



University of Pennsylvania  
**ScholarlyCommons**

---

Wharton Pension Research Council Working  
Papers

Wharton Pension Research Council

---

1996

## Factors Affecting Participation Rates and Contribution Levels in 401(k) Plans

Robert L. Clark

Sylvester J. Schieber

Follow this and additional works at: [https://repository.upenn.edu/prc\\_papers](https://repository.upenn.edu/prc_papers)

 Part of the [Economics Commons](#)

---

Clark, Robert L. and Schieber, Sylvester J., "Factors Affecting Participation Rates and Contribution Levels in 401(k) Plans" (1996). *Wharton Pension Research Council Working Papers*. 603.  
[https://repository.upenn.edu/prc\\_papers/603](https://repository.upenn.edu/prc_papers/603)

The published version of this Working Paper may be found in the 1998 publication: *Living with Defined Contribution Pensions*.

This paper is posted at ScholarlyCommons. [https://repository.upenn.edu/prc\\_papers/603](https://repository.upenn.edu/prc_papers/603)  
For more information, please contact [repository@pobox.upenn.edu](mailto:repository@pobox.upenn.edu).

---

## Factors Affecting Participation Rates and Contribution Levels in 401(k) Plans

### Disciplines

Economics

### Comments

The published version of this Working Paper may be found in the 1998 publication: *Living with Defined Contribution Pensions*.

# **Living with Defined Contribution Pensions**

## **Remaking Responsibility for Retirement**

Edited by

Olivia S. Mitchell and Sylvester J. Schieber

Published by  
The Pension Research Council  
The Wharton School of the University of Pennsylvania  
and  
University of Pennsylvania Press  
Philadelphia

Copyright © 1998 The Pension Research Council of the Wharton School of the University of Pennsylvania

All rights reserved

Printed in the United States of America on acid-free paper

10 9 8 7 6 5 4 3 2 1

Published by

University of Pennsylvania Press

Philadelphia, Pennsylvania 19104-4011

Library of Congress Cataloging-in-Publication Data

Living with defined contribution pensions : remaking responsibility for retirement / edited by Olivia S. Mitchell and Sylvester J. Schieber.

p. cm.

"Pension Research Council publications."

Includes bibliographical references and index.

ISBN 0-8122-3439-1 (cloth : alk. paper)

1. Defined contribution plans—United States. 2. Old age pensions—United States—Finance. 3. Pension trusts—United States—Finance. I. Mitchell, Olivia S. II. Schieber, Sylvester J.

HD7105.45.U6L58 1998

331.25'2'0973—dc21

98-13584

CIP

## Chapter 4

# **Factors Affecting Participation Rates and Contribution Levels in 401 (k) Plans**

---

Robert L. Clark and Sylvester J. Schieber

In recent years there has been a growing dependence on section 401(k) plans that require voluntary employee contributions as a primary source of retirement plan funding. Table 1 shows the growth in the role of 401(k) plans in the private, employer-sponsored retirement system between 1984 and 1992. In 1984, 2.9 percent of all private plans and 4.0 percent of all private defined contribution plans had a 401(k) feature. By 1992, 19.7 percent of all plans and 22.5 percent of the defined contribution plans included a 401(k) feature. In 1984, 12.4 percent of all plan participants and 24.6 percent of all defined contribution participants were in a 401(k) plan. By 1992 this had grown to 34.9 and 57.6 percent respectively. Over the period, the percentage of assets in 401(k) plans grew from 8.8 to 26.4 percent of all plan assets and from 35.7 to 45.8 of defined contribution plan assets. Contributions to 401(k) plans grew from 18.0 to 50.0 percent of all contributions to private plans and from 37.5 to 68.7 percent of contributions to private defined contribution plans.

By most measures, it appears that 401(k) plans are becoming the predominant form of retirement saving through employer-sponsored plans as we come to the close of the twentieth century. This development has not met with universal endorsement. Some critics of 401(k) plans suggest that "do-it-yourself" retirement plans leave many with inadequate retirement accumulations. They argue that workers may start to save too late in life and end up accumulating less than they need for retirement; they may select overly conservative investment options that provide inadequate returns; or they may simply save too little over their working lives.

## 70 Rates and Contribution Levels in 401(k) Plans

TABLE 1 Relative Sizes of 401(k) Plans in Comparison to All Private Tax-Qualified Plans and All Private Defined Contribution Plans for Selected Years (%)

Year	Plans		Participants		Assets		Contributions	
	All plans	DC plans	All plans	DC plans	All plans	DC plans	All plans	DC plans
1984	2.9	4.0	12.4	24.6	8.8	35.7	18.0	37.5
1985	4.7	6.5	16.6	31.1	11.5	36.9	25.6	45.7
1986	5.2	6.9	18.3	33.4	13.2	39.6	31.9	50.1
1987	6.1	7.9	20.7	37.6	15.4	40.9	36.0	53.3
1988	9.3	11.7	24.5	44.6	18.4	41.3	43.2	60.7
1989	11.4	13.9	28.3	51.0	21.3	41.8	47.1	63.0
1990	13.7	16.3	31.6	55.1	23.0	41.7	49.6	64.7
1991	15.9	18.6	31.1	53.5	22.7	42.5	46.4	63.6
1992	19.7	22.5	34.9	57.6	26.4	45.8	50.0	68.7

Source: USDOL (1996).

In addition, critics claim that the accessibility to 401(k) savings prior to retirement means that many workers will end up at retirement with little or nothing left in their old-age nest egg (Ferguson and Blackwell, 1995). Others argue that people fail to participate in 401(k) plans because they do not appreciate their economic vulnerabilities or the favorable saving opportunities that voluntary retirement plans offer them (Bernheim, 1994, 1995). While mandating contributions and locking them into 401(k) plans might be perceived as a good way to enhance the retirement security of current workers, one estimate suggests that a mandatory 3 percent contribution rate would only raise aggregate pension benefits for workers participating in employer programs less than 2 percent (Samwick and Skinner, 1997).

The growing reliance on voluntary contributory retirement plans increases the importance of participation in these plans. In this study, we examine the factors associated with variations in participation rates and workers' contribution levels in a number of 401(k) plans based on personal data records of workers eligible to participate in these plans. The analysis is restricted to a set of employers that offer 401(k) plans. In that regard, it does not consider the potential biases in saving behavior of workers who seek out and tend to stay with employers offering such plans (Ippolito, 1993). We provide a brief review of other studies that have evaluated participation in 401(k) plans. Next, we describe the data set used for the analysis and summarize the general nature of the plans offered and the participation in them, followed by statistical analyses of participation in and contribution rates to the plans under study.

## Previous Research

Relatively few empirical studies have examined the probability that individual workers will contribute to a 401(k) plan and each of these studies has important data limitations. Here we briefly review five articles that have examined 401(k) participation rates and/or the annual contribution into these plans, and draw some preliminary findings and identify major shortcomings in the data employed in these earlier studies. Detailed analysis of 401(k) contributions requires information on individual workers and plan characteristics. These data need to be from a set of representative firms in order to capture variation in match rates and other plan parameters. To date, no study has had access to data of this quality. Thus, one must be cautious in interpreting the results from prior studies concerning the participation in 401(k) plans.

Andrews (1992) presents data showing the growth of 401(k) coverage during the 1980s using the Form 5500 data. Her analysis included firms where the 401(k) plan was either the primary or secondary pension plan. Andrews then used the May 1988 Current Population Survey (CPS) to examine the determinants of participation in 401(k) plans. She estimated the probability that a worker would be participating in a 401(k) plan and found that the likelihood of being in a plan rose with increases in age, earnings, family income, and tenure. In addition, Andrews estimated that employer contributions increased the probability that a worker would participate in the 401(k) plan but that individuals with other pension coverage were less likely to participate. An important limitation to the CPS data is the lack of data on plan characteristics such as the employer match rate.

Andrews also estimated the amount of annual contributions conditional on 401(k) participation. Key findings were that older persons had higher contribution rates, as did workers with larger family income; however, increases in annual earnings did not raise 401(k) contribution rates. Individuals enrolled in plans with employer matches tended to contribute less to the 401(k) plans.

The Employee Benefit Research Institute study (EBRI 1994) compares information from the CPS from May 1988 with April 1993. Between these surveys, the proportion of workers employed by firms offering 401(k) plans increased from 26.9 percent to 36.8 percent. During this period, the participation rate for all workers increased from 15.3 to 23.8 percent. The fraction of those eligible to participate in a 401(k) plan rose from 57.0 to 64.6 percent. The report presents sponsorship and participation rates by age, earnings, sex, and hours worked. Comparisons indicated that the participation rate in plans with an employer match was slightly

higher (78 percent) than participation rate in plans without an employer match (72 percent).

Further cross-tabulations indicate a nonlinear age relationship, with participation rates rising with age until around 50 and then declining. In addition, the participation rate is shown to increase with higher levels of annual earnings. EBRI also reports a nonlinear relationship between earnings and the proportion of salary contributed to the 401(k) plan with the annual contribution rate rising with earnings up to \$20,000 and then declining before increasing again for persons with earnings in excess of \$30,000. The contribution rate is lower for participants in plans with employer matches compared to plans without an employer contribution.

Papke (1995) uses Form 5500 data for 1986 and 1987 to estimate participation and contribution rates. A significant shortcoming of this analysis is the lack of marginal employer match rates. Papke calculates an average match rate using aggregate employer and employee contribution rates for each plan. The participation ratio for each plan is determined by the ratio of active plan participants to the number of employees eligible to participate. Participants include all persons with positive account balances. She then estimates a plan participation rate using plan average data as a function of firm size, the presence of another pension, and a series of dichotomous variables indicating the level of the employer match. Thus, this study is unable to capture the effects of any worker characteristics such as age and earnings.

Papke's primary finding is that increases in the match rate are associated with increases in the plan participation rate; however, these marginal effects are rather small. For example, a 20 percent employer match increases the plan participation rate compared to a plan with no employer contributions by 6.6 percentage points and a 50 percent match raises the participation by 10.2 percentage points compared to a plan with no employer match. A dollar for dollar match increases the participation rate by 17.4 percentage points over a zero match. In addition, she finds that the participation rate rises slightly (1.2 percentage points) when the company does not have another pension plan and that increases in firm size decrease participation in the 401(k) plan. There is no change in the participation model between 1986 and 1987.

Papke estimates a fixed effects model to control for unobservable factors that are affecting the participation rate such as the fact that some firms attract workers who are more likely to be savers. The estimated effects for the match rates in the fixed effects model are much smaller and are statistically insignificant. Papke concludes "that match rates do not affect the level of participation once plan unobservables are controlled for." She speculates that the efforts of benefit staff and the quality



of their communications may be one of the unobservables affecting participation rates.

Papke also examines annual employee contributions using the same model. She finds that contributions are higher in plans with employer matches up to 80 percent compared to a plan with no match; however, the marginal effect of increasing the match rate above 10 percent are small, generally insignificant, and often negative. Plans with matches in excess of 80 percent have lower employee contributions compared to plans without any employer match.

Kusko, Poterba, and Wilcox (this volume) estimate employee contributions to a 401(k) plan sponsored by a single medium-sized manufacturing firm between 1988 and 1991. The employer match rates varied substantially during this period from 25 percent of the first 6 percent of eligible compensation in one year to over 100 percent in another before the match was entirely eliminated in the final year. The data represent information on 12,000 salaried and nonunion hourly employees. Annual participation rates varied from 78 to 84 percent with only those actually making contributions in a given year being counted as participants.

The large changes in the match rate from one year to the next resulted in only small changes in the annual participation rate while changes in the match rate had a small but noticeable effect on the contribution rates of participants. The authors report large bunching of participants at the maximum plan contribution limit of 10 percent of compensation, the maximum employee contributions that receive an employer match (6 percent of compensation), and the IRS contribution limits of \$7,000. They report that three-quarters of all employees are at one of the kinks or constraints and that participants rarely change their contribution levels to reflect changes in the plan structure.

Bernheim and Garrett (1995) evaluate the effects of employer-based education programs on participation in retirement plans. This analysis is based on a survey of household finances done during the fall of 1994. The survey covered a nationally representative sample of people between the ages of 30 and 48. It gathered standard economic and demographic data on the respondents plus levels of knowledge on financial matters, sources of information on such matters, and information on financial education or information provided in the workplace. The data used in the analysis did not include information on matching of worker contributions to 401(k) or similar plans covering workers. The authors developed two measures of educational information for the participants in the survey. The first was a binary variable indicating whether the employer offered informative materials and programs to assist in retirement planning. The second was a binary variable indicating whether the employee used such materials.

Burnheim and Garrett estimated that participation rates were 19.5 percentage points higher for workers who used educational materials than for those who did not receive or use such materials. They found that participation was lower for workers eligible for another pension plan, higher for workers with higher wages, and not significantly different on the basis of worker's age or education. The authors also estimated that the effects of education were large and highly significant on contribution levels to the plans. Finally, they found that there were spillover effects from communications programs positively affecting workers' spouses' participation in their own 401(k) plans, but found the effect on spouses' accumulated balances to be insignificant.

Although research examining participation in and contributions to 401(k) plans is very limited, several consistent findings have emerged. These previous studies suggest that the probability of participation is a positive but nonlinear function of age and annual earnings, that higher employer match rates raise the likelihood of participation, that the presence of other company pensions reduces the proportion of workers participating in 401(k) plans, and that a lower percentage of workers in large firms opt to participate in 401(k) plans. Annual contributions as a percent of salary rise with age of the worker while higher employee matching rates seem to reduce annual contributions. These findings suggest an empirical model for estimating the determinants of 401(k) participation and contributions. Each of these hypotheses will be tested using a relatively large number of workers employed during 1994 in a number of firms from which we could get administrative record data.

### **New Empirical Evidence**

The data used in the present analysis were collected by Watson Wyatt from employer administrative records at the end of 1994. The 401(k) plans included in the data set represent 19 firms ranging in size from 700 to 10,000 employees from a variety of industries, have a wide range of match rates, and include some firms with relatively generous defined benefit plans in addition to the 401(k) plan as well as firms whose only retirement plan is the 401(k) plan. These 19 firms were not randomly selected, but were rather a set of firms where we could accumulate the necessary data to develop the analysis. While these firms are not statistically representative of the universe of firms sponsoring 401(k) plans, we have no reason to believe that the firms, their 401(k) plan, or the workers eligible to participate in them have characteristics that would specifically bias our results.

The analysis of participation in a range of 401(k) plans presented below allows us to explore some of the hypotheses elaborated above in

somewhat more detail. We have the benefit of having administrative records on employee wage levels, contribution and match rates, and other variables that workers sometimes have difficulty recalling in survey settings. We can also control for the existence of a defined benefit plan, and further can estimate the overall generosity of such plans. Like many other studies in this area, we lack information on the nonpension assets owned by workers covered under the plans being studied or by other persons in their immediate families.

The general characteristics of the plans are summarized in Table 2, which describes plan incentives that might influence participation rates and contribution levels and shows 401(k) coverage and participation rates in each of the plans studied. The second column of the table shows the employer matching pattern in the various plans. All of the plans included in this study match some level of employee contributions. While the majority of plans have a constant matching rate, there are a number that have variable rates. Plans O, Q, and R are somewhat different than normal in that they provide for some matching, but limit it in a relatively unique fashion. Plan O restricts matching to workers with pay levels below \$50,000 and matches contributions on up to 4 percent of the first \$30,000 of pay. Plan Q matches only 25 percent of the first \$400 per year that the worker contributes to the plan but contributes \$0.12 for each hour worked under the plan. Plan R matches 25 percent of contributions up to the first \$3,000 per year contributed to the plan without regard to pay level. The third column in the table shows the maximum percentage of pay on which contributions are matched by the plan sponsor. For all but three of the plans, the sponsor matches contributions on amounts up to 2 to 6 percent of pay, with the modal rate being 6 percent.

The fourth column in the table shows the relative generosity of the defined benefit plan offered by the sponsor of the 401(k) plan under study. This measure was derived by calculating a projected defined benefit pension at age 65 and the potential replacement of projected earnings for the year prior to retirement under that plan for workers eligible to participate in that firm's 401(k) plan. Job tenure and age was used to project each worker's ultimate years of coverage under the defined benefit plan, assuming the worker stayed until age 65. Covered pay under the plan was projected by incrementing current pay by 5 percent per year from 1994 until the year the worker would attain age 65. The average defined benefit level presented in the table is stated as a percent of final salary for the average worker.

The reason for including the generosity of the defined benefit plan in the analysis relates to the nature of the employer-sponsored retirement plans as target savings vehicles that allow workers to accumulate sufficient wealth to maintain preretirement standards of living after they retire. If

## 76 Rates and Contribution Levels in 401 (k) Plans

TABLE 2 Matching Provisions of 401 (k) Plans, Generosity of Defined Benefit Plans, Workers Covered in the 401 (k) Plans, and Participation Rates for Individual Plans

<i>Plan</i>	<i>Employer matching rates and patterns</i>	<i>Maximum percent of pay matched</i>	<i>Average defined benefit replacement rate at 65</i>	<i>Number of employees</i>	<i>Participation rate</i>
A	50%	6%	33.4	1,853	78.7
B	100% of 2% of pay, 75% of next 1% of pay, 50% of next 1% of pay	4%	45.6	1,627	62.8
C	100%	3%	27.8	3,458	76.84
D	50%	6%	18.9	1,422	91.8
E	25%	6%	21.5	864	81.9
F	60%	4%	26.1	1,372	93.1
G	25%	4%	0.0	1,660	90.7
H	100% of 1% of pay, 25% of next 3% of pay	4%	25.9	5,746	97.7
I	100%	3%	20.7	9,637	61.5
J	25%	6%	27.9	1,342	65.4
K	100%	3%	41.1	9,598	88.9
L	50%	2%	0.0	2,388	53.2
M	50%	6%	32.2	1,891	98.8
N	50%	6%	38.7	10,585	47.4
O	25% for workers with pay up to \$50,000 on pay up to \$30,000 per year	4%	22.4	2,035	58.7
P	75%	6%	*	774	91.5
Q	\$0.12 per hour, 25% up to first \$400 or employee contributions		*	750	56.8
R	25% on first \$3,000 of employee contributions		0.0	966	71.2
S	100%	6%	*	2,951	91.4

Source: Authors' computations using Watson Wyatt Worldwide data.

\*Signifies company had no defined benefit plan.

TABLE 3 Average Contributions to 401(k) Plans by Age of Worker for Workers Aged 21 to 64 with Annual Wages \$5,000 or Above and One or More Years Tenure

Contribution quintile	Average contribution by age of participant (\$)					All ages (\$)
	20-29	30-39	40-49	50-59	60+	
1st 20%	177	348	427	458	379	338
2nd 20%	440	816	1,049	1,136	955	825
3rd 20%	708	1,348	1,777	1,970	1,717	1,436
4th 20%	1,137	2,178	2,844	3,378	3,061	2,418
5th 20%	2,609	4,918	6,178	6,983	6,542	5,592
Total participants	6,081	16,254	13,809	7,338	1,263	44,745
Mean contribution	1,014	1,921	2,455	2,785	2,533	2,122
No. at limit*	1	94	255	206	33	589
% at limit	0.02	0.58	1.85	2.81	2.61	1.32

Source: Authors' computations using Watson Wyatt Worldwide data.

\*In 1994, federal tax law limited a worker's pretax contributions to a 401(k) plan to \$9,240 of earnings.

employer-sponsored retirement plans do work as target savings vehicles, the more generous a worker's defined benefit plan, the less he or she would have to save under the 401(k) plan to accumulate sufficient wealth to meet the retirement savings target.

The last two columns in Table 2 show the number of employees eligible to participate in each of the 401(k) plans under study, and the plan's participation rate during 1994. In order to be considered a plan participant, a worker had to have contributed to the plan during 1994. Participation rates ranged from a low 47.4 percent to a high of 98.8 percent; the overall participation rate across the whole set of plans during 1994 was 73.5 percent.

Average contribution rates by plan participants distributed by age appear in Table 3. The table excludes nonparticipants. The number of participants shown at the bottom of the table as being at their maximum dollar contribution limit imposed by the IRS reflects the number in each age group that contributed the statutory maximum of \$9,240 to their 401(k) during 1994. We find it surprising that so relatively few workers contributed at this level—fewer than 3 percent even for the older age groups. Generally, contribution levels confirm our expectations that older workers would contribute at higher levels than younger ones. The one exception is that average contributions at each quintile level for workers over age 60 are lower than for workers in their fifties at the same quintile level. Workers age 60 and over have somewhat lower wage levels than workers aged 50 to 59. As a result the lower dollar contributions actually represent higher contribution rate, as we show later (see Table 6).

## 78 Rates and Contribution Levels in 401(k) Plans

TABLE 4 Average Contributions to 401(k) Plans by Workers Aged 21 to 64 with Annual Wages \$5,000 or Above and One or More Years Tenure

Contribution quintile	Average contribution by annual salary of participant (thousands of \$)					All salary levels (\$)
	0-25	25-50	50-75	75-100	100+	
1st 20%	172	544	1,200	1,922	2,865	338
2nd 20%	404	1,103	2,001	3,007	5,200	825
3rd 20%	635	1,621	2,843	4,251	7,521	1,436
4th 20%	949	2,410	4,311	6,377	9,078	2,418
5th 20%	1,832	4,811	7,520	8,738	9,240	5,592
Total participants	14,680	19,832	7,683	1,641	909	44,745
Mean contribution	798	2,098	3,575	4,861	6,785	2,122
No. at limit	0	0	217	117	255	589
% at limit	0.0	0.0	2.8	7.1	28.1	1.3

Source: Authors' computations using Watson Wyatt Worldwide data.

TABLE 5 Participation Rates in 401(k) Plans by Workers' Ages for Workers Aged 21 to 64 with Annual Wages \$5,000 or Above and One or More Years Tenure

Plan	Plan participation rate	Participation rate by age of workers				
		20-29	30-39	40-49	50-59	60+
A	78.7	60.8	77.9	85.1	85.1	87.5
B	62.8	40.0	57.7	63.9	75.5	73.4
C	76.8	75.9	83.9	75.3	70.7	70.4
D	91.6	81.9	91.3	94.7	98.3	89.9
E	81.9	47.3	83.5	84.4	86.8	81.8
F	93.1	83.0	92.8	94.4	95.1	91.7
G	90.7	86.6	91.8	91.7	91.0	85.4
H	97.7	98.4	97.9	97.1	97.5	96.8
I	61.5	49.7	70.4	68.8	75.3	83.0
J	65.4	55.8	60.7	69.0	73.0	80.9
K	88.9	72.5	88.0	89.5	92.9	91.2
L	53.2	40.0	56.8	59.3	52.7	46.2
M	98.8	98.4	99.2	97.8	99.4	100.0
N	47.4	36.6	43.7	49.2	58.6	61.4
O	58.7	50.5	58.3	62.9	58.5	53.5
P	91.5	85.7	90.8	90.1	93.2	100.0
Q	56.8	51.3	53.0	59.1	62.7	64.3
R	71.2	52.1	72.3	76.5	76.1	88.9
S	91.4	75.2	90.1	94.0	96.4	97.7
All plans	73.5	62.3	73.4	75.1	81.1	80.5

Source: Authors' computations using Watson Wyatt Worldwide data.

TABLE 6 Average Contribution to 401(k) Plans as a Percentage of Pay by Age of Workers Aged 21 to 64 with Annual Wages \$5,000 or Above and One or More Years Tenure

Plan	Average contribution amount	Average contribution rate	Average % of pay contributed by age of workers				
			20-29	30-39	40-49	50-59	60+
A	\$2,121	5.7	4.3	5.4	5.8	7.0	6.9
B	1,456	4.3	2.6	3.4	4.1	5.2	6.6
C	2,771	8.1	6.9	8.0	7.8	8.7	9.8
D	1,613	6.1	4.9	5.8	6.1	7.3	7.5
E	3,114	6.4	4.6	5.5	6.5	8.4	8.2
F	3,029	5.8	4.1	5.2	5.9	6.8	6.2
G	2,034	5.3	4.4	5.0	5.8	6.4	7.8
H	1,177	4.7	3.8	4.4	4.9	6.1	6.8
I	880	3.5	3.0	3.7	3.8	4.2	4.6
J	3,271	6.3	5.4	5.9	6.3	7.4	7.2
K	3,470	6.9	6.0	6.4	6.7	8.2	8.7
L	1,229	3.7	3.2	3.7	3.9	3.8	4.2
M	2,091	7.2	6.2	6.7	7.4	8.5	9.3
N	1,498	2.9	2.7	2.8	3.0	3.3	3.3
O	924	2.7	2.5	2.3	2.6	3.3	4.3
P	1,668	6.4	6.0	6.0	6.1	7.2	7.6
Q	1,079	4.9	3.4	4.5	4.3	6.4	8.2
R	4,379	6.8	5.9	6.6	7.0	9.1	7.9
S	3,236	6.3	5.0	5.9	6.5	7.1	7.3
All plans	2,122	5.3	4.0	5.0	5.4	6.7	7.1

Source: Authors' computations using Watson Wyatt Worldwide data.

The quintile distribution of contributions by 401(k) participants on the basis of salary level during 1994 appears in Table 4. In this case the distributions show a consistent pattern of increasing at each successively higher salary level. For workers whose annual pay fell below \$50,000 in 1994, none were at the 401(k) contribution limit for the year. Even among those whose annual salaries were \$100,000 or more for the year, only 28 percent contributed at the maximum dollar rate. It is possible that many workers at this level are constrained by the actual deferral percentage (ADP) limits in their plans. These ADP limits, set by law, often constrain contributions for highly compensated employees (HCEs) well below the dollar maximums established by law. In at least one case, we know the plan sponsor has established a nonqualified plan that substitutes for participation in the 401(k) plan for employees whose pay exceeds \$100,000 per year.

Participation rates in the individual plans by the age of covered worker are presented in Table 5. In general, participation rates rise with a

TABLE 7 Participation Rates in 401(k) Plans by Workers' Salary Levels for Workers Aged 21 to 64 with Annual Wages \$5,000 or Above and One or More Years Tenure

Plan	Plan participation rate	Participation rate by workers' annual salary level (in thousands of \$)				
		0-25	25-50	50-75	75-100	100+
A	78.7	62.4	89.2	93.1	97.4	97.4
B	62.8	48.1	78.2	85.2	92.3	100.0
C	76.8	63.7	84.8	89.0	94.0	60.0
D	91.6	88.8	97.7	100.0	100.0	93.8
E	81.9	50.0	83.6	91.3	93.5	89.5
F	93.1	91.3	92.7	93.8	100.0	96.8
G	90.7	88.3	90.4	96.2	100.0	100.0
H	97.7	98.0	97.0	98.8	100.0	100.0
I	61.5	56.0	83.8	94.9	49.4	6.8
J	65.4	30.3	70.3	79.8	90.5	91.8
K	88.9	69.1	86.4	94.0	97.3	97.5
L	53.2	36.8	76.7	87.7	84.9	100.0
M	98.8	98.2	99.3	100.0	100.0	100.0
N	47.4	33.6	38.4	67.4	82.5	88.4
O	58.7	45.7	66.4	62.2	55.6	61.5
P	91.5	90.5	92.6	NA	NA	NA
Q	56.8	55.7	59.4	NA	NA	NA
R	71.2	34.5	60.9	80.7	78.0	83.3
S	91.4	80.5	90.7	94.4	94.2	96.7
All plans	73.5	66.3	74.2	84.9	88.7	80.4

Source: Authors' computations using Watson Wyatt Worldwide data.

worker's age. On average, workers in their fifties and sixties have participation rates that are about 20 percentage points higher than those in their twenties. Participation rises the most as workers move from their twenties to thirties, increasing 11.2 percentage points. There is considerable variation in participation patterns among the plans, however. In some cases, high participation rates are achieved even among workers in their twenties. In Plan C, for example, participation for workers in their twenties actually exceeds the rates for workers in their fifties and sixties.

Average contribution amounts and rates for participants in each of the plans are reported in Table 6. Average contributions to the 401(k) plans vary from a low of \$880 per year to a high of about \$4,380 per year. In virtually every case, there is a steady increase in the average contribution rate at successively higher ages up through workers in their fifties, and, in most cases, workers in their sixties participating in a plan contribute at higher rates than those in their fifties.



TABLE 8 Average Contribution to 401(k) Plans as a Percentage of Pay by Pay Level for Workers Aged 21 to 64 with Annual Wages \$5,000 or Above and One or More Years Tenure

Plan	Average contribution amount	Average contribution rate	Average % of pay contributed by age of workers' salary levels (in thousands of \$)				
			0-25	25-50	50-75	75-100	100+
A	\$2,120	5.7	5.0	6.1	6.5	4.9	4.6
B	1,456	4.3	4.0	4.5	4.5	4.7	4.9
C	2,771	8.1	6.8	8.7	9.3	8.0	5.5
D	1,613	6.1	5.7	6.6	7.1	7.5	5.8
E	3,114	6.4	5.3	6.2	7.0	6.7	6.2
F	3,029	5.8	5.6	6.3	6.6	6.7	5.0
G	2,034	5.3	4.4	5.5	6.6	6.1	6.4
H	1,177	4.7	4.3	5.3	5.8	3.8	3.7
I	880	3.5	3.3	4.0	4.4	4.9	4.6
J	3,271	6.3	5.7	5.9	6.8	7.3	6.6
K	3,470	6.9	5.2	6.8	7.4	6.7	6.3
L	1,229	3.7	3.6	3.7	4.7	3.6	4.1
M	2,091	7.2	7.4	6.9	7.9	7.9	5.6
N	1,498	2.9	2.5	2.8	3.2	3.4	2.7
O	925	2.7	2.8	2.6	3.4	2.5	2.8
P	1,668	6.4	6.4	6.5	NA	NA	NA
Q	1,079	4.9	4.9	4.6	NA	NA	NA
R	4,379	6.8	6.4	7.6	7.5	6.6	4.4
S	3,236	6.3	6.2	6.6	6.1	6.2	5.7
All plans	2,122	5.3	4.5	5.6	6.0	5.8	5.0

Source: Authors' computations using Watson Wyatt Worldwide data.

Participation rates by annual pay, provided in Table 7, show that workers at successively higher pay levels generally have higher participation rates, although the rates in a number of the plans drop at earnings levels of \$75,000 per year or higher. Undoubtedly the ADP limit considerations come into play in a number of cases. Plan I, for example, has a non-qualified benefit for highly compensated workers that reduces participation by those in the upper end of the wage distribution in the 401(k) plan.

Contributions as a fraction of pay appear in Table 8. Though contribution rates rise with pay levels, this tendency is attenuated for employees earning over \$100,000 during 1994. Here the percent of pay contributed to the 401(k) plan was less than for workers at the \$50,000 to \$75,000 level. Also, in more than half the cases the contribution rates for workers earning between \$75,000 and \$100,000 fell below the contribution rate for workers at the \$50,000 to \$75,000 level of earnings.

## A Multivariate Model of Participation in and Contributions to 401(k) Plans

To test the observed relationships between worker and plan characteristics and participation in 401(k) plans more formally, we estimate (1) the probability that individual workers participate in a 401(k) plan and (2) the size of workers' annual contributions as a percent of annual earnings, given that a worker chooses to participate in a plan.

### Deciding to Participate in a 401(k) Plan

We model the probability that an individual worker will participate in a 401(k) plan as a function of the worker's age, his or her annual earnings, the value of any other company-provided pension, and other personal characteristics such as other family wealth, retirement plans, marginal income tax bracket, etc.<sup>1</sup> Considerable information suggests that retirement savings increase with age; however, this tends to be a nonlinear relationship and savings may actually decline as the actual date of retirement approaches. The value of tax deferred savings is greater for persons with higher earnings and, as a result, high-wage workers will be more likely to participate in 401(k) plans. In addition, higher-income workers may need to save more to attain the level of desired retirement income due to the progressive nature of the social security benefit formula. Of course, workers with higher income may have more discretionary income out of which to save. For these reasons, workers with higher earnings are expected to be more likely to participate in 401(k) plans. If workers have a target for retirement income, the existence of other pension benefits would be expected to reduce the probability of participation in the 401(k) plan.

In addition to these worker variables, several employer and plan characteristics are expected to influence the 401(k) participation decision. These include the rate at which the company matches the first dollar of individual contributions, the extent of communications concerning the 401(k) plan, and the size of the company. Higher match rates are expected to entice a larger percentage of workers to participate in the 401(k) plan by increasing the value of each dollar contributed to the plan. In developing the model of participation and contribution rates, we had no plans that did not match participant contributions to their 401(k) plans at some level. Better communications by the company will improve the worker's understanding of the program and should lead to increased participation.

Participation in a 401(k) plan is estimated using a multivariate logit model; the results are shown in Table 9.<sup>2</sup> The values reported in the table

TABLE 9 Logit Estimation of 401 (k) Participation Rates

Variable	Estimation with 17 companies		Estimation with 15 companies	
	Logit estimate	t-value of the parameter*	Logit estimate	t-value of the parameter*
CONSTANT	-29.194	-13.19	-28.754	-12.74
AGE	2.071	11.81	2.637	11.27
WAGE	0.657	38.52	0.813	43.21
AGE <sup>2</sup>	-9.690	-11.23	-9.494	-10.77
WAGE <sup>2</sup>	-4.419	-23.89	-5.350	-26.89
AGE <sup>3</sup>	15.026	10.71	14.779	10.31
WAGE <sup>3</sup>	8.796	15.76	10.631	17.67
AGE <sup>4</sup>	-8.492	-10.22	-8.396	-9.89
WAGE <sup>4</sup>	-5.375	-11.62	-6.519	-13.03
REPRATE			-0.028	-20.17
MATCH2	0.928	21.08	1.611	29.88
MATCH3	2.143	50.48	2.691	55.47
SIZE	-1.917	-67.40	-2.029	-67.36
COM1	0.388	12.25	0.864	20.77
COM2	0.740	21.28	1.204	28.38
Likelihood ratio chi-square		10,924.98		10,678.38
Observations		59,203		55,478
Percent correctly predicted		77.6		77.0
Madalla's pseudo R-square		0.1685		0.1751
McFadden's pseudo R-square		0.1601		0.1637

The regression results presented here are based on 55,000 to 60,000 worker observations, but the workers are grouped in a relatively small number of plans. Regression models using such data can result in "group effects" that result in a downward bias in the estimation of standard errors of estimated coefficients. To investigate the group effects in our model, we estimated a random-coefficient logit model (see Jain et al., 1994). The results of this estimation (available from the authors on request) show that although most t-ratios from the random-coefficient logit model are smaller than those reported here, all the parameter estimates still have the same signs and all are still statistically significant at the 5 percent level. The relative magnitudes of the parameter estimates also remain the same as those reported here. These results lead us to conclude that even though the group effects exist in our model, the results and related conclusions reported in the paper are still valid. To simplify our analysis and explanations, the results from the ordinary logit model are all that are presented here.

approximately represent the change in the probability of participation due to a one-unit change in the continuous explanatory variables such as age or the change in the dichotomous variables from a value of zero to one with other explanatory variables held constant at their mean values.<sup>3</sup> Levels of significance for the estimated parameters are reported in the table. (The logit coefficients from which these marginal effects are derived are available from the authors upon request.) The values reported in the second column are based on employment records from 17 companies while the results in the fourth column include only 15 companies.

The difference is due to the elimination of two companies for whom we were unable to calculate replacement rates from other company-provided pensions. Thus, the results reported in the second column are from a logit equation that did not include the replacement rate variable while the results presented in the fourth column are from a similar equation that does include the replacement rate variable. Since the results are fairly consistent between the two equations, only the estimates reported in the fourth column are discussed.

Earlier, we showed that there was not much variation in the match rate of employee contributions across the plans in this data set. As a result, match rates were grouped into three categories: 25 percent, 50 to 75 percent, and 100 percent. The estimates in column 4 of Table 9 indicate that relative to being in a plan with a 25 percent match rate, a worker covered by a plan with a 50 to 75 percent match rate is 28 percentage points more likely to participate in the 401(k) plan. Workers in plans with a 100 percent match rate are 47 percentage points more likely to make an annual contribution to the plan than those in a plan with only a 25 percent match rate. These results are statistically significant and imply that increased match rates increase the participation rate in a 401(k) plan. These findings are in general agreement with early studies that showed employer matches increasing the level of participation; however, the estimated magnitude of the increases in the probability of participation associated with higher match rates found here is considerably larger than that found in earlier studies.<sup>4</sup> Since all the plans in our sample provided some employer match, we were unable to test the effect of some match versus no employer match on the probability of participation.

The larger estimated effect of increases in the match rate on the probability of participation in the 401(k) plan found in this analysis may be due, in part, to the inclusion of the value of the current coverage in an employer-provided defined benefit plan. This variable has been omitted in previous studies. If the generosity of the defined benefit plan that has a negative effect on participation is positively correlated with the match rate on the 401(k) plan, excluding this variable from the estimation equation will result in biased estimates of the effect of match rates on the probability of participation in the 401(k) plan. Thus, the lower estimates found in earlier studies may be due to their omission of other company-provided pension benefits.

Workers are more likely to enroll in plans when they understand and feel comfortable about the investment opportunities. A key to the participation decision is the amount and quality of information provided by the plan sponsor. We attempt to measure this activity by considering three levels of plan communications. The first level of communication consists of only distributing plan enrollment forms and required peri-

odic statements of account balances. All plans in the sample provided this level of communication. The second level of employer communication (COM1) provides workers with generic newsletters related to participation in 401(k) plans. These statements are generally prepared by consulting firms and investment managers, and they discuss current financial market trends, personal investment strategies, and the national economic environment. The third level of communications (COM2) involves sending workers communication materials specifically tailored to the individual company's 401(k) plan. These materials generally give more detailed information about the specific plans covering the workers receiving the materials and may even suggest appropriate savings levels in the 401(k) plan, given Social Security and other pension coverage offered by the firm.

Companies can provide COM1, COM2, or both types of information to their employees. Approximately 60 percent of the workers in the Watson Wyatt data are enrolled in plans that provide the generic information, and approximately 60 percent are in plans that provide individually tailored information. About 20 percent are enrolled in plans where both types of communication are used. The logit analysis estimates these two communications strategies as having independent effects on participation.<sup>5</sup>

The estimated effects indicate that increasing the quality of communications significantly increases participation rates. If a company provides generic materials in addition to the required forms and statements, the probability of a worker's participating in the 401(k) plan increases by 15 percentage points. Further use of specifically prepared information tailored for a company's own plan increases the probability of participation relative to only having the required information by 21 percentage points. The estimated effects of communication efforts indicate that a firm using both generic and specifically tailored information can increase participation rates by 36 percentage points while holding the match rate constant.

This finding suggests that firms with relatively low participation rates may use increased education to attempt to raise participation rates. Thus, firms with low past participation rates may be found to have high and increasing levels of education. While this may suggest that the educational activities of the firm are made simultaneous with the participation decisions of its workers, the process is more likely to be recursive. Increased education in time  $t$  follows low participation in time  $t-1$ . If this model correctly captures the participation effect on education, education in time  $t$  is exogenous to the participation decision in time  $t$  and our participation equation is correctly specified. Thus, workers make current participation decisions based on education programs that were put in place by the firm at an earlier date.

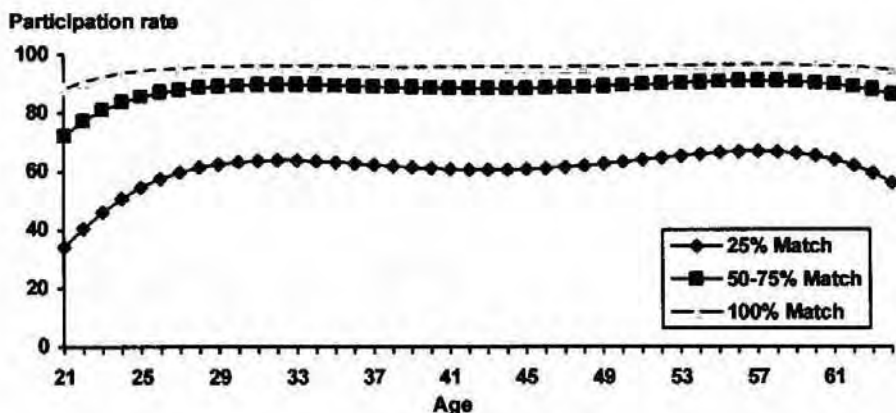


Figure 1. Probability of participating in a 401(k) plan by age under alternative matching assumptions (COM1 = 1, COM2 = 0, WAGE = \$35,000, SIZE = 0, REPRATE = 20%). Source: Authors' computations using Watson Wyatt Worldwide data.

Increases in the replacement rate (REPRATE) expected from other employer-provided pension plans significantly reduces the probability of participation in the 401(k) plan, but the estimated effect is very small, as Table 9 shows. The logit estimates indicate that a 10 percentage point increase in the replacement rate would decrease the probability of participation in the 401(k) plan by 0.48 percentage points. Workers employed in smaller firms are more likely to participate in the 401(k) plan than are comparable workers in large firms.

Prior research, discussed earlier, suggested that age and wage have nonlinear effects on the probability of participation in a 401(k) plan. To allow for these effects, we include four moments for both age and annual earnings in the logit equation. The nonlinear relationships between age and participation and wage and participation can not be easily read from the parameter estimates shown in Table 9. In order to describe the full effects of advancing age and increases in annual earnings, we have derived age/wage profiles that are shown in Figures 1 to 6. These profiles also enable us to better illustrate the relative effects of alternative match rates and communication strategies on the probability of participation in the plan. All profiles in the figures are drawn assuming a replacement rate from other pension plans of 20 percent (REPRATE = 20.0) and the company is among the smaller firms in our sample (SIZE=0). In the age profiles, annual earnings are set equal to \$35,000, and in the earnings profiles, age is assumed to be 40. Finally, each figure either holds the

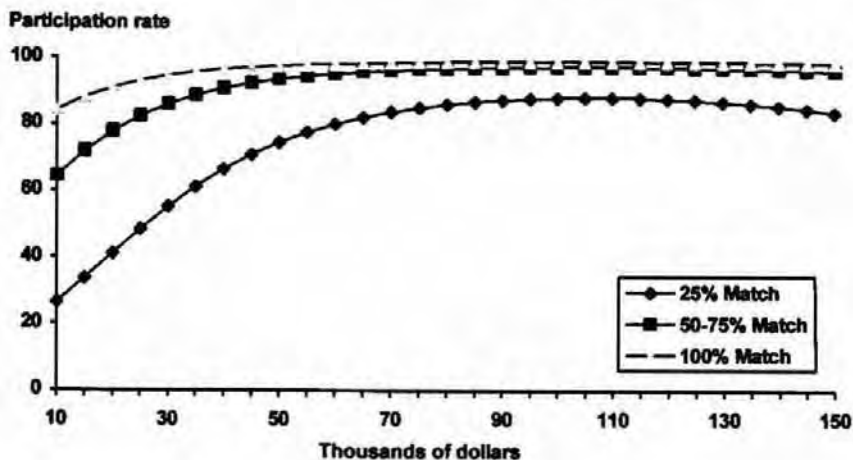


Figure 2. Probability of participating in a 401(k) plan by wage under alternative matching assumptions (COM1 = 1, COM2 = 0, AGE = 40, SIZE = 0, REPRATE = 20%). Source: Authors' computations using Watson Wyatt Worldwide data.

communication strategy or the match rate constant while the other is allowed to vary. With the exception of Figure 5, all figures with a constant match rate are based on a match rate of 25 percent and the figures with a constant communication strategy assume that the firm provides generic but not specific plan and investment information.

Figure 1 illustrates how the probability of participation changes with advancing age for three different match rates. Holding the match rate constant, the age profiles indicate that the probability of participation increases fairly rapidly for workers during their twenties and then remains relatively stable from age 30 to age 58. The participation probability then declines for the oldest workers. For example, the predicted probability of participation for workers aged 21 in a plan with a match rate of 25 percent is just below 40 percent. By age 30, the likelihood of participating in the plan has risen to over 60 percent. The predicted probability declines with age for older workers, falling back to approximately 50 percent for workers aged 65. Figure 1 also illustrates the impact of increasing the match rate on the probability of participation at each age. Raising the match rate from 25 percent to 50 to 75 percent increases the participation probability of workers in their early twenties from around 40 percent to approximately 70 percent. The effects of higher match rates is less for older workers.

Figure 2 presents the relationship between the participation proba-

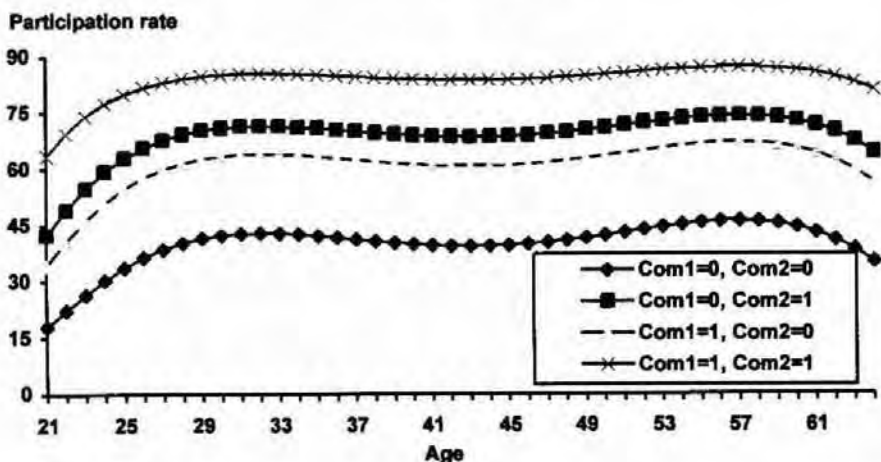


Figure 3. Probability of participating in a 401(k) plan by age under alternative communications programs (MATCH = 25%, WAGE = \$35,000, SIZE = 0, REP-RATE = 20%). Source: Authors' computations using Watson Wyatt Worldwide data.

bility and annual earnings. Holding the match rate constant, the likelihood of participating in a 401(k) plan increases sharply as earnings rise from \$10,000 to \$50,000. For a plan with a 25 percent match rate, the participation probability for a worker with earnings of less than \$20,000 is around 30 percent. The likelihood of participation increases to 70 percent for workers with earnings of \$50,000. The probability of participating in a plan then remains fairly stable with a slight decline in the likelihood of being in the plan for persons with very high earnings. Once again, the figure shows how increases in the match rate raise the probability of participation in the plan.

Figures 3, 4, and 5 show similar age and wage relationships holding constant the match rate while allowing for alternative communication strategies. In each case, the age and wage profiles are shifted up as the firm provides more and higher-quality information concerning the 401(k) plan. These profiles clearly illustrate the substantial impact that information programs can have on worker decisions to contribute funds to a 401(k) plan.

The significance of communication programs is further highlighted in Figure 6. This figure shows a wage participation profile while allowing both the match rate and the communications strategy to vary. The lowest profile is based on a match rate of 25 percent and assumes that the



Participation rate

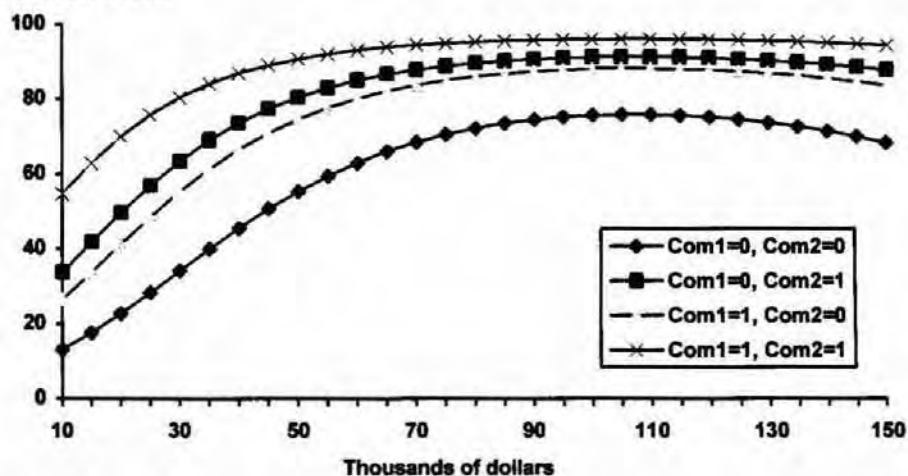


Figure 4. Probability of participating in a 401(k) plan by wage under alternative communications programs (MATCH = 25%, AGE = 40, SIZE = 0, REPRATE = 20%). Source: Authors' computations using Watson Wyatt Worldwide data.

Participation rate

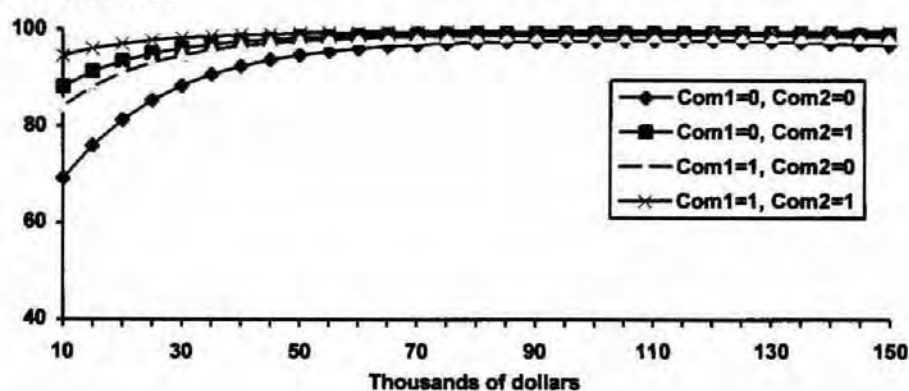


Figure 5. Probability of participating in a 401(k) plan by wage under alternative communications programs (MATCH = 100%, AGE = 40, SIZE = 0, REPRATE = 20%). Source: Authors' computations using Watson Wyatt Worldwide data.

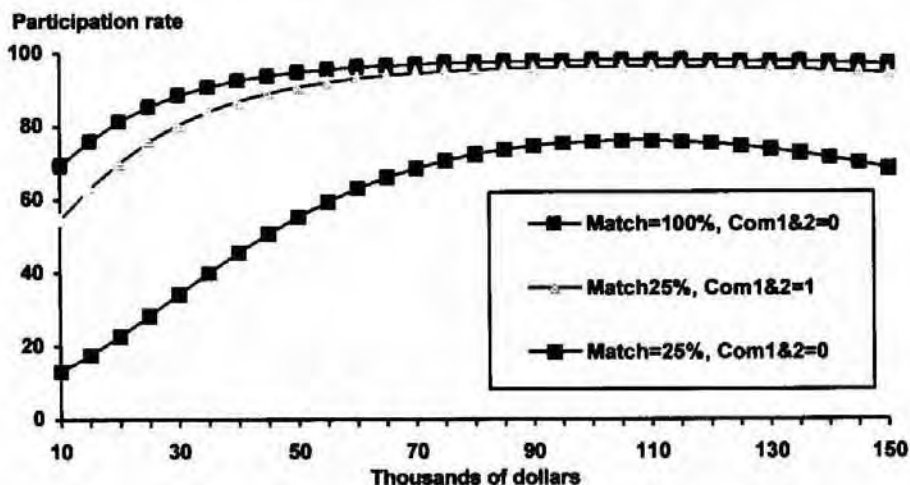


Figure 6. Probability of participating in a 401(k) plan by wage under alternative communications and matching programs (AGE = 40, SIZE = 0, REPRATE = 20%). Source: Authors' computations using Watson Wyatt Worldwide data.

firm only provides the required communications concerning the plan (COM1=0 and COM2=0). Participation probabilities can then be compared for two scenarios: (1) the match rate is increased to 100 percent, holding the communication strategy constant (the top profile) and (2) both generic and plan-specific information is provided and the match rate remains at 25 percent (the middle profile). As shown in the figure, improving communications concerning the plan has nearly as significant effect on the probability of participation as does increasing the match rate from 25 to 100 percent.

To illustrate this point, compare the participation probabilities for a worker earning \$30,000 under each of the three assumptions. The probability that a worker in a plan with a 25 percent match and only required communications will participate in the 401(k) plan is slightly over 34 percent. Increasing the match rate to 100 percent without improving plan communications results in an increase in the probability of participation to just over 88 percent. In contrast, if the match rate is held constant at 25 percent but the firm provides both generic and specific information, the likelihood that the worker will participate in the plan increases to slightly more than 80 percent.

This is an extremely important finding. It indicates that firms struggling to meet discrimination rules can increase participation rates by

doing a better job of informing their workers about the 401(k) plan and its investment options. The figure indicates that the magnitude of this effect is much larger for workers with lower annual earnings and, therefore, firms providing high-quality plan information will have an easier time meeting discrimination requirements. In general, this option of improved communications will be much less expensive to the company than increasing the match rate.

### Annual Contribution Rates

Conditional on participation in a 401(k) plan, workers must decide on their annual contribution. Table 10 presents the results of ordinary least squares (OLS) estimates of workers' annual contributions as a percent of annual earnings for each of the 401(k) plan participants in all 17 companies, and also separately for the 15 companies with for which we derived defined benefit replacement rates. The two specifications are so similar that we again focus on the plans with projected defined benefit replacement rates for workers at age 65. Once again, most of the variables are statistically significant and the direction of influence is consistent with the earlier results on participation.

The results show that increasing age and wage levels have a strong positive and statistically significant effect on workers' contribution rates under the plans. The generosity of the expected benefit from the defined benefit pension plan has a very small negative but statistically insignificant effect on workers' contributions to the plans. The size variable, once again, has a negative and significant effect on workers' contributions, just as it did on the probability of participation in the 401(k) offerings.

The estimates indicate that higher match rates produce significant increases in workers' annual contribution rates. Having a match of between 50 and 75 percent raises the annual contribution rate by 0.8 percentage points compared to the contributions of workers in plans with a 25 percent match. Workers in plans with a 100 percent match have annual contribution rates that are 2.0 percentage points higher than the rate for participants in plans with only a 25 percent match. Figure 7 shows the estimated contribution rates across the age spectrum under the three alternative matching rates in the plans under study. The positive relation between age and contribution rate mentioned earlier is clearly reflected in the graph. Given the linear nature of the model, the effects of match rates are constant across the age spectrum.

Figure 8 shows the estimated contribution rates across the wage spectrum at the three match levels used in the analysis. Workers' contribution rates rise gradually until the annual wage level reaches \$70,000 to \$80,000 and then begin to decline. The decline at the higher wage levels is un-

TABLE 10 Ordinary Least Squares Estimation of 401(k) Contribution Rates

Variable (1)	Estimation with 17 companies			Estimation with 15 companies		
	Estimated coefficient (2)	t-value (3)	Standardized estimate (4)	Estimated coefficient (5)	t-value (6)	Standardized estimate (7)
CONSTANT	-33.60	-8.38	—	-33.76	-8.03	—
AGE	3.43	8.46	8.96	3.41	8.00	8.74
WAGE	0.72	23.99	0.49	0.96	28.92	0.64
AGE <sup>2</sup>	-12.38	-8.28	-27.36	-12.33	-7.83	-26.60
WAGE <sup>2</sup>	-7.13	-19.51	-1.09	-8.76	-22.68	-1.36
AGE <sup>3</sup>	19.46	8.15	28.71	19.36	7.70	27.80
WAGE <sup>3</sup>	18.85	15.08	1.48	22.46	17.23	1.81
AGE <sup>4</sup>	-11.04	-7.93	-10.11	-10.95	-7.45	-9.73
WAGE <sup>4</sup>	-13.97	-12.97	0.80	-16.38	-14.66	-0.96
REPRATE				-0.00	-0.34	-0.00
MATCH2	0.61	8.62	0.07	0.79	9.19	0.09
MATCH3	1.55	24.60	0.20	2.00	26.68	0.26
SIZE	-1.40	-33.93	-0.19	-1.79	-38.82	-0.24
COM1	0.38	7.73	0.05	0.05	0.78	0.01
COM2	1.91	36.59	0.25	1.97	31.99	0.26
Valid cases		41,701			38,354	
R-squared		0.14			0.15	
Rbar-squared		0.14			0.15	
F		508.98			480.80	
Std error of estimate		3.41			3.44	
Durbin-Watson		1.76			1.78	

doubtedly related to the combined effects of IRS maximum dollar limits on pretax contributions to 401(k) plans and to the limits imposed by the ADP tests on these plans. At the upper wage levels reflected in the figure, some workers would have reached the dollar limits with contributions of 7 percent of pay. Workers whose wage levels were above \$65,000 in 1994 would have been in the highly compensated employee category and would have been subject to the ADP limits imposed on plans. While the figure suggests that the ADP tests appear not to have been a problem in general, they likely result in limitations in individual plans.

Estimated contribution rates to the plans by participants at various wage levels under the four alternative levels of communication are shown in Figure 9. Introduction of specifically tailored plan information results in a considerable increase in the annual contribution rate of two percentage points. The use of generic information does not alter annual contributions of participants at all. Each of the lines in Figure 9 actually reflects the outcomes under two different communications scenarios. The bot-

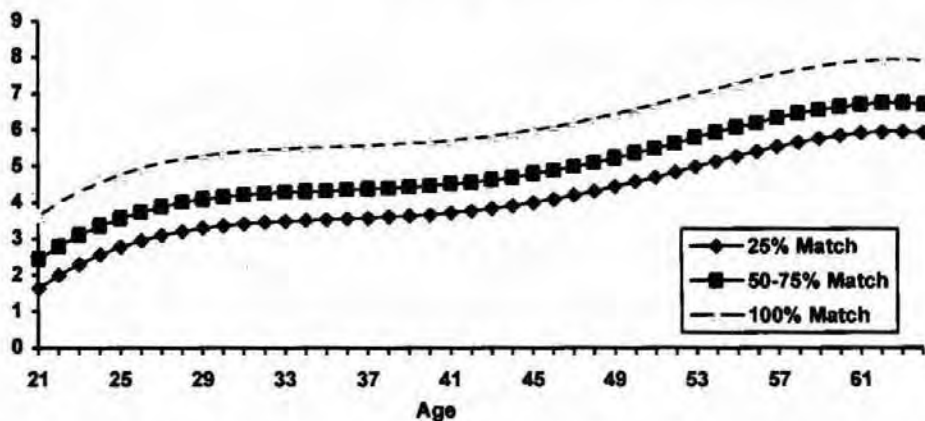


Figure 7. Estimated employee contribution rates to 401(k) plans by age of participant under alternative matching assumptions (COM1 = 0, COM2 = 0, WAGE = \$35,000, SIZE = 0, REPRATE = 20%). Source: Authors' computations using Watson Wyatt Worldwide data.

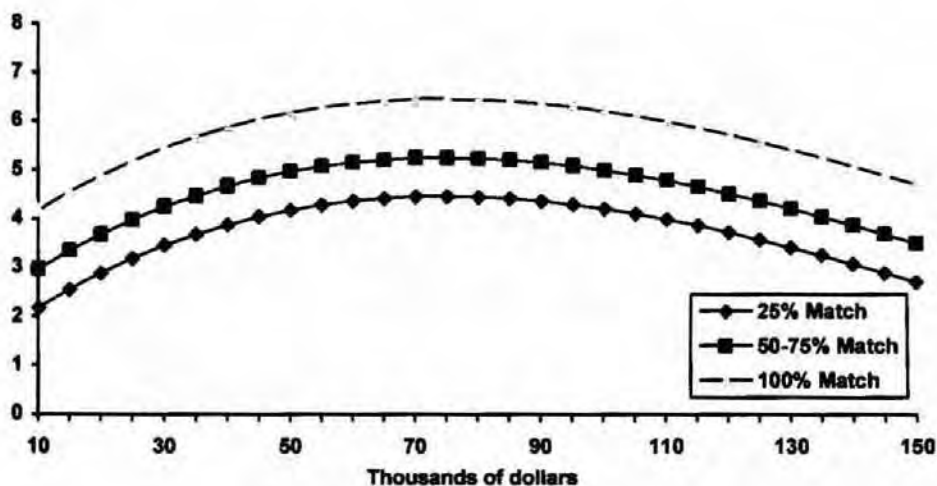


Figure 8. Estimated employee contribution rates to 401(k) plans by participant's wage level under alternative matching assumptions (COM1 = 0, COM2 = 0, AGE = 40, SIZE = 0, REPRATE = 20%). Source: Authors' computations using Watson Wyatt Worldwide data.

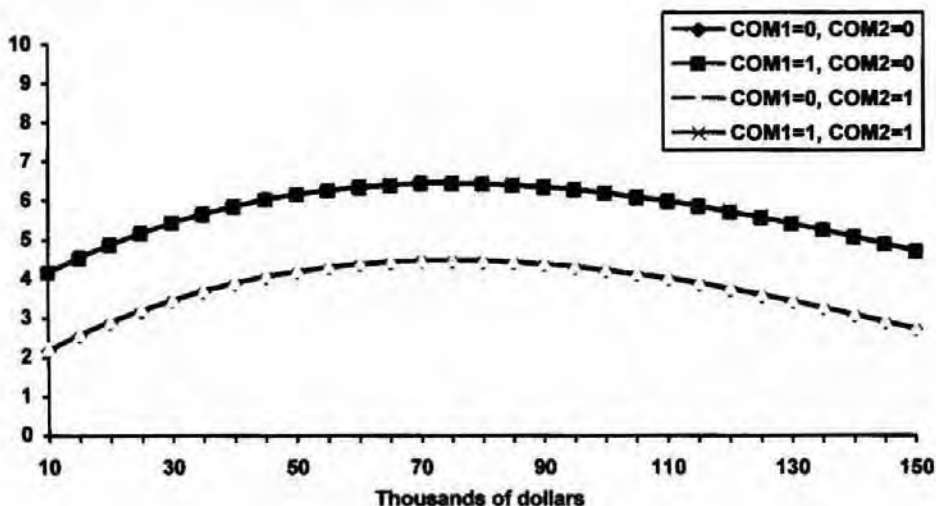


Figure 9. Estimated employee contribution rates to 401(k) plans by participant's wage level under alternative communications programs (MATCH = 25%, AGE = 40, REPRATE = 20%). Source: Authors' computations using Watson Wyatt Worldwide data.

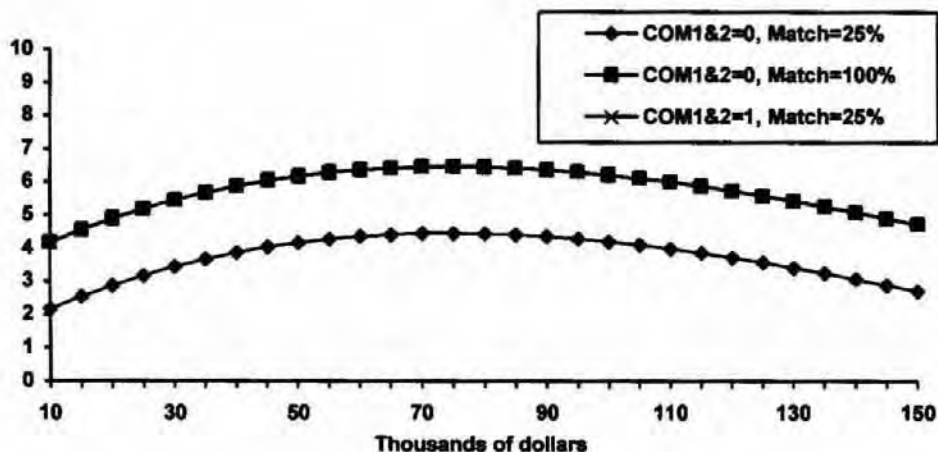


Figure 10. Estimated employee contribution rates to 401(k) plans by participant's wage level under alternative communications and matching programs (WAGE = \$35,000, SIZE = 0, REPRATE = 20%). Source: Authors' computations using Watson Wyatt Worldwide data.

tom line includes the case where only enrollment materials or enrollment materials plus generic communications materials are distributed to participants. The top line includes the cases where individually tailored communications materials are distributed either with or without generic communications.

Once again, it is clear that there is some tradeoff between higher matching of employee contributions to 401(k) plans and more intensive communications of the programs as alternative means of improving the participation in these plans. Figure 10 shows the estimated employee contribution rates in these plans at various wage levels under three alternative scenarios. The bottom line in the figure reflects the estimate under the scenario where the employer provides a 25 percent match of employee contributions and provides no communications materials beyond the basic materials needed to enroll in the plan and move one's money around. The top line in the figure represents the estimated participation rates in the other two scenarios. One scenario would have the sponsor increase the match rate in the plan from 25 percent to 100 percent. The other scenario would have the sponsor maintain the contribution rate at 25 percent but implement a communications program that was tailored to its own workforce and retirement plans. The outcome under these two scenarios is identical for all practical purposes.

## Conclusions

This analysis examines the factors affecting both participation and contribution rates in 401(k) plans using a limited cross-section of companies. Our results generally find that plan characteristics and communications have a somewhat larger effect on both participation and contribution levels than prior studies have indicated. The results of the current analysis suggest that further work should be done to expand the range of plans to include a set of plans that provide no match on employee contributions. Also the important effects of alternative communications programs on participation in these plans suggests that more detailed classification of the communications materials for future analyses would be worthwhile. The data also suggest virtually no pension offset; that is, 401(k) participation and contribution rates are only negligibly affected by corporate defined benefit generosity.

The authors wish to acknowledge the contributions of WeiKe Hai and Gordon Goodfellow of Watson Wyatt Worldwide for preparing the data and developing the statistical analyses that are included in this chapter. The opinions stated in this chapter are the authors', as is the responsibility for any errors in the analyses.

## Notes

1. The Watson Wyatt data set is based on company employment records and contains only those items routinely collected by employers. For this study, we were able to determine the workers' current age, their annual earnings for 1994, and the expected value of future benefits from other pensions offered by the company. While other factors may influence participation in a 401(k) plan, these variables represent some of the most important factors that workers consider when deciding whether to make a 401(k) contribution.

2. In developing the estimates, we dropped the two plans Q and R, where matching was on the basis of participant dollar contributions to the plan.

3. The participation profiles discussed below illustrate how the estimated effects of alternative match rates and communications strategies vary with different values of the other variables such as worker's age and annual wage.

4. For example, Papke (1993) reports an increase in plan participation rates of 17.4 percent associated with going from a zero match rate to a dollar-for-dollar match.

5. The authors are currently investigating the potential interactive effects associated with using both of these types of communications at the same time.

## References

- Andrews, Emily. "The Growth and Distribution of 401(k) Plans." In John A. Turner and Daniel J. Beller, eds., *Trends in Pensions 1992*. Washington, D.C.: USGPO, 1992.
- Bernheim, B. Douglas. "Personal Saving, Information, and Economic Literacy: New Directions for Public Policy." In Charles E. Walker, Mark Bloomfield, and Margo Thorning, eds., *Tax Policy for Economic Growth in the 1990s*. Washington, D.C.: American Council for Capital Formation, 1994: 53-78.
- . "Do Households Appreciate Their Financial Vulnerabilities? An Analysis of Actions, Perceptions, and Public Policy." In *Tax Policy and Economic Growth*. Washington, D.C.: American Council for Capital Formation, 1995: 1-30.
- Bernheim, B. Douglas and Daniel M. Garrett. "The Determinants and Consequences of financial Education in the Workplace: Evidence from a Survey of Households." Paper developed under grants from the Smith-Richardson Foundation and the National Science Foundation, August 1995.
- Employee Benefit Research Institute (EBRI). "Salary Reduction Plans and Individual Saving for Retirement." *Issue Brief* No. 155. Washington, D.C.: EBRI, November 1994.
- Ferguson, Karen and Kate Blackwell. *Pensions in Crisis*. New York: Arcade Publishing, 1995: 173-78.
- Ippolito, Richard A. "Discount Rates Imperfect Information and 401(k) Pensions." Mimeo; Washington, D.C.: Pension Benefit Guaranty Corporation, November 1993.
- Jain, Dipak C., Naufel J. Vilcassim, and Pradeep K. Chintagunta. "A Random-Coefficients Logit Brand-Choice Model Applied to Panel Data." *Journal of Business and Economic Statistics* 12, 3 (July 1994): 317-28.
- Kusko, Andrea L., James M. Poterba, and David W. Wilcox. "Employee Decisions with Respect to 401(k) Plans." This volume.



- Papke, Leslie. "Did 401(k) Plans Replace Other Employer Provided Pensions?" NBER Working Paper No. 4501, 1995.
- U.S. Department of Labor (USDOL), Pension and Welfare Benefits Administration. *Abstract of 1992 Form 5500 Annual Reports. Private Pension Plan Bulletin*, No. 5. Washington, D.C.: USGPO, Winter 1996: 59-81.
- Samwick, Andrew and Jonathan Skinner. "Abandoning the Nest Egg? 401(k) Plans and Inadequate Pension Saving." In Sylvester J. Schieber and John Shoven, eds., *The Economics of U.S. Retirement Policy: Current Status and Future Directions*, Cambridge, Mass.: MIT Press, 1997.