▶ 401(k) Issues

# Pension Education: Does It Work? Does It Matter?

## by David D. McCarthy and John A. Turner

▶ How do the investment practices of sophisticated and naive investors differ? With the growth of 401(k) plans, increasingly pension participants determine whether they participate in their employer-sponsored pension plan, the rate at which they contribute to it and the amount of portfolio risk they bear. *This shift in the retirement income system away from professional money managers and toward reliance on the decisions of unsophisticated individual worker-investors may result in some retirees having inadequate retirement income. This article finds that written financial information provided by employers increases the self-assessed financial knowledge of employees and that individuals who have a higher self-assessment of their financial knowledge are more likely to contribute to their defined contribution pension plan and more likely to invest in risky assets.* ◀

How do the investment practices of sophisticated and naive investors differ? Traditionally, both defined benefit and defined contribution pension portfolios were managed by sophisticated investors—plan sponsors or their professional money managers. Defined contribution plans, and in particular 401(k) plans, have grown rapidly, so that 60% of the workers participating in a private pension plan in 1993 indicated that a defined contribution plan was their primary plan (U.S. Department of Labor 1994). Along with the growth in 401(k) plans, there has been an increase in individuals managing their pension portfolios.

The trend toward individual management of pension portfolios has caused policy makers concern about investment decisions made by individuals. Are individuals making investment decisions that will lead to adequate retirement income? Proposals to establish individually managed funded accounts as part of Social Security have heightened policy interest in the way individuals are managing their pension accounts.

The shift in the retirement income system toward reliance on the decisions of unsophisticated investors may result in some retirees having inadequate retirement income. Some workers do not participate in the pension plans their employers offer them, some participants contribute little and some are conservative in their portfolio choice (Hinz, McCarthy and Turner 1996). These decisions by workers generally reduce their future retirement income.

Financial planning specialists contend that some pension participants allocate to fixed income assets too large a share of their portfolio.[1] On a survey, 69% of working Americans said that if they had to choose how to invest their pension money knowing that their benefits would go up with investment gains and down with losses, they would prefer low-risk, low-return investments (Employee Benefit Research Institute 1993).

Worker preference for low risk may result from lack of information. According to another Employee Benefit Research Institute (1996) survey, the majority of working Americans have limited financial knowledge about issues important in planning and saving for retirement. The survey rated 28% of workers as hav-

ing a high level of retirement financial knowledge. 55% as having a moderate level and 16% as having little knowledge. Only 55% of workers knew that U.S. government bonds provided a lower rate of return averaged over the past 20 years than the U.S. stock market. Many workers thus have insufficient knowledge to make informed decisions about asset allocation. A further concern has been raised by another survey where women self-assessed their knowledge of investments much lower than men.[2]

We investigate the effects of self-assessed financial knowledge on aspects of worker retirement planning. We focus on the effects of financial knowledge for three reasons. First, improving workers' financial knowledge may affect their choices. Second, the financial knowledge of workers may be affected by employers and policy makers and thus is a policy variable. Third, changes in behavior based on increased information are generally considered to be desirable.

In an earlier study, Bernheim and Garrett (1995) report results from a survey that included a battery of ten economic and financial questions. The worker's score on that test had a significantly positive coefficient in regressions on total wealth and retirement wealth.

Practitioners commonly believe that more knowledgeable workers contribute a higher percentage of their salary to the pension plan and invest in riskier portfolios. A 1994-95 survey by the Employee Benefit Research Institute (EBRI 1996) found that plan service providers and plan participants agreed that participant education affects participant behavior. The percentage of service providers who felt that educational materials had a *substantial* (as opposed to *minimal* or *moderate*) effect was 59% for participation rates, 46% for contribution rates and 49% for financial risk bearing. Among participants utilizing financial education, 39% reported that the materials led them to increase their contributions and 46% that it led them to reallocate investments among the options offered by the plan. Survey responses to such questions are potentially subject to bias. Plan service providers may overestimate the effect of participant education because some are in the business of providing such services, and participants may tend to provide answers they believe to be socially acceptable.

Economic theory suggests that a *priori* the effects are ambiguous. More knowledgeable workers would save more if they had underestimated the amount of savings required to maintain their desired consumption level in retirement. Similarly, they would invest in riskier portfolios if they had underestimated the increased expected return that accompanied increased risk. Our analysis provides econometric evidence on whether participant education affects self-assessed financial knowledge, and whether that knowledge affects individual pension contributions and financial risk bearing. Our earlier work with the same data focused on economic and demographic factors explaining gender differences in risk bearing in pension portfolios (Hinz, McCarthy and Turner 1996).

## THE DATA

The study uses data from a 1990 survey of federal employees regarding the Thrift Savings Plan (TSP) for federal government workers.[3] This plan as of December 1998 had assets of $64.5 billion, making it, after less than 13 years' existence, one of the ten largest pension funds in the United States (*Pensions and Investments* Web site). With 2.2 million participants, and $26 million in average daily contributions, it is projected to become the largest U.S. pension fund.[4]

Use of data from a single pension plan provides an important econometric advantage. If pension plans and other employment conditions available to a particular demographic group (e.g., men) differed from those available to another group (e.g., women) because of differences in the types of firms that employ the

**The Authors**

**David D. McCarthy** is an operations research analyst with the Pension and Welfare Benefits Administration of the U.S. Department of Labor. He holds a B.A. in mathematics from Amherst College and an M.S. in operations research from George Washington University. His areas of research interest include pension benefit levels, risk aversion and 401(k) plans.

**John A. Turner** is an economist in the Office of the Chief Economist, U.S. Department of Labor. He has a Ph.D. in economics from the University of Chicago. Preceding his current job, he spent two years working for the International Labor Office in Geneva, Switzerland as co-editor and contributing author for the book *Social Security Pensions: Development and Reform*, which will be published in 2000.

> *"By analyzing data from a single plan, we avoid the possibility that unobserved plan or firm characteristics confound our interpretation of individual behavior."*

two groups, we might observe demographic patterns of risk bearing even if each individual's decision was independent of demographic characteristics. By analyzing data from a single plan, we avoid the possibility that unobserved plan or firm characteristics confound our interpretation of individual behavior.[5]

The Federal Employees Retirement System (FERS) covers most federal employees hired after January 1, 1984. Participants in the preexisting Civil Service Retirement System could join the new system, but only a small percent did. Workers in the new system participate in a defined benefit plan, in Social Security and in the FERS. TSP was designed to provide a package of retirement benefits comparable to that provided by large private sector employers.

In the TSP, as in 401(k) plans in the private sector, workers contribute before-tax earnings. For FERS employees, the federal government automatically contributes 1% of salary. Workers may contribute up to 10% of pay. For workers who choose to contribute, the federal government matches their contribution up to 5% of pay—dollar for dollar for the first 3% and $.50 per dollar for the next 2%, for a maximum government contribution of 5% of pay and a maximum total contribution of 15%. In 1990, 76% of male and 62% of female eligible federal (FERS) employees contributed to the TSP.[6]

The plan has three funds in which participants may invest. The G fund holds short-term U.S. Treasury securities specially issued to the plan. The interest rate on these equals, by law, the average of market rates of return on U.S.

Treasury marketable securities outstanding with four or more years to maturity. The G fund generally earns a higher rate of return than Treasury bills.

The F fund contains both government and corporate bonds. This fund at the time of the survey invested primarily in a commingled Shearson Lehman Hutton Government/Corporate bond index fund. In dollar terms, the U.S. Government sector was 74% of the index, and the corporate sector was 26%. The fixed income fund has greater risk than the government securities fund because it has longer maturity (and thus greater interest rate risk) and because it includes corporate bonds with default risk.

The C fund is a Standard & Poor's (S&P) 500 index fund. While this fund is riskier than the other two funds, it is well diversified and thus much less risky than an investment in individual stocks. From 1980 to 1989, these three funds tracked indexes that earned average annual rates of return of 11.0% for the government bond fund, 12.2% for the fixed income fund and 17.4% for the stock fund. These performance statistics were the most recent available to participants at the time of the survey.

Data on the percentage of earnings the worker contributed to the plan and the investment mix of pension contributions are from a 1990 survey conducted by the Federal Retirement Thrift Investment Board (the Board), which administers the TSP. The primary purpose of the survey was to evaluate the effectiveness of the Board's publications in informing employees about the plan.

The survey asked if workers received written educational material from the Board,[7] if they received the material in time for it to affect their decisions concerning their pension account, how much of it they read and how they rated its clarity.

The survey also asked if workers received adequate information, considering all sources from which they received financial information, including friends, television and newspapers. The exact wording of that question is, "Overall, did you get enough information from any or all sources to make an informed decision about the Thrift Savings Plan?" The possible responses are "Definitely yes," "Probably yes," "Uncertain," "Probably no," and "Definitely

no." We interpret this question as a self-assessment of the worker's knowledge of financial and other aspects of the TSP.

The survey was matched using personal identifiers with administrative information on the employees.[8] Because the data on worker salary are based on administrative records, they are nearly complete and highly reliable.

While the full survey included part-time workers, postal service workers and federal workers in the Civil Service Retirement System, we restrict our sample to full-time nonpostal workers in the FERS.[9]

The data lack information on worker educational attainment and family asset holdings, which would be useful for a more complete analysis.[10] More educated workers may be less risk averse and more likely to participate in retirement savings programs. More importantly, a better measure of risk aversion could be obtained if information were available on family asset holdings. Many Americans, however, hold no financial assets outside their pension plans—in 1989, only 19% of American households owned stocks. Even among households with income of $50,000 or more, only 49% owned stocks (Kennickell and Shack-Marquez 1992).

### Empirical Results

The control variables we use are own salary, other family income, age, gender and marital status (married/not married). The means and variances of the variables are presented in Table I.

The intervening variable in our analysis is self-assessed financial knowledge. It is not obvious whether this self-assessed measure is more or less affected by participant education than an objective measure such as a test score would be. For purposes of our second goal, assessing the impact of participant knowledge on participant choices, the self-assessed measure is probably superior because it presumably represents the metric workers actually use in financial decision making.

Reverse causality in the effects of financial knowledge may bias our estimates. Workers who invest larger percentages of their earnings in the TSP and who invest their pension accounts in risky assets may choose to become better informed because their contribution and asset allocation decisions provide them

## TABLE I

### Variable Means
### Full-Time Nonpostal, FERS Employees Only
(Standard Deviations of Continuous Variables in Parentheses)

| Variable Description | Women | Men | Total |
|---|---|---|---|
| **Percent of Workers** | | | |
| Contributing to TSP | 66.6 | 82.2 | 76.6 |
| Contributing to C or F funds | 26.6 | 43.6 | 37.5 |
| Male | 0 | 100 | 64.3 |
| Married | 55.1 | 79.4 | 70.8 |
| **Responses to "Enough Information" Question** | | | |
| Definitely yes | 24.8 | 39.5 | 34.2 |
| Probably yes | 39.3 | 41.3 | 40.6 |
| Uncertain | 18.0 | 8.2 | 11.7 |
| Probably no | 9.0 | 4.6 | 6.2 |
| Definitely no | 1.2 | 1.9 | 1.7 |
| No response | 7.7 | 4.5 | 5.6 |
| **Continuous Measures for Workers** | | | |
| Salary | 30,654 | 44,131 | 39,326 |
| | (17,635) | (19,873) | (20,158) |
| Log (salary) | 10.2 | 10.6 | 10.4 |
| | (0.51) | (0.48) | (0.52) |
| Family income | 16,558 | 14,939 | 15,516 |
| (other than worker salary) | (18,161) | (13,645) | (15,418) |
| Log (family income | 7.1 | 7.7 | 7.5 |
| (other than worker salary)) | (4.2) | (3.8) | (4.0) |
| Age | 38.2 | 41.1 | 40.1 |
| | (10.3) | (10.6) | (10.6) |
| **Percent of TSP Contributors Who** | | | |
| Contribute max % (10) of salary to TSP | 19.5 | 31.3 | 27.7 |
| Contribute to C fund | 28.1 | 44.0 | 39.3 |
| Contribute to F fund | 11.8 | 19.8 | 17.4 |
| Contribute to C or F funds | 40.0 | 53.0 | 49.0 |
| Allocate max % (60) to C/F funds | 7.3 | 14.1 | 12.1 |
| **Continuous Measures for TSP Contributors** | | | |
| Percent of salary contributed to TSP | 3.7 | 5.2 | 4.7 |
| | (3.5) | (3.5) | (3.6) |
| Percent of contributions allocated | | | |
| To C fund | 31.4 | 34.1 | 33.6 |
| (C fund contributors only) | (16.6) | (18.9) | (18.4) |
| To F fund | 21.1 | 18.4 | 18.9 |
| (F fund contributors only) | (10.2) | (10.6) | (10.5) |
| To G fund | 84.4 | 77.2 | 79.3 |
| (G fund contributors only) | (25.7) | (27.4) | (27.1) |
| **Historical Returns for Chosen Mix of Funds** | | | |
| Mean | 11.7 | 12.1 | 12.0 |
| | (1.2) | (1.5) | (1.4) |
| Variance | 9.9 | 14.3 | 13.0 |
| | (11.8) | (16.2) | (15.1) |

(Note: These statistics are an unweighted description of the regression sample and should not be interpreted as representing all workers. The percentage of TSP contributors who contribute to the G fund is not shown because all participants were required to allocate at least 40% of their contributions to the G fund in 1990.)

## TABLE II

### Multinomial Logit Estimates of the Determinants of Worker Financial Knowledge

| Variable | 1 | 2 |
|---|---|---|
| Intercept 1 | −1.846 | −2.702 |
| | (0.28) | (0.37) |
| Intercept 2 | 0.155 | −0.678 |
| | (0.27) | (0.36) |
| Intercept 3 | 1.250 | 0.428 |
| | (0.28) | (0.36) |
| Intercept 4 | 2.887 | 2.076 |
| | (0.36) | (0.43) |
| Salary quartile 1 | −0.333 | −0.343 |
| | (0.16) | (0.16) |
| Male | 0.549 | 0.581 |
| | (0.15) | (0.15) |
| Age | 0.024 | 0.024 |
| | (0.01) | (0.01) |
| Received info.* | | 0.906 |
| | | (0.25) |
| −2 log likelihood | 2,069 | 2,056 |
| N | 855 | 855 |

(Note: Standard exrror in parentheses. Salary quartile 1 is a dummy variable taking the value of 1 if the worker's salary is in the lowest quartile of salaries in the sample. Age >50 is a dummy variable for the worker's age exceeding 50. We used this specification in order to satisfy the score test for the proportional odds ratio assumption.)
* A dummy variable flagging participant receipt of either: (a) the "TSP Open Season Update for May 15-July 31, 1990," or (b) the "Summary of the TSP for Federal Employees."

greater financial incentive to do so. For this reason, the associations we find between participant education and participant behavior may overstate the extent to which education changes behavior.

### Determinants of Financial Knowledge

Because self-assessed financial knowledge is the key variable in our analysis, we first investigate its economic and demographic determinants. Using multinomial logit, we find that males, older workers and higher income workers had higher self-assessed financial knowledge (Table II, column 1). A man in our sample self-assesses his financial knowledge equivalent to that of an otherwise similar woman 23 years older.

We next examine whether employers can affect the financial knowledge of workers. We find a positive effect on financial knowledge for workers who reported receiving one or both ed-

ucational publications from the board when this explanatory variable is added to the model discussed above. The estimated coefficient (0.906) for receipt of information in column 2 of Table II demonstrates a positive effect on worker financial knowledge with high statistical significance. Adding this dummy variable to the model minimally affects the coefficients of the other variables. These results suggest that differences in self-assessed financial knowledge are due in part to workers having access to educational publications and are not due solely to differences in individual characteristics.

### Contribution Rate

For workers in our sample who contributed to the TSP, the mean percentage of pay was 5%. However, roughly a quarter of the sample contributed 10% (the maximum), and roughly a quarter contributed nothing. Because of the bunching of observations at the two extremes, we use the tobit procedure to estimate the effect on contribution rates (Table III).

The contribution rate models encode responses to the question regarding self-assessed financial knowledge using four indicator variables. The indicators flag "definitely yes," "probably yes," "uncertain" and nonresponse. The infrequently given responses of "probably no" and "definitely no" constituted the omitted category.

Workers who self-assessed higher knowledge invested a significantly larger percentage of their salary in the TSP. Workers responding that they definitely had sufficient information invested 4.1% points more of salary than did workers who responded that they definitely or probably did not have sufficient information. This difference is statistically significant at the 1% level.

To investigate the results, the tobit regression on percentage of salary contributed to the pension was reestimated excluding workers who did not contribute. In that regression, the knowledge variables are insignificant. That result suggests that the significant effects found for the knowledge variables in the first regression are due to the effect of the knowledge measure on whether workers choose to contribute to the pension plan, not on how much they contribute once they decide to do so. To investigate further, we entered the same variables in a logistic regression testing whether self-assessed financial knowl-

edge affected whether the worker contributed. The estimated coefficients are positive and significant, with the magnitude of the coefficients increasing with higher levels of self-assessed knowledge. Thus, worker knowledge affects the threshold decision of whether to contribute, but once the decision to contribute has been made, worker knowledge does not have a further effect. These results are analogous to results found by other researchers concerning effects of employers offering matching contributions, where an employer matching contribution affects the worker's decision whether to contribute, but not how much to contribute (Papke 1995).

The nature of the educational materials that were the subject of this survey may account for the absence of a detectible effect on contributions beyond the threshold decision. Of nine investment education topics addressed by a 1994-95 EBRI survey, the topic bearing the closest logical connection to contribution rates was estimation of the income needed for retirement. Although 60% of plans offer education on this topic (EBRI 1996), neither of the two TSP publications in question covered it.

As expected, age and own salary both have significant positive effects on the contribution rate. In some regressions, other family income also has a significantly positive effect. The estimated effect of other family income may be weaker than that of own salary in part because it is self-reported and thus is measured with greater error, while own salary is obtained from administrative records. Gender and marital status are insignificant.

Because of habit persistence and the persisting effect of knowledge, we expect that once a worker decides to contribute to the TSP, he or she would probably continue doing so in future years. Thus, the ultimate effect on economic security of pension participation decisions influenced by an employer-sponsored financial education campaign may be large for some workers. For other workers, the effect may only be that the worker participated at a slightly younger age than otherwise. Even in that situation, inducing earlier participation is important to future economic security because the earliest contributions accumulate investment earnings over the longest periods.

Bayer, Bernheim and Scholz (1996) find no effect on worker participation or contributions of

## TABLE III

### The Effect of Self-Assessed Financial Knowledge on the Percentage of Income Contributed to the Thrift Savings Plan

| Variable | Tobit Left and Right Censored (1) | Tobit Excluding Zeros, Right Censored (2) | Logit (3) |
|---|---|---|---|
| Male | .269 | −.094 | .146 |
| | (.45) | (.34) | (.19) |
| Log of salary | 3.815 | 2.086 | 1.238 |
| | (.42) | (.03) | (.20) |
| Log of other income | .092 | .074 | .013 |
| | (.05) | (.038) | (.02) |
| Age | .091 | .093 | .009 |
| | (.02) | (.01) | (.009) |
| Married | −.098 | −.056 | −.041 |
| | (.49) | (.37) | (.21) |
| Definitely yes | 4.113 | .444 | 1.684 |
| | (.81) | (.68) | (.32) |
| Probably yes | 2.976 | .212 | 1.057 |
| | (.80) | (.67) | (.29) |
| Uncertain | 0.523 | −.440 | .213 |
| | (.94) | (.81) | (.33) |
| Nonresponse | −3.240 | −1.588 | −1.237 |
| | (1.29) | (1.19) | (.48) |
| Intercept | −42.766 | −19.648 | −12.986 |
| −2 log Likelihood | 3,519.76 | 2,829.26 | 985.84 |
| N | 856 | 656 | 906 |

(Note: Asymptotic standard errors in parentheses. The variables def. yes, prob. yes, and uncertain refer to responses to the question concerning whether the worker felt he or she had adequate knowledge of the Thrift Savings Plan. The variable nonresponse refers to nonresponse to that question.)

financial education provided through written materials. As they note, their results may be biased downward because financial education is more likely to be provided in plans where the workers tend not to participate. That bias is not present in our data since we use data from a single plan.

### Portfolio Choice

The survey asked what percentage of contributions the worker allocated to each of the three funds. In 1990, FERS employees could allocate a maximum of 60% of their own contributions to the combination of the common stock and fixed income funds.[11]

We first examine determinants of the percentage of the worker's contribution allocated to the C fund (Table IV). The estimation proce-

## TABLE IV

### Impact of Self-Assessed Financial Knowledge on Portfolio Choice

| Variable | Allocation to Stock Left and Right Censored All TSP Contributors | | Allocation to Stock Right Censored Stock Investors Only | | Portfolio Risk Left and Right Censored Stock or Bond Investors | |
|---|---|---|---|---|---|---|
| | Three Vars. for Knowledge | One Var. for Knowledge | Three Vars. for Knowledge | One Var. for Knowledge | Three Vars. for Knowledge | One Var. for Knowledge |
| Male | 15.930 (6.46) | 16.261 (6.44) | 3.327 (4.09) | 3.770 (4.03) | 0.138 (0.20) | 0.150 (0.20) |
| Log (salary) | 27.894 (5.99) | 28.063 (5.98) | 8.449 (3.69) | 8.520 (3.68) | 0.413 (0.18) | 0.423 (0.18) |
| Log (other income) | 1.585 (0.72) | 1.549 (0.721) | 0.325 (0.45) | 0.330 (0.44) | 0.012 (0.02) | 0.013 (0.02) |
| Age | −.418 (0.26) | −0.411 (0.26) | −0.084 (0.16) | −0.093 (0.16) | −0.01 (0.01) | −0.008 (0.01) |
| Married | −17.951 (6.90) | −17.704 (6.88) | −6.199 (4.08) | −5.924 (4.07) | −0.301 (0.20) | −0.284 (0.20) |
| Definitely yes | 20.554 (12.73) | | 11.867 (7.92) | | 0.556 (0.40) | |
| Probably yes | 10.073 (12.68) | | 9.492 (7.91) | | 0.369 (0.39) | |
| Uncertain | −0.98 (15.81) | | 1.238 (10.23) | | 0.003 (0.49) | |
| Five-category knowledge | | −8.484 (3.30) | | −3.804 (2.060) | | 0.200 (0.10) |
| Intercept | −313.66 (63.00) | −287.74 (62.05) | −60.97 (38.86) | −45.87 (38.33) | −1.436 (1.90) | −0.811 (1.86) |
| −2 log likelihood | 2,088.54 | 2,088.64 | 1,493.52 | 1,494.02 | 569.36 | 569.84 |
| N | 499 | 499 | 199 | 199 | 211 | 211 |

dure we use is tobit, allowing for both upper at 60% and lower censoring at zero.

Using a model quite similar to the contribution model, we first estimate a tobit including zeroes (Table IV, column 1) and then reestimate it with zeroes excluded (Table IV column 3).[12] In neither regression do we find a significant effect for the knowledge variables. That result was replicated when we reestimated the regressions using OLS (not shown).

Although all three of the knowledge variables are insignificant in both models even at the 10% level, their impacts vary monotonically in the expected direction; that is, more knowledgeable participants assume more risk. To investigate further, in both models we replace the three knowledge indicator variables

with a single knowledge variable coded as on the survey instrument, with one representing "definitely yes" and five "definitely no."[13]

When measured using this single variable approach, the impact of knowledge on percent allocation to stock is significant even in a two-tailed test at the 1% level in the double censored tobit model (Table IV, column 2). In a comparable right-censored model that excludes participants not investing in stock (Table IV, column 4), knowledge has an equivocal level of significance in a two-tailed test at the 5% level (p-value = 0.065). Because the restriction to participants investing in stock substantially reduces the number of observations and because a one-tailed test would be warranted, we do not regard this result as evidence that the

impact of knowledge is limited to a threshold effect as we found for contribution rates.

To further investigate, we measure risk preference by an alternative measure. The measure we use is based on the portfolio risk implicit in the participants' allocation of contributions among the three funds. The measure is the variance of returns on a hypothetical portfolio that, throughout the 1980-89 period, allocated assets among the three funds as the participant allocated contributions at the time of the survey.[14] Because the funds did not exist over the entire period, we use the returns of related securities, as published in TSP educational materials available to participants at the time of the survey. We calculated the historical variance incorporating the variances and covariances of the three funds. With this measure of risk bearing as the dependent variable, again the effects of the three indicator variables for self-assessed financial knowledge are insignificant.

As in the stock allocation model, we test the single variable coding of knowledge in a model limited to participants who allocate some portion of their contributions to either the stock or fixed income funds. We find that the impact of this knowledge measure on portfolio risk just reaches the threshold of statistical significance in a two-tailed Chi-square test at the 5% level of significance (Table IV, column 6). This result strengthens the evidence that self-assessed financial knowledge affects not only whether participants will invest in risky assets, but also shifts their preferences regarding the risk/return trade-off in the direction of greater risk and return.

In an earlier paper investigating male-female differences in choice of portfolio risk, we speculated that part of the unexplained gender difference in risk bearing was due to gender differences in financial knowledge (Hinz, McCarthy, and Turner 1996). These results confirm that hypothesis. After controlling for differences in self-assessed financial knowledge, unexplained gender differences in risk bearing remain among TSP participants overall, but those differences are reduced to insignificant levels when models are limited to participants who choose to invest in either the C or F funds. Thus, knowledge differences partially explain gender differences in the decision to invest in corporate stocks or bonds, and we cannot rule out the possibility that

they completely explain portfolio differences among those who choose such investments.

## CONCLUSIONS

This study provides econometric evidence supporting the widely held views that financial education increases self-assessed financial knowledge and that financially more sophisticated investors save more. We find that financial sophistication affects the decision to contribute. The limited scope of the educational materials in question may be the reason that we find no evidence that financial education affects the amount contributed beyond the threshold decision (to contribute or not). In addition, we find that financial sophistication increases both the portfolio share held in common stock and other measures of financial risk. Our evidence is too weak to rule out the possibility that the effect of financial knowledge on portfolio composition is limited to the threshold decision regarding acceptance of investment risk.

Our result that financial education associated with being in a pension plan increases the probability of contributing to a pension plan has implications for the effects of pensions on savings. Studies that have examined the effects of pensions on savings have not controlled for the effects of financial education that employers often provide to workers participating in a pension plan. Policy makers concerned with savings rates should understand that the effect of pension coverage on savings arises, in part, from the financial education that often accompanies pension coverage.

This study uses a sample of federal government workers. Federal workers may be more risk averse than private sector workers, having chosen employment that has a relatively low risk of layoff. However, because federal workers have less risk of layoff, they may more willingly accept financial risks. In either case, it appears unlikely that government employment would qualitatively affect the results of our study. Our findings demonstrate that employer-provided financial information increases self-assessed financial knowledge of employees and that increased knowledge is associated with higher levels of participation and financial risk bearing in 401(k)-type pension plans. ◀

*Authors' Note:* Helpful comments have been provided by Harriet Duleep, Leslie Papke, Josh

Wiener, participants at the Center for Pension and Retirement Research Conference at the Miami University of Ohio and participants at a seminar at the Bureau of Labor Statistics. The views expressed are solely the responsibility of the authors and do not represent the position of the U.S. Department of Labor.

## Endnotes

1. See, for example, *Employee Benefit Plan Review* (1993).

2. This conclusion is drawn from unpublished statistics of a nationwide survey of 401(k) plans conducted by New York Life and the Gallup Organization. The published results are contained in New York Life Insurance Company (1993).

3. Federal government workers may be more conservative in their attitude toward risk than private sector workers. Whether or not that is the case, male-female differences in attitudes toward risk are arguably the same for federal and private sector workers.

4. This projection was made by Francis Cavanaugh, executive director of the plan and was reported in Chernoff (1990).

5. This point was made for age differences in the analysis of single plan data by Kusko, Poterba and Wilcox (1994).

6. The information reported in this section is taken from Federal Retirement Thrift Investment Board (1991, p. B-69), which reports a descriptive analysis of these data. Most employees who began working for the federal government before January 1, 1984 are covered by the Civil Service Retirement System.

7. Employers use a variety of forms of communicating participant education including individualized counseling, group meetings, computer programs and videos. These forms may differ in effectiveness from the dissemination of written materials considered in this study.

8. Personal identifiers in the survey allowed an exact match. Workers tend to understate or not provide salary and family income on questionnaires. Thus, having administrative information on salary is one of the strengths of these data. It also provides a check on the information on family income, which was provided by the worker on the survey. Responses where family income was less than the worker's salary from the administrative records were excluded from the analysis.

9. Employees hired after January 1, 1984 are generally required to participate in FERS. Employees hired before that date had the option of participating when FERS was initially offered. The study is limited to FERS employees because in 1990, the survey year, non-FERS employees were required to allocate their entire Thrift Savings Plan investments to the G fund.

10. Workers with more than 12 years of schooling are more likely to use educational material but may be less affected by it than workers with less formal education (EBRI 1996).

11. The ceiling has since been lifted and FERS employees can direct 100% of their contributions to any of the funds.

12. The model that excludes workers not investing in the C fund distinguishes between the threshold decision as to whether to accept risk or not and the level of risk decision in a manner analogous to that used for the contribution models.

13. These responses can be encoded in many other ways. None of the obvious alternatives significantly improved the model.

14. The data contain information on the allocation of investments for contributions but do not provide information on the asset mix of the worker's entire pension account.

## References

Bayer, Patrick J., B. Douglas Bernheim and John Karl Scholz. 1996. "The Effects of Financial Education in the Workplace: Evidence From a Survey of Employers." Stanford University. June.

Bernheim, B. Douglas, and Daniel M. Garrett. 1995. "The Determinants and Consequences of Financial Education in the Workplace: Evidence From a Survey of Households." Stanford University. August.

*Employee Benefit Plan Review*. 1993. "Conservative Players Should Seek Balance With Common Stocks." January. pp. 29-30.

Employee Benefit Research Institute. 1995. "Participant Education in Participant Directed Defined Contribution Plans." A report to the U.S. Department of Labor and the U.S. Securities and Exchange Commission. Washington, D.C., October 1.

_____. 1994. "Retirement Confidence in America: Getting Ready for Tomorrow." EBRI Special Report SR-27. *Issue Brief* No. 156, December.

_____. 1993. *Public Attitudes on Investment Preferences*. Washington, D.C.

Federal Retirement Thrift Investment Board. 1991. *Thrift Savings Plan: Report on 1990 Survey of Federal and Postal Employees*. Prepared by the Office of Communications, Washington, D.C., November.

Hay Associates. 1995. "Trends and Experience in 401(k) Plans." Lincolnshire, IL.

Hinz, Richard P., David D. McCarthy and John A. Turner. 1996. "Are Women Conservative Investors? Gender Differences in Participant Directed Pension Investments." In *Positioning Pensions for the Year 2000*, edited by Olivia Mitchell. Philadelphia: University of Pennsylvania Press.

Kennickell, Arthur, and Janice Shack-Marquez. 1992. "Changes in Family Finances From 1983 to 1989: Evidence From the Survey of Consumer Finances." *Federal Reserve Bulletin* 78 (January): 1-18.

Milne, Deborah A., Jack L. VanDerhei and Paul J. Yakoboski. 1996. "Participant Education: Actions and Outcomes." EBRI *Issue Brief* No. 169, January.

New York Life Insurance Company. 1993. "Most 401(k) Participants Are Well Informed. And Now for the Bad News."

Papke, Leslie E. 1995. "Participation in and Contributions to 401(k) Pension Plans: Evidence From Plan Data." *Journal of Human Resources* 30 (Spring): 311-325.

*Pensions and Investments*. http://www.pionline.com/pension/200_top.cfm.

U.S. Department of Labor, Advisory Council on Employee Welfare and Pension Benefit Plans. 1995. "Report of the Working Group on Pension Education." Washington, D.C., November 7.

U.S. Department of Labor, Bureau of Labor Statistics. 1993. "Employee Benefits in Medium and Large Firms." Washington, D.C.

U.S. Department of Labor, Pension and Welfare Benefits Administration. 1995. "Abstract of 1991 Form 5500 Annual Reports." *Private Pension Plan Bulletin* 4 (Winter).

_____. 1995. "Executive Summary of the Fiduciary Oversight Program for the Thrift Savings Plan as of September 30, 1995."

_____. 1994. *Pension and Health Benefits of American Workers*. Washington, D.C.

U.S. General Accounting Office. 1995. "Federal Pensions: Thrift Savings Plan Has Key Role in Retirement Benefits." Washington, D.C., October.