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## Financial education and asset allocation

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### Abstract

We conduct a clinical study on a firm that restructures its 401(k) plan and simultaneously offers financial education seminars to its employees. The restructuring requires each employee to restate allocation percentages, thus we are able to analyze the specific benefits of retirement planning seminars on the asset allocation decision. We find that seminar attendance is associated with increased portfolio diversification and improved risk management. When combined with changes in return, the overall result is that seminar attendees create more efficient portfolios, which implies a better understanding of the retirement planning process. © 2006 Academy of Financial Services. All rights reserved.

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### 1. Introduction

The trend in corporate retirement plans in recent years has been to transition from defined benefit (i.e., pension) to defined contribution [i.e., 401(k)] plans. This change shifts the responsibility of retirement planning from the firm to its employees and presents a number of investment alternatives for plan participants to choose from in building a retirement portfolio. To avoid potentially serious mistakes, employees must become educated as to the proper methods and criteria to employ when managing their retirement portfolios.

Initially, most of this financial education was the responsibility of individual plan participants. More recently, firms have begun offering in-house education, either by internal staff or external consultants, which participants often view as a form of employee benefit. If

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individual participants are to have investment decision making responsibility, it is also important from a fiduciary perspective for employers to offer effective education programs that improve participants' ability to make sound asset allocation decisions. Thus, good financial education may be just as important to the firm as it is to the individual employee.

These trends motivate us to examine the effectiveness of a particular employer sponsored financial education program in meeting the needs of both its participants and the employer. Existing studies examine various employer-sponsored plans, giving particular attention to the benefits that financial education provides. For example, many studies find that participants are too conservative in their allocation decisions. These studies also find that employees who attend investment education seminars are more likely to increase the proportion of equity they hold, thereby offsetting the conservative bent.

Our study differs in significant ways from existing research. Prior studies generally concentrate on surveyed intentions (Muller, 2003; Clark, d'Ambrosio, McDermed & Sawant, 2003), whereas we measure the impact of a retirement planning seminar on the actual asset allocations of attendees. Previous studies primarily analyze cross sectional data on allocation decisions of individuals who have attended a seminar (employer or non-employer-sponsored) relative to those who have not. We concentrate on participants within the same firm who did (or did not) attend the employer sponsored education seminar.

The advantage of our clinical study is that we use actual asset allocation elections collected and reported by an employer at a single point in time rather than survey data on what participants intend to do or eventually do in a multimonth period after the education. In addition, by focusing on just one firm and its investment alternatives we are able to provide more insightful results on the potential impact of financial education on asset allocation decisions. For example, we are able to calculate Sharpe ratios on the pre- and post-seminar asset allocations to determine if participants who attend the planning seminar achieve more efficient portfolio diversification. Moreover, the firm we study presents a unique situation in that at the time of the education program, the structure of its 401(k) plan was in transition, which forced all employees to restate their allocation elections. This allows us to highlight more formally the actual impact of education programs on asset allocation decisions.

We find that the education program provided by the firm we study appears to improve the financial understanding of its employees. More specifically, we find that participants who attend the seminar select a greater number of funds to hold, thereby increasing the diversification of their portfolios, which is consistent with the results of previous studies. In contrast to previous results, we find that employees who attend the seminars become more conservative in their allocation decisions. This result appears to be a function of firm specific characteristics. The original investment choices in the firm's plan were skewed toward small- and midcap equities. Thus, participants may have unknowingly constructed extremely risky portfolios. Our results are consistent with previous studies that find education induces participants to allocate in a way that is more consistent with their risk tolerance.

In conjunction with reduced risk, we also find that portfolios of participants who attend the seminar do not have lower expected returns. The combination of lower risk, but otherwise equivalent returns, implies that participants who receive financial education are able to create

more efficient portfolios. Consistent with this implication, we find that the portfolios of attendees generally exhibit higher Sharpe ratios. In sum and consistent with previous studies, our results suggest that individual employees may not generally be knowledgeable enough to structure the most appropriate retirement portfolios. Employers may be able to offset this lack of knowledge, and also fulfill their fiduciary responsibilities, by providing education programs.

In Section 2, we provide pertinent background on the recent transition to 401(k) plans, as well as the preparedness of employees and employers to deal with these changes. We also address the role of education in overcoming biases and improving portfolio management. In Section 3, we describe our data, giving particular attention to the specifics associated with the firm we study. Section 4 presents our results, including a series of robustness tests designed to increase confidence in our findings. In Section 5, we discuss implications for employees, employers, and education providers before summarizing conclusions in Section 6.

## 2. Background

### 2.1. *History and transition of 401(k) plans*

The legislation that created 401(k) retirement plans in the United States passed in 1978 and, by 2002, there were over 430,000 such plans with over 47,000,000 participants (History of 401(k) plans, 2002). Before the establishment and subsequent rise in use of these defined contribution plans, employers retained much of the responsibility for meeting the retirement needs of their workers through defined benefit plans. Although the increased use of 401(k) plans generally provides employees with more flexibility, this transition also shifts the burden and responsibility for retirement investment strategy to individual workers.

This trend does not appear to be confined to corporations in the United States. The movement toward defined contribution plans seems to be occurring in the governmental sector, as well as abroad. For example, as this study is written in early 2005, President Bush has begun urging Social Security reforms that include a self-directed investment component, and Governor Schwarzenegger in California is advocating a similar privatization of part of the state's retirement system. Additionally, a number of other states either have optional private plans for employees or are considering them (Palmeri & Byrnes, 2005).

Although at an earlier stage, this trend toward participant directed retirement plans is evident in the European Union as well. In 1998, the European Commission announced an initiative to promote defined contribution plans and individual retirement accounts that would have similar rules across Europe (Bell, 1998). An example is France's "Plan d'Épargne Retraite Collectif" (PERCO), which gives employees a choice of at least three investment alternatives and which may also serve as a model for a pan European plan (Mahmud, 2004).

At the same time that defined contribution plans are proliferating, plan sponsors are also

increasing the number of choices available to participants (Benartzi & Thaler, 2002). A few years ago participants might have been asked to allocate funds among a stock fund, a bond fund, and the money market. Today, these same participants may face the choice of a dozen or more funds, each representing a distinct asset category.

## *2.2. Employee preparedness*

With increased responsibility and a growing number of choices, a very real concern is whether individual participants are prepared to manage their own accounts. For example, some observers doubt that the majority of individuals have sufficient knowledge to make the asset allocation decision in a way that is consistent with their risk tolerance and retirement income needs (Zuckerman, 2005). According to a survey conducted by Hewitt Associates LLC, employers tend to agree that their workers lack financial knowledge. The survey also indicates that, as a result, employers are increasingly offering education opportunities. Unfortunately, many employers still doubt the overall effectiveness of these programs (Crenshaw, 2005), particularly considering that many workers choose not to take advantage of this financial education.

In a similar fashion, Bernheim (1998) concludes that most Americans lack the preparation to manage their personal finances and that their retirement choices are a reflection of this ignorance. Bernheim also finds that Americans typically do not use assistance from qualified financial advisors, and his view is supported by data from the Employee Benefit Research Institute (1997), which finds that half of 401(k) decision makers do not consult a financial professional and only 45% of these participants find information from their employers to be “very helpful.” This lack of knowledge generally results in participants being too conservative and allocating too small of a percentage of their portfolios to equity securities.

Compounding the problems associated with financial ignorance is a series of potential behavioral biases typically exhibited by uneducated investors. For example, Baker and Nofsinger (2002) note that biases such as heuristic simplification, overconfidence, status quo bias, and attachment bias may affect investment decisions, thereby causing investors to do serious harm to their wealth. Baker and Nofsinger suggest a five-step process for avoiding and/or overcoming these biases. This process revolves around financial education that leads investors to identify objectives and constraints, as well as fosters an understanding of diversification and quantitative investment criteria. Thus, education not only serves to improve fundamental understanding, but it may also dissipate the effects of psychological and behavioral biases.

## *2.3. Effects of employer sponsored education*

Although only a relatively small percentage of participants take advantage of financial education offered by their employers, it is ironic that those who do use employer sponsored programs generally find them to be practical and useful. For example, Bernheim and Garrett (2003) find that the mere availability of an employer sponsored education program appears to increase savings rates, particularly in 401(k) plans.

Arnone (2004) analyzes the availability and quality of employer sponsored education

programs. He contends that the highest quality programs are those that are offered year round (during working hours) and that address both general, as well as individualized, retirement planning scenarios. Unfortunately, Arnone concludes that this description is apt for only a minority of the available programs and that most individuals are still making decisions without the benefit of expert guidance from their employers.

McCarthy and Turner (2000) find that even cursory written educational materials supplied by employers are beneficial, resulting in participants reducing their conservatism bias and allocating a greater portion of their accounts to equities. In a similar fashion, Muller (2003) shows that education classes influence more risk averse individuals to increase their allocation to equities, particularly those individuals who are farthest from retirement.

Similar to the results of the above studies, Clark et al. (2003) find that approximately 30% of participants who attend a seminar provided by TIAA-CREF intend to change their asset allocations. Ameriks (2001) finds that TIAA-CREF participants who take part in a guidance session, either by phone or in person, which includes a software driven asset allocation recommendation, are more likely to adjust their allocations.

The overall evidence suggests that even the most basic education programs are beneficial and aid plan participants in structuring more appropriate portfolios. In addition, with the shift in responsibility, these education programs are increasingly being viewed as more than just an employee benefit. Rather, the education may be viewed as a way to fulfill the fiduciary responsibility of plan sponsors. Thus, education programs may meet the needs of both employers and employees.

### **3. Data**

A sizable law firm (approximately 100 lawyers and 125 support staff) located in the Midwestern United States provided the opportunity to address the research question of how financial education impacts participant asset allocation decisions in a retirement portfolio. Early in 2004, the firm conducted a review of possible changes to the investment alternatives made available to its participants through its 401(k) plan. On advice from consultants, the firm decided to engage a different fund manager for many of the investment alternatives. Although the change involved adding funds in asset categories not specifically available in the existing set, funds representing most of the typical asset categories were available in both the existing and the prospective sets of investment alternatives. Appendix 1 provides a listing of the available fund investments both prior and subsequent to the change.

With the change in fund provider, all participants were required to restate their asset allocations. Before this decision, the firm provided opportunities for participants and their spouses to attend a seminar on retirement investing. The seminar was presented four times during the first two weeks of June 2004 at a variety of hours to be convenient to as many participants as possible. The seminar, which was conducted by the same educator each time, lasted approximately 90 min and covered the main topics of planning fundamentals, the alternative investment funds and their risk-return characteristics, diversification, risk tolerance, and asset allocation strategies. Handout materials summarizing the presentation were also distributed. Approximately 60% of the eligible participants attended one of the seminars.

After the seminars, plan participants (both attendees and non-attendees) were surveyed by the employer to determine if they attended the seminar, as well as to collect control information on risk attitudes and demographics. Survey respondents provided the last four digits of their social security numbers so that survey data could be matched in an anonymous fashion to asset allocation data from both prior and subsequent to the education seminars.

To estimate the overall risk and return profiles of retirement portfolios selected by plan participants, we collect five years of monthly historical return information on all funds available both prior and subsequent to the restructuring. We collect mutual fund data from Yahoo! Finance, Morningstar, and the Center for Research in Security Prices (CRSP) databases. Data for the midcap blend and small-cap value funds come directly from the portfolio managers. In addition, we proxy risk free rates of return using the market rate on three-month Treasury bills for the specific month of interest.

With survey and financial data collected as described above, we calculate the following variables for participant retirement accounts prior and subsequent to the plan restructuring:

*Funds* = The number of funds held in the participant's portfolio;

*Equity* = The percentage of the participant's portfolio that is invested in equity (i.e., non-fixed income instruments), as determined by Morningstar data on individual fund compositions;

*Return* = The expected yearly return on the participant's portfolio, as estimated using five year historical return data;

*Dev* = The standard deviation of the participant's portfolio, which accounts for the covariance of returns among the different investment choices; and

*Sharpe* = The Sharpe ratio of the participant's portfolio, defined as the fund's expected return less the risk free rate, relative to the portfolio standard deviation.

## 4. Methodology and results

### 4.1. Univariate results

It is possible that the change in plan structure would allow all employees to create more efficient portfolios. For example, the addition of REIT, High Yield Bond, and Balanced funds expands the opportunity sets participants face and, therefore, increases the ability to form efficient portfolios. It is also possible that there is an underlying relation between seminar attendance and prior portfolio choice. Thus, rather than focusing on a comparison of attendees versus non-attendees on either a pre-change or post-change basis, we concentrate on a comparison of the changes in each of the above variables.

For example, rather than evaluating the variable *Funds*, both before and after the change, we define the variable *FundsDiff* as the difference in the number of funds held subsequent to the restructuring relative to the number of funds held prior. Thus, for a participant who held five funds before the change and seven funds after, the variable *FundsDiff* would take on a value of 2. Because both attendees and non-attendees face the same pre- and post-choices, analyzing the change, rather than the individual values, allows us to specifically

Table 1  
Portfolio summary statistics

|            | Attend (1) | Not Attend (2) | <i>t</i> -statistics (1) v (2) |
|------------|------------|----------------|--------------------------------|
| n          | 43         | 29             |                                |
| FundsDiff  | 2.26       | .66            | <i>3.14</i>                    |
| EquityDiff | -3.66      | 5.13           | -1.72                          |
| ReturnDiff | -1.34      | -.88           | -.36                           |
| DevDiff    | -3.51      | -.89           | -2.26                          |
| SharpeDiff | .74        | .03            | 1.85                           |

*Note:* This table reports descriptive statistics for the portfolios of two groups of participants: those who attend the seminar (that is, *Attend*) and those who do not attend the seminar (that is, *NotAttend*). The first two columns report mean values for each group, and the last column provides *t*-statistics from difference tests between the two groups. *t*-statistics that are italicized are significant at the 10% level. Each variable represents a differenced amount that compares values prior to the seminar to values after the seminar. For example, *FundsDiff* is the number of funds held after the seminar less the number of funds held before the seminar. Thus, a positive value indicates an increase in the number of funds held. *Equity* measures the percentage of the participant's portfolio invested in equity; *Return* measures the average historical return for the selected portfolio; *Dev* measures the standard deviation of the chosen portfolio; and *Sharpe* measures the reward to risk ratio of the selected portfolio, as measured by the risk premium, relative to standard deviation.

focus on the influence of the financial education seminar and, at least in part, reduce the effects of the structural change in the plan's composition. It is worth noting that the number of funds available before the plan change is equivalent to the number offered subsequent to the change.

Table 1 contains portfolio summary statistics for the differenced values of the variables described above. We report averages for those plan participants who attend the seminar and those who do not. In addition, we report *t*-statistics from difference of means tests between the reported values. We find that, on average, those who attend the seminar increase the number of funds they hold by 2.26 whereas those who do not attend increase by only 0.66. This difference is significant at the 1% level and is consistent with increased diversification for those who receive financial education.

While attendees hold more funds, the percentage invested in equity is actually reduced by -3.66%; whereas, equity held by non-attendees increases by 5.13%. This difference is significant at the 10% level. This result is in contrast to prior studies (McCarthy & Turner, 2000; Muller, 2003) that find financial education results in participants becoming more risk tolerant; however, it is consistent with the starting position of this plan.

A unique characteristic of the firm we study is a long-standing relationship with the managers of both the midcap blend and small-cap value funds. (These are actually managed accounts rather than mutual funds.) At one time in the plan's history, these were the only equity fund alternatives. In addition, through multiple changes in the plan's structure, these managers have been retained. In fact, these were the only two funds for which the manager was not changed in the most recent restructuring.

Benartzi and Thaler (2001) investigate diversification strategies in defined contribution plans and find that many investors follow a simple and naive strategy of dividing their contributions equally among all available investment alternatives. Thus, the previous struc-



ture of the firm's plan, in which there were multiple equity choices (particularly more risky equity choices), suggests that participants in this plan may have had an aggressive bias, rather than a conservative bias as shown in previous studies. This aggressive bent may be even more pronounced because of the mid- and small-cap funds being the only equity choices available at one point in the plan's history.

As a result of the long-standing relationships, the average starting position of most plan participants was likely very different from that of a typical 401(k) plan. Thus, the decrease in the portion of equity held in the portfolio may actually be more efficient, which would be consistent with the results of previous studies. This finding also highlights the critical fiduciary role of plan sponsors in providing appropriate investment alternatives.

Although seminar attendees invest in more and different funds than their counterparts who do not attend, the difference in average returns on portfolios for the two groups is not significantly different. Attendees hold relatively less equity, but their expected returns do not decrease compared to non-attendees who are holding relatively more equity. Consistent with reduced equity holdings and increased diversification, portfolios held by seminar attendees are associated with a reduced standard deviation, particularly in comparison to non-attendees, and this difference is significant at the 1% level. Insignificant differences with regard to returns, but significantly reduced risk as measured by standard deviation, implies a more efficient portfolio. This is consistent with the difference in the Sharpe ratio being higher (significant at the 10% level) for seminar attendees.

Some additional information may illustrate the differences even more clearly. Before the seminar, 24 of the seminar attendees had their entire allocation split evenly between the midcap blend and the small-cap value funds, which, as mentioned, are the traditional equity offerings of the firm. After the seminar, only four of these retained this allocation. Those who attended the seminar and made some change to their election percentages reduced the allocation to these two funds from 78 to 37% of their contributions. These simple statistics clearly illustrate both the influence of the set of alternatives the employer presents participants (i.e., perceived fiduciary responsibility) and the increased attention to diversification engendered by seminar attendance. These findings are also consistent with Waggle and Englis (2000) who find that two-thirds of IRA investors put all their holdings in a single asset class. Also consistent with our study, Waggle and Englis suggest that these portfolio choices illustrate a compelling need for financial education.

To address the possibility that the differences between attendees and non-attendees found in Table 1 are related to factors other than seminar attendance (i.e., self-selection bias), we examine individual participant characteristics. For example, Lin and Lee (2004) find that age, education level, investment knowledge, and risk tolerance affect allocation decisions. Moreover, Boscaljon (2004) and Booth (2004) both find that time to retirement, rather than just age, is also important in determining allocations.

After these studies, we examine a similar set of participant characteristics. For example, *Retire* is a binary variable equal to one if the participant plans to retire within the next five years. *Age* is the age of the participant, in years. *Female* is a binary variable equal to one if the participant is female, zero if male. *Primary* is a binary variable equal to one if the participant is the primary income earner in his or her household.

*Aggressive* is a binary variable equal to one if the participant classifies him/herself as an

Table 2  
Participant summary characteristics

|                 | Attend (1) | Not Attend (3) | <i>t</i> -statistics (1) v (2) |
|-----------------|------------|----------------|--------------------------------|
| N               | 43         | 29             |                                |
| Retire          | .06        | .15            | –1.35                          |
| Age             | 45.86      | 44.53          | .62                            |
| Female          | .70        | .63            | .74                            |
| Primary         | .56        | .70            | –1.37                          |
| Aggressive      | .22        | .05            | 2.47                           |
| ModAggressive   | .64        | .63            | .14                            |
| ModConservative | .14        | .25            | –1.29                          |
| Conservative    | .00        | .08            | –1.78                          |
| HS              | .16        | .23            | –.77                           |
| College         | .26        | .23            | .38                            |
| Bachelors       | .18        | .10            | 1.10                           |
| Graduate        | .40        | .45            | –.47                           |
| Extreme         | .12        | .13            | –.07                           |
| Some            | .62        | .53            | .90                            |
| None            | .26        | .35            | –.91                           |
| ExtSeminar      | .18        | .28            | –1.05                          |

*Note:* This table reports descriptive statistics for two groups of participants: those who attend the seminar (that is, *Attend*) and those who do not attend the seminar (that is, *NotAttend*). The first two columns report mean values for each group, and the last column provides *t*-statistics from difference tests between the two groups. *t*-statistics that are italicized are significant at the 10% level. *Retire* is a binary variable equal to one if the participant plans to retire within the next five years. *Age* is the age of the participant, in years. *Female* is a binary variable equal to one if the participant is female, zero if male. *Primary* is a binary variable equal to one if the participant is the primary income earner in his/her household. *Aggressive* is a binary variable equal to one if the participant classifies him/herself as an aggressive investor. *ModAggressive*, *ModConservative*, and *Conservative* are also self-described risk tolerance binary variables indicating moderately aggressive, moderately conservative, and conservative, respectively. *HS*, *College*, *Bachelors*, and *Graduate* are binary variables indicating an education level of high school, some college (that is, associates), bachelors degree, or graduate degree, respectively. *Extreme*, *Some*, and *None* are binary variables indicating a participant's self-described knowledge of investments. *ExtSeminar* is a binary variable equal to one if the participant previously attended an external retirement planning seminar in the last five years.

aggressive investor. *ModAggressive*, *ModConservative*, and *Conservative* are also self-described risk tolerance binary variables indicating moderately aggressive, moderately conservative, and conservative, respectively. Although these are self-assessed measures of risk tolerance, Hallahan, Faff, and McKenzie (2004) find that these self-assessments generally correspond with psychometrically derived financial risk tolerance scores.

*HS*, *College*, *Bachelors*, and *Graduate* are binary variables indicating an education level of high school, some college, bachelors degree, or graduate degree, respectively. *Extreme*, *Some*, and *None* are binary variables indicating a participant's self-described knowledge of investments. *ExtSeminar* is a binary variable equal to one if the participant previously attended an external retirement planning seminar in the last five years. (The 2004 seminar was the first such seminar offered internally.) Similar to Table 1, we calculate means for attendees and non-attendees, as well as *t*-statistics from difference tests between these values, and we report these results in Table 2.

In general, it appears that the characteristics of attendees and non-attendees are relatively

similar, which suggests that there is not a significant self-selection bias and that it is the education seminar that primarily drives the differences in portfolios that we observe. There is, however, one significant difference. Those who attend the seminar are more likely to be aggressive investors and less likely to be conservative. We should note, however, that those who attend the seminar complete a risk assessment as part of the experience. Thus, they may have a better basis from which to answer the survey item than those who do not attend. Presumably, non-attendees just make a completely subjective evaluation of their risk attitude. Thus, this difference may not be meaningful; however, we formally address possible endogeneity in a subsequent section.

#### 4.2. Multivariate results

The lack of significant differences in Table 2 suggests that seminar attendance is the driving force behind the relations found in Table 1; however, to address these findings even further we conduct multivariate analyses that explicitly control for the underlying characteristics of plan participants. We begin by estimating the parameters of the following model:

$$\begin{aligned}
 Dep_i = & \alpha + \beta_1 Attend + \beta_2 Retire + \beta_3 Age + \beta_4 Female & (1) \\
 & + \beta_5 Primary + \beta_6 Aggressive + \beta_7 ModAggressive \\
 & + \beta_8 ModConservative + \beta_9 College + \beta_{10} Bachelors \\
 & + \beta_{11} Graduate + \beta_{12} Some + \beta_{13} Extreme + \beta_{14} ExtSeminar + \varepsilon_i
 \end{aligned}$$

where *Dep* is the dependent variable and is either *FundsDiff*, *EquityDiff*, *ReturnDiff*, *DevDiff*, or *SharpeDiff*. These dependent variables are defined above. *Attend* is a binary variable equal to one if the participant attends the education seminar, zero otherwise, and all other independent variables are as defined previously. We report the results of this analysis in Table 3.

Controlling for individual participant characteristics, we find that seminar attendance remains significant in increasing the number of funds held. Also consistent with our earlier results, we find that individual participant characteristics are insignificantly related to the difference in the number of funds held prior and subsequent to the plan change.

Examining the difference in the percentage of equity held, we find that seminar attendance, consistent with our earlier univariate results, decreases the percentage of equity held. In fact, we find that the estimate of the reduction is  $-13.89\%$ , which is more economically significant than our earlier results suggest (i.e., previously found a  $-3.66\%$  reduction for attendees, or an  $-8.79\%$  reduction relative to non-attendees). We also find that the control variables are generally insignificant. The only exception is education level, which suggests that those with undergraduate or graduate degrees generally increase the proportion of equity held. We address the potential relation between education and seminar attendance in robustness tests, which we report in a subsequent section.

Seminar attendance is unrelated to differences in expected return, which is consistent with our earlier results. The only variables that appear to be significantly related to changes in

Table 3  
Regression results

|                    | <i>FundsDiff</i> |                | <i>EquityDiff</i> |                | <i>ReturnDiff</i> |                | <i>DevDiff</i> |                | <i>SharpeDiff</i> |                |
|--------------------|------------------|----------------|-------------------|----------------|-------------------|----------------|----------------|----------------|-------------------|----------------|
|                    | Coef.            | <i>t</i> -stat | Coef.             | <i>t</i> -stat | Coef.             | <i>t</i> -stat | Coef.          | <i>t</i> -stat | Coef.             | <i>t</i> -stat |
| Intercept          | .10              | .04            | -.97              | -.04           | -6.44             | -1.25          | -3.93          | -.75           | .19               | .05            |
| Attend             | 1.50             | 2.37           | -13.89            | -2.29          | -1.03             | -.74           | -3.15          | -2.21          | .42               | 1.39           |
| Retire             | -1.77            | -1.37          | -6.47             | -.52           | -.40              | -.14           | 1.84           | .63            | .07               | .03            |
| Age                | .01              | .17            | .46               | 1.51           | .14               | 2.02           | .08            | 1.18           | -.01              | -.14           |
| Female             | -.57             | -.59           | 2.84              | .31            | .78               | .37            | 1.28           | .59            | -.01              | -.01           |
| Primary            | -.03             | -.05           | -7.93             | -1.36          | -1.46             | -1.08          | -.89           | -.65           | -.74              | -.71           |
| Aggressive         | 1.36             | .71            | -1.01             | -.06           | -4.17             | -.99           | .82            | .19            | -.76              | -.23           |
| ModAggressive      | 2.32             | 1.37           | -20.49            | -1.26          | -3.39             | -.91           | -3.05          | -.80           | .24               | .08            |
| ModConservative    | .42              | .24            | -13.01            | -.77           | -1.73             | -.45           | -1.34          | -.34           | -.46              | -.15           |
| College            | -.58             | -.75           | 12.20             | 1.64           | 3.19              | 1.86           | 3.14           | 1.79           | 1.18              | .89            |
| Bachelors          | -1.36            | -1.24          | 30.92             | 2.96           | 6.88              | 2.86           | 7.13           | 2.90           | -.92              | -.49           |
| Graduate           | -.45             | -.35           | 23.18             | 1.89           | 3.13              | 1.11           | 4.76           | 1.65           | -.95              | -.43           |
| Some               | -.55             | -.75           | -8.48             | -1.21          | -.24              | -.15           | -3.38          | -2.04          | 1.54              | 1.23           |
| Extreme            | -.74             | -.62           | -11.80            | -1.03          | .40               | .15            | -3.18          | -1.18          | 1.91              | .94            |
| ExtSeminar         | .01              | .01            | -7.65             | -1.14          | .49               | .32            | -.18           | -.11           | -.30              | -.25           |
| n                  | 72               |                | 72                |                | 72                |                | 72             |                | 72                |                |
| Adj R <sup>2</sup> | .1511            |                | .0817             |                | .0943             |                | .1258          |                | .0165             |                |

Note: This table presents regression results from estimating the following model:

$$Dep_i = \alpha + \beta_1 Attend + \beta_2 Retire + \beta_3 Age + \beta_4 Female + \beta_5 Primary + \beta_6 Aggressive + \beta_7 ModAggressive + \beta_8 ModConservative + \beta_9 College + \beta_{10} Bachelors + \beta_{11} Graduate + \beta_{12} Some + \beta_{13} Extreme + \beta_{14} ExtSeminar + \varepsilon_i$$

where *Dep* is the dependent variable and is either *FundsDiff*, *EquityDiff*, *ReturnDiff*, *DevDiff*, and *SharpeDiff*. These dependent variables are defined in Table 1. *Attend* is a binary variable equal to one if the participant attends the education seminar, zero otherwise, and all other independent variables are defined in Table 2. *t*-statistics that are italicized are significant at the 10% level.

expected return are participant age and education level, both of which appear to be positively related to differences in return. We also find that seminar attendance, consistent with our results above, is negatively related to changes in the average portfolio standard deviation. Again, education level is positively related to this difference, as is the level of previous investment experience. Given that seminar attendance reduces the average portfolio risk but has little effect on return, we would expect attendees to have a larger (positive) change in the efficiency of their portfolios. Consistent with this, we find that seminar attendance is positively related to the Sharpe ratio, although the coefficient is only significant at the 15% level, which may, however, be a reasonable significance given the relatively low number of observations.

Our findings, both on a univariate and multivariate basis, indicate that seminar attendance aids participants in improving the structure of their portfolios. Given the importance of seminar attendance, two important questions follow. First, "Which participants are likely to attend the seminar?" Second, "Do the characteristics of these participants cause the changes we observe, or is it the education provided that precipitates the differences we find?" To address these issues, we conduct a logistic regression that identifies characteristics associated with an increased or decreased likelihood of attendance. Specifically, we estimate the coefficients of the following model:

Table 4  
Logistic regression results

|                    | Initial |         |
|--------------------|---------|---------|
|                    | Coef.   | p-value |
| Intercept          | -23.14  | .90     |
| FundsB             | .27     | .25     |
| DevB               | .33     | .07     |
| EquityB            | -.02    | .53     |
| Retire             | -.56    | .73     |
| Age                | .12     | .01     |
| Female             | 3.06    | .04     |
| Primary            | -1.80   | .03     |
| Aggressive         | 15.07   | .93     |
| ModAggressive      | 11.85   | .95     |
| ModConservative    | 10.46   | .95     |
| College            | .96     | .31     |
| Bachelors          | 4.27    | .05     |
| Graduate           | 4.00    | .04     |
| Some               | .92     | .39     |
| Extreme            | -.71    | .65     |
| ExtSeminar         | -2.59   | .00     |
| n                  | 72      |         |
| Percent Concordant | 87.9    |         |

Note: This table presents logistic regression results from estimating the following model:

$$\begin{aligned}
 Attend_i = & \alpha + \beta_1 FundsB + \beta_2 DevB + \beta_3 EquityB + \beta_4 Retire + \beta_5 Age + \beta_6 Female \\
 & + \beta_7 Primary + \beta_8 Aggressive + \beta_9 ModAggressive + \beta_{10} HModConservative \\
 & + \beta_{11} College + \beta_{12} Bachelors + \beta_{13} Graduate + \beta_{14} Some + \beta_{15} Extreme \\
 & + \beta_{16} ExtSeminar + \varepsilon_i
 \end{aligned}$$

where *Attend* is a binary variable equal to one if the participant attends the education seminar, zero otherwise. *FundsB* is the number of funds held prior to the seminar; *DevB* is the participant's portfolio standard deviation prior to the seminar; and *EquityB* is the percentage of the preexisting portfolio that is invested in equities. All other independent variables are defined in Table 2.

$$\begin{aligned}
 Attend_i = & \alpha + \beta_1 FundsB + \beta_2 DevB + \beta_3 EquityB + \beta_4 Retire \quad (2) \\
 & + \beta_5 Age + \beta_6 Female + \beta_7 Primary + \beta_8 Aggressive + \beta_9 ModAggressive \\
 & + \beta_{10} ModConservative + \beta_{11} College + \beta_{12} Bachelors + \beta_{13} Graduate \\
 & + \beta_{14} Some + \beta_{15} Extreme + \beta_{16} Extseminar + \varepsilon_i
 \end{aligned}$$

where *FundsB* is the number of funds held before the seminar; *DevB* is the participant's portfolio standard deviation before the seminar; and *EquityB* is the percentage of the preexisting portfolio that is invested in equities. All other variables are as defined previously. We report the results of the above logistic regression in Table 4.

We find that participants with a higher portfolio standard deviation before the seminar are more likely to attend. Recall that many participants were heavily invested in the midcap blend and small-cap value funds because of those being the primary equity alternatives in the

plan for a number of years. It is reasonable to expect, therefore, that these participants may have been naïve investors seeking to make a more informed asset allocation election.

We find that neither perceived risk tolerance nor investment experience is significant in predicting attendance, which is in contrast to what we would expect. We do find, however, that those with undergraduate or graduate degrees are more likely to attend. Interestingly, although participants with only a high school education may benefit the most from the seminar (which we discuss in more detail in our robustness tests), they are not more likely to attend.

Female and older participants are more likely to attend the seminar, although those who are closest to retirement (i.e., within five years) are not more likely to attend. These results are consistent with earlier studies that find females are more responsive to financial education. Participants who have attended an external seminar are less likely to attend, as are those who are the primary income earner for their family.

To address possible self-selection bias, we conduct a two-stage (i.e., simultaneous equation) analysis using regression Eqs. (1) and (2). Specifically, we use the logistic regression results in Table 4 to predict which employees will attend the seminar. We then use these predicted values, rather than the actual attendance variable, in the regressions in Table 3. If education is important, then we would expect significance levels on the predicted attendance variable similar to those we find on the actual attendance variable. We find results consistent with this notion. Specifically, the predicted attendance variable (which controls for attendee characteristics) is significantly related to the changes we find, giving us increased confidence in the importance of seminar attendance and the education it provides. We also note that even if there were a self-selection bias, it is very unlikely that the individuals would have made the changes we find without the direction provided by the seminars. Therefore, even if self-selection existed, it would not necessarily rule out the potential importance of financial education seminars.

#### 4.3. Robustness tests

Recall that in Table 3, the only variable, other than seminar attendance, that is consistently related to portfolio characteristics is level of education. Lin and Lee (2004) and Hallahan, Faff and McKenzie (2004) find that education increases an individual's capacity to identify, evaluate, and incorporate relevant information. Moreover, they find that it is not the type of education that matters, but the level. Therefore, we repeat the analyses after including interaction variables between *Attend* and each of the education level binary variables, which accounts for the possibility that the seminar is more useful for individuals with a particular level of education. We find, however, that these interaction terms are generally insignificant. The one exception is that high school graduates (i.e., lowest education level) who attend the seminar tend to have a significantly greater number of holdings and reduced equity (and risk) positions compared to high school graduates who do not attend. Thus, seminars may be most beneficial for those with less formal education. This suggests that the education itself was clear enough for even the least educated to apply. Unfortunately, as found in Table 4, high school graduates are not more likely to attend the seminars.

As a further robustness check, we examine interaction variables between attendance and

each of the other control variables. We find that these terms are generally insignificant, which lends additional support to our earlier results. Additionally, to address the possibility that survey respondents are qualitatively different from those who complete the survey, we conduct difference tests on portfolio composition before the plan change. (These data are provided by the firm for all employees, not just survey respondents.) We find no significant differences. In addition, rather than focusing purely on portfolios within the 401(k) plan, we examine possible changes in portfolio compositions outside the plan; however, we find no significant difference between the two groups of employees. Both of these findings suggest our results are robust.

Rather than focusing on standard deviations and Sharpe ratios, we repeat our analysis using portfolio betas, which are calculated using five years of historical monthly returns, and Treynor ratios, which we define as portfolio return less the risk free rate relative to the portfolio beta. If investment alternatives exhibit sufficient levels of diversification, then we would expect similar results. Consistent with this expectation and our earlier results, we find that seminar attendees create portfolios with reduced betas and higher Treynor ratios. Thus, our results are robust to different definitions of portfolio risk.

As a last test, we conduct the analyses after defining historical returns on 3- and 10-year bases, rather than using five years of historical data as in our primary analyses. We find that the results are qualitatively similar to those reported. Specifically, seminar attendance appears to reduce portfolio risk (i.e., increased diversification and lower deviation), yet it does not decrease expected return. Thus, portfolios of those who attend generally appear to have improved efficiency relative to portfolios of participants who do not attend.

## **5. Discussion**

The results of this study suggest that financial education aids employees in choosing more appropriate asset allocation percentages, as well as more efficient portfolios. These improvements may result from a deeper understanding of the intricacies of financial management, as well as from a reduction in the psychological biases typically exhibited by unsophisticated investors.

We recognize, however, that our results may not be completely representative of the broad market, particularly given the small sample size of this clinical study and the difference in historical structure (i.e., small-cap weighting) of the firm's 401(k) plan as compared to most other plans. However, the results are generally consistent with previous studies in highlighting the critical importance of improving the financial education level and understanding of plan participants.

In some ways, by offering participants this seminar, this employer was able to mitigate a situation it had unwittingly created several years ago. The two primary equity alternatives, a midcap blend fund and a small-cap value fund, have a history of excellent return performance. Nevertheless, these funds represent relatively risky choices in which to concentrate a large percentage of participant holdings.

Consistent with previous studies, we find that many participants undertake a naïve strategy of evenly splitting contributions across investment alternatives. At the extreme,

we find that many plan participants did so when only the small and midcap funds were available, without any subsequent changes as the plan investment alternatives were altered (status quo bias). This simplistic approach created portfolios that were extremely risky, particularly in comparison to the apparent desires and risk tolerance of the investors.

It is apparent, therefore, that employers influence asset allocation simply through the investment alternatives they offer, which is another indication of the fiduciary responsibility to which firms are subject. By expanding the choices available to participants and also by providing the education seminars, this employer appears to have significantly benefited its participants. We suggest that plan sponsors would be wise to ensure they are offering an appropriate set of investment funds and offer basic investment education to assist plan participants in making efficient asset allocation decisions.

Our findings do not suggest that external, independent financial educators need to be used to present seminars. Consistent with previous studies, our results suggest that it is imperative that content follow a standard approach. Specifically, building on Baker and Nofsinger (2002), a seminar should, at a minimum, include the following: 1) identification of objectives and constraints (including time to retirement), 2) description of expected return and risk levels associated with various investment categories, and 3) explanation of ongoing review and reallocation.

## **6. Conclusions**

It seems that the business news continues to contain regular announcements of another employer's shift from a traditional defined benefit retirement plan to a defined contribution plan. Management will continue to face the task of offering an appropriate set of investment alternatives for these plans. Perhaps just as importantly, they will increasingly feel pressure to provide their employees with financial education to better equip them to manage their individual retirement portfolios.

In this clinical study, we address the potential benefits of financial education on retirement fund asset allocation. We find that the retirement education seminar sponsored by the employer we study has significant effects on the asset allocation decisions of 401(k) plan participants. Compared to participants who do not attend a seminar, those who attend appear to diversify into more funds and reduce the overall risk level of their retirement portfolios. Attendees do not appear to sacrifice portfolio return, which suggests that their portfolios are generally more efficient. These results imply that employers offering defined contribution plans should pay attention to the financial education needs of their employees.

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## Appendix 1

## Fund categories offered prior and subsequent to the plan change

| Prior categories           | Subsequent categories         |
|----------------------------|-------------------------------|
| Fixed income               |                               |
| Money market               | Money market                  |
| Intermediate bond          | Intermediate bond             |
|                            | High yield bond               |
| Equity                     |                               |
| Large cap index            | Large cap index               |
| Extended index             |                               |
| Large cap growth (2 funds) |                               |
| Dividend growth            |                               |
| Mid cap blend*             | Mid cap blend*                |
|                            | Small cap growth              |
| Small cap value*           | Small cap value*              |
| International              | International                 |
| Other                      |                               |
|                            | Balanced debt and equity REIT |

*Note:* This appendix provides the set of funds available prior and subsequent to the change in plan structure. An \* indicates funds that were retained in the plan. All others, even if in the same category, were replaced by a different fund.

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