	9.0	9.5	7.8	6.8	8.6
60-65	8.9	10.6	9.0	10.4	8.8	10.1	10.7	4.8	9.8
All ages	6.5	6.7	6.4	7.3	8.0	8.0	7.5	5.7	6.8
<i>Men</i>									
20-29	<b>4.7</b>	<b>5.1</b>	<b>5.4</b>	<b>6.3</b>	<b>7.0</b>	<b>7.3</b>	<b>5.4</b>	<b>4.8</b>	<b>5.7</b>
30-39	<b>7.7</b>	<b>6.9</b>	6.1	6.4	7.1	7.4	<b>7.2</b>	<b>5.4</b>	<b>6.7</b>
40-49	<b>10.3</b>	<b>8.3</b>	6.4	6.5	7.0	7.4	7.2	5.8	6.9
50-59	<b>10.8</b>	<b>9.8</b>	7.7	7.5	8.1	8.3	7.6	6.0	7.9
60-65	<b>11.6</b>	10.2	9.0	8.4	9.1	8.7	7.6	<b>5.7</b>	8.7
All ages	<b>8.6</b>	<b>7.3</b>	6.3	6.6	7.3	7.6	7.3	<b>5.8</b>	6.9

Source: See Table 1.

Note: Entries for men in boldface show age and earnings cells where men's average contribution rate is greater than women's.

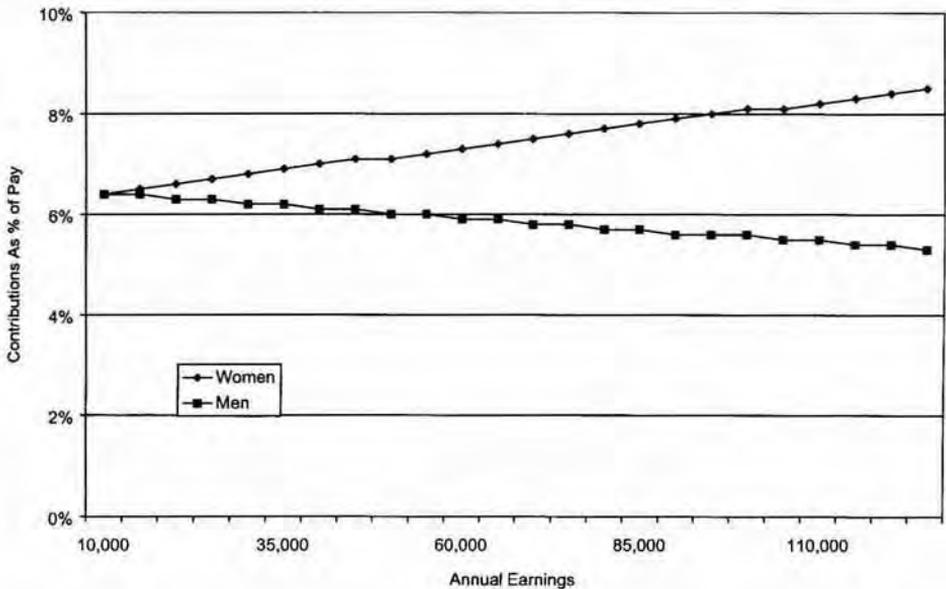


Figure 8. 401(k) contribution rates by sex and earnings (%). Values are based on the OLS estimates in columns 2 and 4, Appendix Table 6. Values are for employees of the largest plan sponsor, age 40, with 10 years tenure.

and women (Appendix Table 6), and the results are used to examine how age and earnings affect differences in sex-specific contribution rates. Figure 8 shows that for workers age 40 with 10 years of tenure, the contribution rate for women was greater than that for men for all but the lowest income workers, and the difference widened as earnings increased. The estimated effects indicated that with the exception of workers under age 33, working women of all ages contributed a higher proportion of annual earnings to their 401(k) plan. Together with the findings concerning participation, these effects indicated that women workers offered 401(k) plans were at least as active participants as men, controlling for differences in age, tenure, earnings, and plan features. We next examined whether men and women behaved differently in the investment of their 401(k) contributions and account balances.

#### Sex Differences in 401(k) Accumulations

An analysis of account balances by sex showed that men had larger account balances than women. In our sample, men had balances of \$24,880, or over twice the size of the average female balance of \$11,360. However, this obser-

TABLE 10: Average Account Balances by Sex, Age, and Earnings

Age group	Annual Earnings (\$000)								All Earnings
	10.0-14.9	15.0-24.9	25.0-34.9	35.0-44.9	45.0-59.9	60.0-74.9	75.0-99.9	100+	
<i>Women</i>									
20-29	1,246	2,025	3,259	6,377	9,012	13,893	10,087	8,153	3,074
30-39	2,608	4,122	7,038	11,832	18,002	25,736	30,527	36,294	9,146
40-49	3,893	5,890	10,041	17,910	27,521	40,444	48,644	58,644	13,786
50-59	4,937	9,219	16,336	28,287	39,795	53,001	62,161	99,353	17,377
60-65	6,374	12,564	21,289	34,374	53,487	64,274	78,379	72,657	19,853
All ages	3,430	5,493	9,173	16,301	24,672	35,422	42,473	53,983	11,360
<i>Men</i>									
20-29	<b>1,351</b>	<b>2,334</b>	<b>4,150</b>	<b>6,996</b>	<b>11,420</b>	<b>14,286</b>	<b>13,966</b>	<b>19,787</b>	<b>5,201</b>
30-39	<b>3,426</b>	<b>4,511</b>	6,981	11,249	17,787	<b>27,158</b>	<b>34,797</b>	<b>45,575</b>	<b>15,100</b>
40-49	<b>7,345</b>	<b>7,317</b>	9,628	15,989	25,038	39,495	<b>52,574</b>	<b>74,426</b>	<b>28,426</b>
50-59	<b>13,164</b>	<b>11,306</b>	15,060	25,193	38,261	<b>56,531</b>	<b>71,672</b>	<b>117,724</b>	<b>44,637</b>
60-65	<b>14,604</b>	<b>19,641</b>	20,883	30,227	46,250	63,429	<b>82,559</b>	<b>152,961</b>	<b>52,520</b>
All ages	<b>6,622</b>	<b>6,224</b>	8,640	14,689	24,639	<b>39,491</b>	<b>53,326</b>	<b>84,638</b>	<b>24,880</b>

Source: See Table 1.

Note: Entries for men in boldface show age and earnings cells where men's average account balance is greater than women's.

vation did not hold for all ages and earnings levels (see Table 10). Men's balances were consistently larger than women's for workers in their 20s and at the bottom and top of the earnings distributions. In the middle of the earnings distribution, however, women had larger accumulated account balances, and in some cases these differences were fairly large. One explanation for men having larger account balances despite being less likely to participate in the plan and having lower contribution rates may be that older men had longer job tenure than similar aged women. The general observation that men tended to have higher earnings than women will also tend to produce higher 401(k) account balances.

### Sex Differences in 401(k) Investments

Each of the 401(k) plans in our sample required participants to make investment decisions. These choices were classified into fixed-income assets and equities, and, as noted above, some plans also required that workers to devote a portion of their holdings to the purchase of company stock. Table 11 illustrates several key findings. First, women devoted less of their contributions to the purchase of company stock than did men, and they held a lower percentage of their total account balances in company stock than did men (29 percent compared to 45 percent). Women were also more likely to hold fixed-income assets than men (40 percent compared to just over 25 percent). This pattern of investment of 401(k) accounts persisted for all age groups.

Examining the account balances for men and women in the 58 plans that did not have a company stock investment choice reveals a dramatically different picture (see Table 12). With the exception of young men at the low and high tails of the earnings distribution, women generally held a higher proportion of their 401(k) assets in equities in plans not offering company stock. These results suggested that previous findings that women tended to devote a higher percentage of their retirement savings to low-risk/low-return assets were wrong.

To further examine this issue, we estimated sex-specific equations for the allocation of 1995 contributions and account balances separately for plans with and without company stock investment options. In the first set of estimates we looked at differences in the investment in fixed-income assets (Appendix Tables 7 and 8). The results showed that, controlling for age and tenure, there was a slightly negative relationship between earnings level and share of 401(k) assets held in fixed-income assets in plans that did not have a company stock option (Figure 9). This relationship was slightly more pronounced for women than men, but still relatively moderate. The relationship between earnings level and fixed-income asset holding was much more pronounced in cases where the plan includes company stock as an investment option. In these plans, women were estimated to hold considerably

TABLE 11: Allocation of 401(k) Contributions and Balances By Sex and Earnings: Plans with Company Stock as an Investment Option (%)

Sex	Annual Earnings (\$000)								All Earnings
	10.0–14.9	15.0–24.9	25.0–34.9	35.0–44.9	45.0–59.9	60.0–74.9	75.0–99.9	100+	
<i>Employee contributions in company stock</i>									
Women	25	25	26	30	32	29	28	27	27
Men	60	35	37	42	43	43	41	39	41
<i>Employee contributions in other equities</i>									
Women	38	30	32	37	40	45	47	51	34
Men	25	31	28	28	33	35	40	45	32
<i>Employee contributions in fixed-income assets</i>									
Women	36	45	42	32	27	26	25	22	39
Men	15	33	35	30	25	22	19	16	27
<i>Employee-financed 401(k) balances in company stock</i>									
Women	26	26	28	34	36	30	31	27	29
Men	65	37	42	48	47	47	44	40	45
<i>Employee-financed 401(k) balances in other equities</i>									
Women	39	30	31	35	37	44	44	49	33
Men	24	33	29	28	30	33	37	42	31
<i>Employee-financed 401(k) balances in fixed-income assets</i>									
Women	36	44	41	31	27	26	25	24	38
Men	12	30	29	25	22	21	19	18	24

Source: See Table 6.

TABLE 12: 401(k) Account Balances Held in Equities by Sex, Age, and Earnings: Plans without Company Stock as an Investment Option (%)

Age group	Annual Earnings (\$000)								All Earnings
	10.0-14.9	15.0-24.9	25.0-34.9	35.0-44.9	45.0-59.9	60.0-74.9	75.0-99.9	100+	
<i>Women</i>									
20-29	55	57	60	67	67	75	72	30	58
30-39	48	52	56	63	66	67	74	77	55
40-49	49	51	51	60	59	60	68	70	52
50-59	42	46	48	56	58	61	60	69	46
60-65	40	37	43	48	61	49	50	87	39
All ages	47	51	53	61	62	63	69	72	52
<i>Men</i>									
20-29	<b>58</b>	46	57	64	<b>70</b>	72	<b>83</b>	<b>84</b>	57
30-39	<b>50</b>	45	51	59	63	<b>68</b>	72	<b>78</b>	59
40-49	47	39	39	53	57	60	63	<b>71</b>	54
50-59	39	31	32	44	49	54	57	64	46
60-65	32	23	28	41	40	<b>56</b>	50	61	40
All ages	<b>48</b>	40	46	55	59	62	64	71	54

Source: See Table 5.

Note: Entries for men in boldface type show age and earnings cells where men's average allocation of account balances to equities is greater than women's.

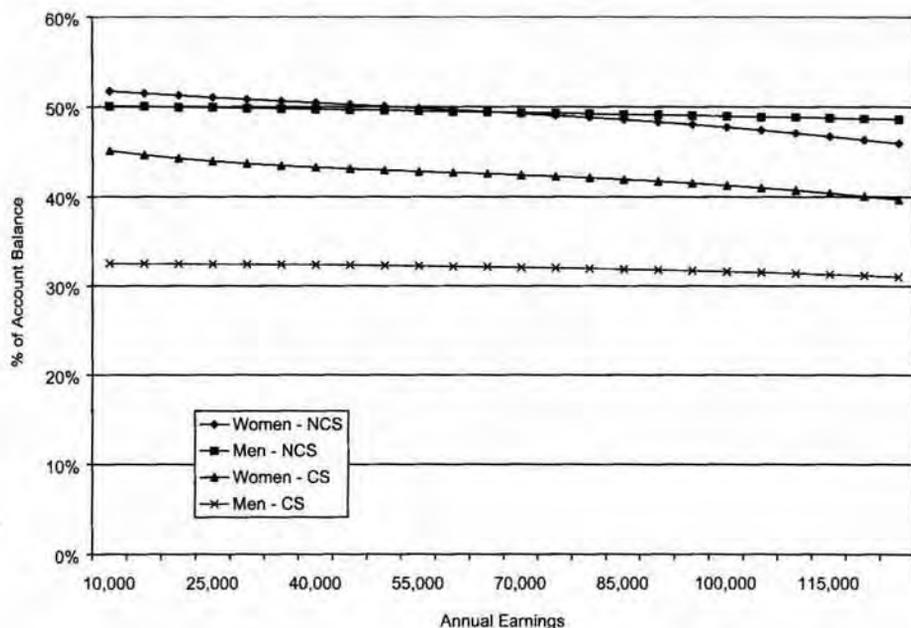


Figure 9. Allocation of 401(k) contributions to fixed-income assets by sex and whether the plan offers company stock as an investment option (% of total account balances). Values are based on the Tobit estimates in columns 2 and 4, Appendix Tables 7 and 8. Values are for employees age 40, with 10 years tenure. Intercepts should not be interpreted as representing an average difference between plans with and without company stock. CS/NCS refers to plans that respectively do or do not offer company stock as an investment option.

more fixed-income assets than men and their holding of these assets was more sensitive to earnings level than men's.

The estimated effects suggested that a requirement that the employee's contributions be to company stock in order to qualify for a company match had a roughly equivalent effect on men and women in reducing their overall holding of fixed-income assets. When the employer match was in the form of company stock, but was not conditioned on the employee investing in this form, both men and women were predicted to hold more fixed-income assets at the mean. The estimated effect on men, however, was nearly 4.5 times as strong as for women.

Examining the effect of age on investment choices, we found that where there was no company stock investment in the plan men and women tended to invest in fixed-income assets in a very similar pattern at each age-tenure combination, with there being an overall positive relationship between investing in this form and age. When company stock was part of the invest-

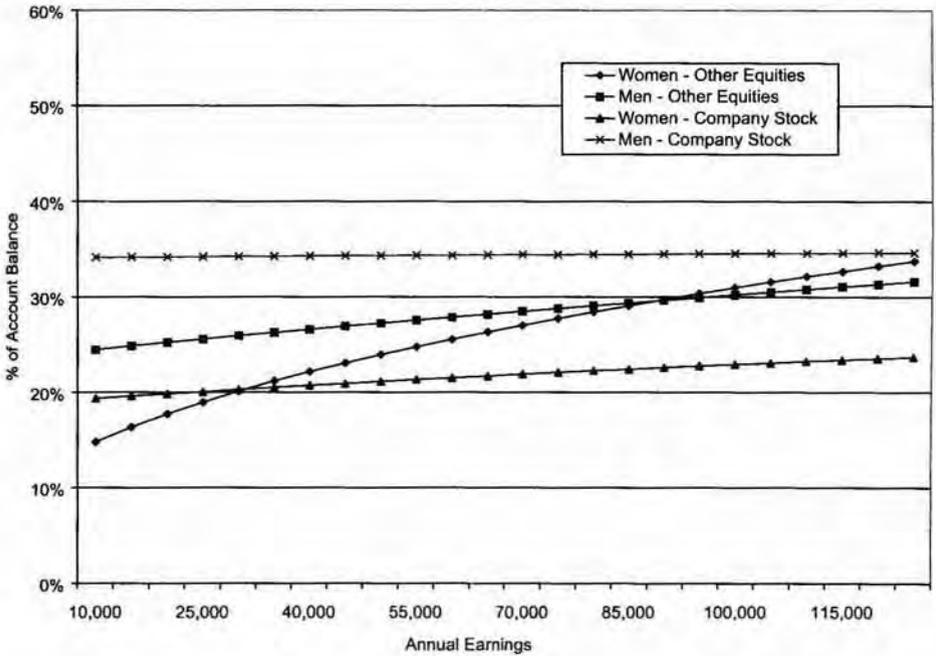


Figure 10. Allocation 401 (k) contributions to company stock and other equity investments by sex and earnings, plans with company stock as an investment option (% of total account balances). Values are based on the Tobit estimates in columns 2 and 4, Appendix Tables 9 and 10. Values are for employees age 40, with 10 years tenure. Intercepts should not be interpreted as representing an average difference between plans with and without company stock.

ment portfolio, however, there was clearly some substitution of other assets for fixed-income holdings and the substitution was clearly much stronger for men than for women.

Estimates for equity and company stock holdings are reported in Appendix Tables 9 and 10. For plans with company stock investment, the relationship between earnings and investment behavior of men and women is interesting (Figure 10). The earnings effect on company stock investment for men was negligible—they were estimated to hold a relatively constant percentage of total assets in this form no matter what their earnings. Among women, however, higher earners were willing to take on the greater risk of company stock as compared to their counterparts further down the earnings spectrum. The relationship between earnings and holding of other equities was positive for both men and women, although it was slightly more so for women than men. The combination of these findings suggested that overall, women were somewhat more sensitive to investment risk across the

earnings spectrum than men, and that the inclusion of company stock in the 401(k) portfolio increased that sensitivity.

## Conclusion

This research confirms and extends previous research regarding American workers' use of 401(k) pension plans as retirement savings vehicles. We find that 401(k) plan participation is more age sensitive at lower earnings levels than higher. Participation among workers earning \$10,000–\$15,000 per year rises from 44 percent for those 20–29 to over 70 percent for those age 50 and older. In comparison, over 90 percent of all workers earning in excess of \$60,000 participate in 401(k) plans regardless of age. We have shown that given participation, age is more important in determining contribution rates than earnings. Among those making a 401(k) contribution in 1995, the contribution rates of persons age 50 and older was over fifty percent higher than that of workers 20–29 (over 8 percent of earnings compared to 5 percent).

These patterns are consistent with earlier studies, as are our results that older people tend to invest more conservatively than younger ones, and that people with lower earnings invest more conservatively than more highly paid workers. One finding that has not received prior study is that the allocation of workers' current contributions to 401(k) plans is remarkably similar to the allocation of total assets in plans when controlling their age, earnings levels, and sex. Our analysis also showed that the inclusion of company stock as an investment option in the plans did influence how people invested their 401(k) assets and that it had a differential effect on the patterns of investment of men and women. Women with relatively low earnings who participated in plans with company stock requirements tended to allocate about 10 percent less of their account balances to fixed-income assets, while higher-earning women in plans with company stock requirements devoted over 20 percent less to fixed-income assets. In contrast, men with low earnings held over 25 percent less in fixed-income assets while men with higher earnings devoted almost 25 percent less to fixed-income assets.

One area we explored in detail pertains to differences between men and women in their utilization of 401(k) plans. We find that women behaved differently from men in these plans and the differences were not just a matter of degree. Specifically, women's participation rates increased more steeply with increases in annual earnings, and with age and tenure, than did men's. Women's contribution rates rose significantly with earnings, while men's declined slightly. Furthermore, women's contributions rose more steeply with age than did men's. Overall, we found that men had more money in their plans than did women, but these sex differences may be attributable to differences in their earnings, contribution rates, and job tenure. We also found that women generally are not more conservative in

their investment behavior than men after controlling for earnings, age, and other important determinants of investment behavior. In general, we believe our results suggest that women are as effective in their use of 401(k) plans as their male counterparts. Beyond the youngest ages and lowest earnings levels they participate and contribute at rates equal to or exceeding those of men.

These findings have important implications for understanding national retirement policy in the twenty-first century, and they provide new insights into how workers make voluntary retirement savings decisions. Key insights include:

1. When offered the option of participating in a voluntary 401(k) plan, most workers choose to make annual contributions.
2. The probability that workers make an annual contribution and the amount of the contribution increase with age and earnings.
3. Women are equally (or more) likely than men to contribute to 401(k) plans.
4. Participants tend to have balanced portfolios, with about half of contributions and account balances being devoted to equities and half to fixed-income assets.
5. The proportion of balances and contributions allocated to equities increases with annual earnings and declines with age.
6. In plans without company stock requirements, women hold as much or more of their 401(k) balances in equities than men. When company stock requirements are imposed, men tend to hold a larger portion of their assets in company stock.

These findings suggest that most workers will be able to adjust to the ongoing changes in private pensions—the continuing shift toward voluntary defined contribution plans—by regularly contributing to their new pension plans. Our analysis also indicates that further education of young workers and those with low earnings is needed to insure that they begin saving early enough and contribute sufficient funds to provide for an adequate retirement income. Finally, these findings may provide some indication of how workers would behave under a revised social security system that included individual accounts. Our analysis indicates that most workers maintain diversified accounts and tend to move toward portfolios with less risk at older ages. This should dispel some of the concerns associated with individual accounts as a primary component of future national retirement policy.

## Notes

1. To predict individual employee sex, we used a name recognition algorithm described below.

2. There has been some debate over the incidence of federal pension tax expenditures. For different views of the incidence of the tax expenditures for employer pensions, see Munnell (1991), Goodfellow and Schieber (1993), and Clark and Wolper (1997).

3. This observation has important implications for understanding the role of pensions in providing retirement income. Specifically, it is probable that more people will accumulate retirement benefits than is indicated by cross-sectional participation rates. This higher career coverage rate by pensions implies that more workers receive the advantage of pension tax expenditures than that implied by the cross-sectional data. In particular, young, low-wage workers are likely to obtain pension coverage later in their careers.

4. The probability of workers making a contribution to their 401(k) plan in 1995 is estimated using a logit procedure. Results from the logit estimation of the probability of participation appear in the first two columns of Appendix Table 1.

5. The statistical model estimates individual intercepts for the probability of participation for each plan; however, the response to the other explanatory variables is not a function of the plan which covers the worker. The largest plan sponsor in our sample had a relatively low percentage of its employees participating in the 401(k) plan. As a result, the participation probabilities shown in Figures 1 and 2 are lower than are estimated for most of the plans in the sample.

6. This variable was derived based on the benefit formula of the defined benefit pension plan, projected growth in annual earnings, and the assumption that the worker remains with the company until age 65. The company dummy variables were not included in this equation, since these two variables were expected to capture much of the variation in participation across the individual companies. These results are shown in the last two columns of Appendix Table 1.

7. Contribution rates were estimated using ordinary least squares.

8. While 1995 participation in the plan was not a criterion for being included in Table 4, the other screening criteria were still applied. That is, we still only included workers earning \$10,000 per year or more, those with one year of service or more, and so forth.

9. Determination of the sex of employees was not straightforward because the administrative records do not include a specific designation of the sex of the worker. We had access to administrative employment records of another firm with similar data on approximately 16,000 employees that included the individual plan participants' first names and an indicator of their sex. We sorted this file by first names and tabulated the sex distributions with each name. We used the results of this exercise to assign a sex classification to each individual in our sample. Any name where more than 80 percent of the individuals with that name were of one sex was classified as being a sex-specific name. All individuals with that name were assigned that sex. For example, people with the name Ann were virtually always identified as females in our source file. Thus, anyone in our sample with the name Ann was classified as a female. In cases where a name did not include at least 80 percent persons of one sex, we characterized that name as having an indeterminate sexual classification. For example, names like Brett or Chris that are often associated with either men or women did not meet our identification criterion. All individuals classified as being of indeterminate sex on the analysis file were then visually reviewed for possible reclassification. Where it was relatively clear to us that the name was associated with a man or woman, it was reclassified accordingly.

10. Other than at the lowest earnings level, working men were consistently more likely to be married than working women, but they were far more likely to be married to a spouse who did not work outside the home for pay. Indeed, for working men

earning more than \$25,000 per year, the probability of having a wife who did not work for pay increased with the husband's earnings. Almost 80 percent of married women who work earn less than their husbands (Winkler 1998). This means that if you compare a man and a woman at the same earnings level, each of whom has a working spouse, it is likely that the woman will be in a household with higher total earnings than the man. The man is likely to have a wife earning less than he is and the woman is likely to have a husband earning more than she is. The lower probability of having a man having working spouse accentuates the likelihood that men at a given earnings level will end up in households with lower total income than women with similar earnings levels. Controlling for earnings level, working women consistently have higher average family incomes than their male counterparts at any given earnings level.

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APPENDIX TABLE 1: Logit Estimates of Participation Rates in 401(k) Plans

<i>Variable</i>	<i>Marginal Effect</i>	<i>Standard Error</i>	<i>Marginal Effect</i>	<i>Standard Error</i>
INTERCEPT	-0.47	0.11	-0.234	0.10
AGE	0.51	0.01	0.01	0.01
AGE SQUARED	-0.19	0.01	-0.01	0.01
TENURE	0.20	0.003	0.01	0.003
TENURE SQUARED	-0.07	0.00	-0.00	0.00
EARNINGS	0.15	0.004	0.03	0.004
EARNINGS SQUARED	-0.004	0.001	-0.01	0.001
FEMALE <sup>a</sup>	0.02	0.02	0.07	0.01
SEX UNKNOWN <sup>a</sup>	-0.001	0.02	0.02	0.02
COMPANY DUMMIES <sup>b</sup>	Yes		No	
MATCH RATE			0.03	0.02
REPLACEMENT RATE AT AGE 65			-0.04	0.04
Likelihood ratio chi-square	19,1976.32		8,346.79	
N	156,009		152,914	
Percent correctly predicted	74.5		67.3	
McFadden's pseudo R-square	0.123		0.052	

*Source:* Authors' estimates of the probability of employees' participation in the 401(k) plan using a Logit procedure.

<sup>a</sup> Equations include dichotomous variables indicating sex, if known, or whether this information is missing.

<sup>b</sup> Estimates shown in column 2 include the effect of dichotomous variables indicating the specific 401(k) plan covering each employee. These variables are not included in the estimates of marginal effects shown in column 4.

APPENDIX TABLE 2: OLS Estimates of Percentage of Earnings Contributed to Plan by Participants

<i>Variable</i>	<i>Marginal Effect</i>	<i>Standard Error</i>	<i>Marginal Effect</i>	<i>Standard Error</i>
INTERCEPT	0.06	.003	0.05	.003
AGE	-0.001	.00	0.00	.00
AGE SQUARED	0.002	.00	0.001	.00
TENURE	0.001	.00	0.001	.00
TENURE SQUARED	-0.003	.00	-0.01	.00
EARNINGS	-0.001	.00	-0.001	.00
EARNINGS SQUARED	0.00	.00	0.00	.00
FEMALE <sup>a</sup>	-0.003	.00	-0.003	.00
SEX UNKNOWN <sup>a</sup>	0.001	.001	-0.00	.001
COMPANY DUMMIES <sup>b</sup>	Yes		No	
MATCH RATE			-0.03	.001
REPLACEMENT RATE AT AGE 65			0.02	.001
N	122,511		120,010	
R-squared	0.37		0.05	
Rbar-squared	0.37		0.05	
F	758.41		598.80	
Std. error of estimate	0.06		0.07	

Source: Authors' estimates of contribution rates for employees making a contribution to their 401(k) plan using ordinary least squares.

<sup>a</sup> Equations include dichotomous variables indicating sex, if known, or whether this information is missing.

<sup>b</sup> Estimates shown in column 2 include effect of dichotomous variables indicating the specific 401(k) plan covering each employee. These variables are not included in the estimates shown in column 4.

APPENDIX TABLE 3: Tobit Estimates of Percentage of Participants' Contributions Directed to Investments in Fixed Assets

Variable	Plans with no company stock		Plans with company stock	
	Marginal Effect	Standard Error	Marginal Effect	Standard Error
INTERCEPT <sup>a</sup>	0.60	0.04	0.80	0.04
EMPLOYER MATCH IN COMPANY STOCK			-0.24	0.01
CO STOCK INVESTMENT REQUIRED FOR MATCH			-1.09	0.002
AGE	-0.17	0.02	-0.02	0.002
AGE SQUARED	0.02	0.002	0.03	0.002
TENURE	0.02	0.001	0.02	0.001
TENURE SQUARED	-0.04	0.003	-0.03	0.003
EARNINGS	-0.01	0.001	-0.03	0.001
EARNINGS SQUARED	0.003	0.00	0.01	0.00
FEMALE <sup>b</sup>	0.09	0.01	0.08	0.01
SEX UNKNOWN <sup>b</sup>	0.06	0.01	0.06	0.01
COMPANY DUMMIES <sup>c</sup>	Yes		Yes	
Uncensored	33,959		33,883	
Right censored	11,491		7,418	
Left censored	11,313		24,447	
N	56,763		65,748	

Source: Authors' estimates of the allocation of contributions to fixed-income assets using a Tobit procedure.

<sup>a</sup> The intercept in column 4 is an average of three 401(k) plans with omitted dummy variables.

<sup>b</sup> Equations include dichotomous variables indicating sex, if known, or whether this information is missing.

<sup>c</sup> Estimates shown in columns 2 and 4 include the effect of dichotomous variables indicating the specific 401(k) plan covering each employee.

APPENDIX TABLE 4: Tobit Estimates of Percentage of Participants' Contributions Directed to Investment in Company Stock and Other Equities by Participants in Plans with Company Stock

Variable	Company stock		Other equities	
	Marginal Effect	Standard Error	Marginal Effect	Standard Error
INTERCEPT <sup>a</sup>	-0.29	0.03	0.20	0.04
EMPLOYER MATCH IN COMPANY STOCK	.58	0.01	-0.39	0.01
CO STOCK INVESTMENT REQUIRED FOR MATCH	1.22	0.01	-0.58	0.01
AGE	0.02	0.002	0.01	0.002
AGE SQUARED	-0.02	0.002	-0.01	0.002
TENURE	-0.05	0.001	-0.02	0.001
TENURE SQUARED	0.01	0.002	0.03	0.003
EARNINGS	0.002	0.001	0.03	0.001
EARNINGS SQUARED	-0.00	0.00	-0.03	0.001
FEMALE <sup>b</sup>	-0.03	0.004	-0.02	0.005
SEX UNKNOWN <sup>b</sup>	-0.02	0.007	-0.04	0.008
COMPANYDUMMIES <sup>c</sup>	Yes		Yes	
Uncensored	33,681		39,176	
Right censored	9,810		349	
Left censored	22,257		26,223	
N	65,748		65,748	

Source: Authors' estimates of the allocation of contributions to company stock and other equities using a Tobit procedure.

<sup>a</sup> The intercepts are an average of three 401(k) plans with omitted dummy variables.

<sup>b</sup> Equation include dichotomous variables indicating sex, if known, or whether this information is missing.

<sup>c</sup> Estimates shown in columns 2 and 4 include the effect of dichotomous variables indicating the specific 401(k) plan covering each employee.

APPENDIX TABLE 5: Logit Estimates of 401 (k) Plan Participation Rates for Men and Women

Variable	Men		Women	
	Marginal Effect	Standard Error	Marginal Effect	Standard Error
INTERCEPT	-0.39	0.16	-0.57	0.17
AGE	0.01	0.01	0.01	0.01
AGE SQUARED	-0.01	0.01	-0.01	0.01
TENURE	0.01	0.004	0.03	0.01
TENURE SQUARED	-0.00	0.00	-0.001	0.00
EARNINGS	0.03	0.01	0.07	0.01
EARNINGS SQUARED	-0.01	0.002	-0.04	0.01
COMPANY DUMMIES <sup>a</sup>	Yes		Yes	
Likelihood ratio chi-square		10,458.58		8,119.95
N		77,010		65,208
Percent correctly predicted		74.8		74.9
McFadden's pseudo R-square		0.13		0.12

Source: Authors' estimates of the probability by sex of employees' participation in the 401(k) plan using a Logit procedure.

<sup>a</sup> Estimates shown in columns 2 and 4 include the effect of dichotomous variables indicating the specific 401(k) plan covering each employee.

APPENDIX TABLE 6: OLS Estimates of Percentage of Earnings Contributed to Plan by Participants for Men and Women Separately

Variable	Men		Women	
	Marginal Effect	Standard Error	Marginal Effect	Standard Error
INTERCEPT	0.06	0.004	0.06	0.01
AGE	-0.001	0.00	-0.001	0.00
AGE SQUARED	0.002	0.00	0.003	0.00
TENURE	0.001	0.00	0.002	0.00
TENURE SQUARED	-0.002	0.00	-0.01	0.00
EARNINGS	-0.001	0.00	0.002	0.00
EARNINGS SQUARED	0.00	0.00	-0.001	0.00
COMPANY DUMMIES <sup>a</sup>	Yes		Yes	
N	59,804		52,088	
R-squared	0.32		0.41	
Rbar-squared	0.32		0.41	
F	308.30		395.37	
Std. error of estimate	0.05		0.06	

Source: Authors' estimates of contribution rates by sex for employees making a contribution to their 401(k) plan using ordinary least squares.

<sup>a</sup> Estimates shown in columns 2 and 4 include the effect of dichotomous variables indicating the specific 401(k) plan covering each employee.

APPENDIX TABLE 7: Tobit Estimates of Percentage of Men's and Women's 401 (k) Contributions Directed to Investments in Fixed-Income Assets: Plans with Company Stock

Variable	Men		Women	
	Marginal Effect	Standard Error	Marginal Effect	Standard Error
INTERCEPT <sup>a</sup>	0.64	0.06	0.98	0.07
EMPLOYER MATCH IN COMPANY STOCK	-0.15	0.02	-0.40	0.03
CO STOCK INVESTMENT REQUIRED FOR MATCH	-0.96	0.02	-1.26	0.02
AGE	-0.02	0.003	-0.02	0.003
AGE SQUARED	0.03	0.003	0.02	0.004
TENURE	0.02	0.001	0.02	0.002
TENURE SQUARED	-0.03	0.004	-0.03	0.01
EARNINGS	-0.02	0.001	-0.06	0.003
EARNINGS SQUARED	0.01	0.001	0.10	0.01
COMPANY DUMMIES <sup>b</sup>	Yes		Yes	
Uncensored	17,555		13,749	
Right censored	2,610		4,177	
Left censored	14,801		7,929	
N	34,966		25,855	

Source: Authors' estimates of the allocation by sex of account balances to fixed-income assets using a Tobit procedure.

<sup>a</sup> The intercepts are an average of three 401 (k) plans with omitted dummy variables.

<sup>b</sup> Estimates shown in columns 2 and 4 include the effect of dichotomous variables indicating the specific 401 (k) plan covering each employee.

APPENDIX TABLE 8: Tobit Estimates of Percentage of Men's and Women's 401 (k) Contributions Directed to Investments in Fixed-Income Assets: Plans with No Company Stock

<i>Variable</i>	<i>Men</i>		<i>Women</i>	
	<i>Marginal Effect</i>	<i>Standard Error</i>	<i>Marginal Effect</i>	<i>Standard Error</i>
INTERCEPT	0.62	0.06	0.66	0.06
AGE	-0.02	0.003	-0.01	0.003
AGE SQUARED	0.02	0.003	0.02	0.003
TENURE	0.02	0.001	0.02	0.002
TENURE SQUARED	-0.03	0.004	-0.05	0.006
EARNINGS	-0.01	0.001	-0.04	0.002
EARNINGS SQUARED	0.002	0.00	0.02	0.001
COMPANYDUMMIES <sup>a</sup>	Yes		Yes	
Uncensored	15,161		15,434	
Right censored	4,888		5,467	
Left censored	4,789		5,332	
N	24,838		26,233	

*Source:* Authors' estimates of the allocation by sex of account balances to fixed-income assets using a Tobit procedure.

<sup>a</sup> Estimates shown in columns 2 and 4 include the effect of dichotomous variables indicating the specific 401(k) plan covering each employee.

APPENDIX TABLE 9: Tobit Estimates of Percentage of Men's and Women's 401(k) Balances Directed to Investments in Other Equities: Plans with Company Stock

Variable	Men		Women	
	Marginal Effect	Standard Error	Marginal Effect	Standard Error
INTERCEPT <sup>a</sup>	0.34	0.05	0.08	0.06
EMPLOYER MATCH IN COMPANY STOCK	-0.45	0.02	-0.27	0.02
CO STOCK INVESTMENT REQUIRED FOR MATCH	-0.60	0.01	-0.55	0.02
AGE	0.004	0.002	0.01	0.003
AGE SQUARED	-0.009	0.003	-0.01	0.003
TENURE	-0.01	0.001	-0.03	0.002
TENURE SQUARED	0.02	0.003	0.05	0.005
EARNINGS	0.03	0.001	0.06	0.003
EARNINGS SQUARED	-0.02	0.001	-0.11	0.01
COMPANY DUMMIES <sup>b</sup>	Yes		Yes	
Uncensored	20,522		15,917	
Right censored	291		35	
Left censored	14,153		9,903	
N	34,966		25,855	

Source: Authors' estimates of the allocation by sex of account balances to fixed-income assets using a Tobit procedure.

<sup>a</sup> The intercepts are an average of three 401(k) plans with omitted dummy variables.

<sup>b</sup> Estimates shown in columns 2 and 4 include the effect of dichotomous variables indicating the specific 401(k) plan covering each employee.

APPENDIX TABLE 10: Tobit Estimates of Percentage of Men's and Women's 401(k) Balances Directed to Investments in Company Stock

<i>Variable</i>	<i>Men</i>		<i>Women</i>	
	<i>Marginal Effect</i>	<i>Standard Error</i>	<i>Marginal Effect</i>	<i>Standard Error</i>
INTERCEPT <sup>a</sup>	-0.18	0.05	-0.42	0.04
EMPLOYER MATCH IN COMPANY STOCK	0.56	0.02	0.62	0.02
CO STOCK INVESTMENT REQUIRED FOR MATCH	1.19	0.01	1.25	0.05
AGE	0.01	0.002	0.02	0.002
AGE SQUARED	-0.02	0.003	-0.02	0.003
TENURE	-0.01	0.001	-0.004	0.001
TENURE SQUARED	0.02	0.003	-0.025	0.004
EARNINGS	0.001	0.001	0.01	0.002
EARNINGS SQUARED	-0.00	0.001	-0.01	0.01
COMPANY DUMMIES <sup>b</sup>	Yes		Yes	
Uncensored	18,421		12,613	
Right censored	6,649		2,403	
Left censored	9,896		10,839	
N	34,966		25,855	

Source: Authors' estimates of the allocation by sex of account balances to company stock using a Tobit procedure.

<sup>a</sup> The intercepts are an average of three 401(k) plans with omitted dummy variables.

<sup>b</sup> Estimates shown in columns 2 and 4 include the effect of dichotomous variables indicating the specific 401(k) plan covering each employee.