FACTORS AFFECTING ASSET ALLOCATION DECISIONS IN DEFINED CONTRIBUTION PENSION PLANS

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ABSTRACT

The objective of this paper is to identify the factors that account for the differences in asset allocation choices among individuals who participate in defined contribution pension plans and who have a choice in how the assets in their pension plans are allocated. Using data from the 1998 Survey of Consumer Finances, a logistic regression equation is fitted to estimate the relationship between the allocation of assets in defined contribution pension plans and demographic, attitudinal, financial and employment variables. Implications of the findings for policy and for further research are considered. (JEL D12, D14 G11, G23)

Key Words: asset allocation, defined contribution plan, risk tolerance, Survey of Consumer Finances

INTRODUCTION

The major sources of income for retirees in the U.S. are the benefits provided by the Social Security program and the income from pension plans. In 2001, Social Security benefits accounted for 42 percent of the income for individuals age 65 or over, followed by 20 percent from pensions (McDonnell, 2003). However, the Board of Trustees of the Social Security system (1999) recently projected that the ratio of workers who support the Social Security system with their payroll taxes to the recipients of Social Security benefits will decline from the current level of 3.4 to 1.8 by the year 2075. Because of the aging of the U.S. population, the long-term viability of the Social Security program as presently structured and traditional defined benefit pension plans are being questioned.

There have been a myriad of responses to the challenges posed by the aging of the population. Among these has been the decision by employers to shift from defined benefit to defined contribution pension plans. The number of active participants in defined benefit pension plans peaked at 30.2 million in 1984 and declined to 23 million by 1998. During this period the number of participants in defined contribution plans increased from 30.6 million to 50.3 million (Turner, Muller and Verma, 2003). With a defined benefit plan the employer agrees to provide the funding necessary to guarantee a monthly benefit to its employees after they have reached a certain age and/or completed a certain number of years of service. The actual monthly benefit that is guaranteed is usually based on the individual's years of service and salary. The employer assumes the responsibility for funding the guaranteed benefits. Under the defined benefit plan all of the investment risk is borne

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by the employer. With a defined contribution plan the employer provides an account into which employees are able to contribute a portion of their earnings to provide for their retirement. The employer may or may not contribute matching funds to the account. Taxes on the earnings that are contributed to the account as well the earnings on the account assets are deferred until the employees withdraw the funds during their retirement years. Examples of defined contribution plans include the 401(K) and 403(B) plans. Employee retirement benefits under a defined contribution plan depend on employee and employer contributions as well as on how well the investments of the retirement account perform. Under the defined contribution plan all of the investment risk is borne by the employee (Turner, Muller and Verma, 2003).

Among the proposals put forward to address the looming fiscal problem of the Social Security program is a plan to allow workers to redirect a portion of their payroll taxes to individually owned and privately invested accounts. It is argued that the establishment of such accounts would allow workers to accumulate substantial assets which would provide significantly greater benefits than those provided by the current Social Security program (Lips, 1998).

The shift from defined benefit to defined contribution pension plans and the proposal for establishing privately invested accounts within the Social Security program both would require that individuals assume greater responsibility for managing the assets that are to provide for their economic security during the retirement years. If Americans will be required to assume this responsibility, how they allocate the assets in defined contribution pension plans will significantly affect their economic well being during their retirement years. If individuals invest the funds in their defined contribution plans too conservatively during the early periods of their work life and do not take advantage of the higher returns associated with investment in equities, they will enter their retirement years with significantly less wealth than if the assets had been managed by professional pension fund managers who invest more heavily in equities. On the other hand, if pension assets are adequate to meet the income needs for retirement as the individual approaches the retirement years but are heavily concentrated in equities, a large decline in equity prices in the first few years of retirement will increase the risk that the individual's retirement funds will be depleted early in the retirement period.

Recent news reports (Block, 2003; Grant, 1998; Mabry, 1999) and previous research (Badu, Daniels and Salandro, 1999; Bajtelsmit, Bernasek and Jianakoplos, 1999; Sunden and Surette, 1998) indicate that some individuals invest funds earmarked for long term goals such as retirement too conservatively and do not benefit from the equity premium. As a result, the amount of wealth accumulated to achieve these long-term goals is significantly diminished. In addition, some investment advisory services are beginning to advise investors of the risks of having retirement assets heavily concentrated in equities as they near the retirement period (Vanguard, 2005).

There has been little research that has examined how individuals who have control over their assets in defined contribution pension plans allocate the assets in those plans. Previous research (Bajtelsmit, Bernasek et al., 1999; DeVaney and Zhang, 2001; Yuh and DeVaney, 1996) has focused on the level of assets that individuals accumulated in pension plans. This research did not examine how the assets were allocated within the pension plans.

The objective of this paper is to examine how individuals who participate in defined contribution pension plans and who have control over the allocation of assets in those plans allocate the assets within their plans. Specifically, the paper attempts to identify the factors that account for the differences between individuals who hold

stock in their defined contribution pension plans and those individuals who do not hold stock. An understanding of how individuals who have a choice in the allocation of assets in their pension plans actually allocate those assets may provide some insight into how a broader population of Americans might allocate pension plan assets. This knowledge will be of particular importance if there is a continued movement toward more self directed defined contribution plans and the implementation of privately invested accounts within the social security system. If most employees are able to accurately assess the risk/reward characteristics of alternative investment vehicles and if they are able to allocate the assets in their self directed retirement accounts in a manner consistent with a risk tolerance level that is appropriate for their age and expected retirement date, then such self directed retirement plans are likely to succeed. On the other hand, if employees lack those skills, the successful implementation of self directed retirement accounts will require additional education, and counseling for plan participants. If the employees are not able to acquire the necessary skills to effectively manage their plan assets, it may be appropriate to develop policies to limit the investment options available to them.

LITERATURE REVIEW

Empirical research on how individuals allocate the assets within their defined contribution pension plans is limited. However, there has been a significant amount of research that attempts to explain the differences in individual risk tolerance as measured by overall asset allocation decisions. The results of this research provide some insight into how individuals allocate the assets in their defined contribution pension plans. The literature on risk tolerance and asset allocation will first be reviewed, followed by a review of the literature on defined contribution plans.

Risk Tolerance and Asset Allocation Choices

The empirical work on asset allocation is couched in terms of the theoretical treatment of attitudes toward risk developed by Arrow (1971) and Pratt (1964). According to this theory, if a greater proportion of wealth is held in the form of risky assets, the individual exhibits decreasing relative risk aversion (increasing risk tolerance) as total wealth increases. If a smaller proportion of wealth is held in risky assets, the individual exhibits increasing relative risk aversion (decreasing risk tolerance). Individuals who exhibit decreasing relative risk aversion are less risk averse, while those who exhibit increasing relative risk aversion are more risk averse.

Early empirical studies on relative risk aversion (Cohn, Lewellen, Lease and Schlarbaum, 1975; Friend and Blume, 1975; Siegal and Hoban, 1982) focus almost exclusively on the relationship between wealth and relative risk aversion. In addition, these studies are limited to small groups of relatively wealthy individuals (Riley and Chow, 1992).

More recent empirical studies focused on the relationship between asset allocation choices and an array of demographic, attitudinal, and financial variables. Demographic variables that have been posited to affect individual risk tolerance and asset allocation decisions include: (a) age, (b) gender-marital status, (c) race, and (d) education. It has been hypothesized that individuals become more risk averse as they age. The reason is that as they age, there is less time to recover from the losses incurred from risky investments (Hallahan, Faff, and McKenzie, 2004). However, findings on this hypothesis are mixed. Some studies have found that risk aversion

increased with age (Coleman, 2003; Morin and Suarez, 1983; Riley and Chow, 1992). However, Grable and Lytton (1998) and Hariharan, Chapman and Domian (2000) did not find risk tolerance to be related to age while Wang and Hanna (1997) find that risk tolerance actually increased with age when other variables are held constant.

An individual's risk tolerance has also been found to be associated with the individual's gender and marital status. Findings by Bajtelsmit et al. (1999), Grable (2000), and Jianakoplos and Bernasek (1998), indicate that females are less risk tolerant than males. However findings by Sunden and Surette (1998) indicate that gender alone does not affect risk tolerance. Rather, risk tolerance is driven by a combination of gender and marital status. Specifically, Sunden and Surette find that single females and married males are less risk tolerant than single males, and that married females are less risk tolerant than singles females.

Some previous studies have found that Blacks are less risk tolerant than Whites. Zhong and Xiao (1995) found that White households are more likely to hold stocks in their portfolios than are otherwise similar Non-White households. Badu, Daniels and Salandro (1999) find that Blacks are significantly more risk averse in their choice of assets than Whites. However, Coleman (2003) finds that, after controlling for household wealth, the risk tolerance of Blacks is not significantly different than that of Whites. She finds that although Black household heads hold a lower percentage of their wealth in the form of directly held stocks and business equity, they hold a larger proportion of their wealth in the form of pensions and managed accounts. Likewise, Siegal and Hoban (1991) find that Blacks do not have significantly different asset allocation choices than Whites. In addition, Gutter et al. (1999) find that racial differences in risky asset ownership are explained by racial differences in the individual determinants of risky asset ownership and not by race itself.

Previous studies have found that risk tolerance increases with the level of education (Gutter et al., 1999; Hallahan, et al, 2004; Riley and Chow, 1992; Sung and Hanna, 1996). Hallahan, et al. (2004) suggest that this relationship holds because the individual's capacity to evaluate the risks associated with investing increases as the individual becomes more educated. With a better understanding of the risks associated with investing, the individual becomes more willing to assume risk.

Attitudinal variables that have been posited to affect individual risk tolerance and asset allocation decisions include (a) the individual's attitude toward risk, and (b) the individual's planning horizon. Schooley and Worden (1996) find that the individual's self-reported willingness to take risk in making saving and investment decisions is consistent with the individual's actual asset allocation. Specifically, individuals who indicate a greater willingness to take risk hold more risky portfolios. Likewise Gutter et al. (1999) find that an individual's self-reported willingness to take risk is consistent with the individual's actual asset allocation. Gutter et al. (1999) also include the individual's planning horizon as one of the hypothesized predictors of risky asset ownership. They find that as the individual's planning horizon for making saving and spending decisions lengthened, the individual was more likely to invest in risky assets.

Cohn et al. (1975), Riley and Chow (1992), and Schooley and Worden (1996) find that a higher proportion of total assets are committed to risky assets as household wealth increases (i.e. relative risk aversion declines as household wealth increases). Friend and Bloom (1975) conclude that relative risk aversion remains constant as wealth increases. However, Siegel and Hoban (1982) find that when housing is included in net worth, increasing relative risk aversion is observed for both lower wealth and higher wealth groups. Bajtelsmit, et al. (1999) argue that residential

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housing has both consumption and investment aspects and include it as a separate predictor of overall asset allocation in addition to the total wealth variable. They find that the proportion of wealth held in defined contribution plans varies inversely with the level of wealth for women but varies directly with the level of wealth for men. They also find that women who are homeowners hold a smaller proportion of their wealth in defined contribution plans compared to women who are not homeowners. However, for men the relationship between homeownership and the proportion of wealth held in defined contribution plans is not statistically significant.

Defined Contribution Pension Plans

There have been some empirical studies that examine the level of assets and asset allocation in pension plans. However, most of these studies do not specifically consider how individuals allocate their defined contribution plan assets. Using data from the 1992 Survey of Consumer Finance, Yuh and DeVaney (1996), examine the factors associated with the dollar value of couples' defined contribution retirement funds. They find that households who had lower levels of education, were employed in less skilled occupations, were unwilling to take financial risk, or who were Black or Hispanic had smaller defined contribution fund account balances.

Using data from the 1989 Survey of Consumer Finances, Bajtelsmit et al. (1999), examine gender differences in the proportion of total household wealth allocated to defined contribution pension plans. Using data for survey participants who indicated that they participated in defined contribution pension plans and who had wealth greater than $1,000, Bajtelsmit et al. examine the proportion of wealth allocated to defined contribution plans. They find that women allocate a smaller proportion of their total wealth to defined contribution pension plans compared to men. The authors conclude that since women tend to be more risk averse, it is likely that they will retire with significantly lower pension wealth compared to their male counterparts. Since women live longer than men, this smaller amount of wealth will have to be spread over a longer retirement period.

Using data from the 1992 and 1995 Surveys of Consumer Finances, Sunden and Surette (1998), examine the effect of gender and marital status on asset allocation in defined contribution pension plans. They find that, after controlling for other demographic, financial and attitudinal variables, there are significant gender and marital status effects on asset allocation. They conclude that the failure of certain groups, such as single females, to allocate a significant portion of their assets to stocks may lead to lower accumulated wealth at the time of retirement.

Using data from the 1995 Survey of Consumer Finances, Hassan and Lawrence (2002) examine the factors that influence employee participation in defined contribution pension plans and the level of contributions into such plans by those employees who participate in the plans. They find that there is not a statistically significant relationship between the employer's contributions and the decision by the employee to contribute to the plan. However, for those employees who do contribute to the plan, the level of employee contributions is positively associated with the level of employer contributions.

Using data from the 1995 Survey of Consumer Finances, Lawrence and Hassan (2001) find that being in good health and having a long work history increase the likelihood of being eligible for participation in defined contribution pension plans for men and women in their forties. They also find that as their incomes increase, women in their forties are more likely to be eligible to participate in defined

contribution pension plans. However, men in their forties are less likely to be eligible to participate in such plans as their incomes rise.

Using data from the 1986, 1992, and 1998 Surveys of Consumer Finances DeVaney and Zhang (2001) examine age, period, and cohort effects on the level of assets accumulated in defined contribution, IRA, and Keogh accounts. They find that the amount accumulated in all of these accounts increases with age. However, they find that the period and cohort effects varied, especially for savings in defined contribution accounts.

Using data from the 1995 Survey of Consumer Finances, Hassan and Lawrence (2007) examine the factors that affect the eligibility for participating in defined contribution pension plans by men and women in their fifties. In addition, for those who are eligible to participate in such plans, they examine whether the level of individual contributions to the plans are related to the level of employer contributions into the plans.   They find that having a good work history and being in good health are positively related to the likelihood of being eligible to participate in a defined contribution plan. Also, divorced women are more likely to be eligible for participation than are married women or women living with a partner. However, as age and education increase, the likelihood of being eligible to participate in a plan decreases. The authors find that individuals who are eligible to participate in a plan are more likely to actually participate in the plan as their incomes and levels of education rise. In addition, women who are married or living with a partner are more likely to actually participate in the plan than are divorced women. The likelihood of participating in the plan is not related to the health or home ownership status of individuals who are eligible to participate in a plan.

METHODOLOGY

The Data and Sample

Data used in the study were drawn from the 1998 Survey of Consumer Finances. The survey is conducted every three years by the National Opinion Research Center at the University of Chicago (Kennickell, 2000). Sponsored by the Federal Reserve Board of Governors, the survey provides detailed information on the assets, liabilities, and demographic characteristics of U.S. households. In 1998, the sample included 4,308 households. The survey is based on a dual-frame sample design. One set of the survey cases was selected from a standard multi-stage area-probability design and the second set was selected from statistical records derived from tax data of the Internal Revenue Service. The two samples consisted of 2,813 and 1,496 cases respectively. Information on 3 cases was not released to the public. The sample used in this study consists of individuals who: (a) were at least age 35 and less than age 65, (b) were employed full-time, (c) were either White or Black/ African-American, (d) had household wealth of at least $1,000, (e) participated in a defined contribution pension plan, and (f) had a choice in how the money in the defined contribution account was invested. These restrictions resulted in a sample of 587 observations.

The Conceptual Framework

The method used to examine asset allocation differences in defined contribution pension plans is based on the theory of risk preferences developed by Arrow (1965) and Pratt (1964). According to this theory, an individual's risk aversion is assumed to be reflected in the individual's portfolio allocation choices.   Following

the theoretical work of Arrow and Pratt, Friend and Blume (1975) developed a method for considering an individual's allocation of assets between risky and risk free assets. This method has been used in a number of empirical studies (Bajtelsmit et al., 1999; Jianakoplos and Bernasek, 1998; and Schooley and Worden, 1996).

Friend and Blume denote the proportion of assets invested in risky assets as follows:

$$\alpha = \frac{E(r_m - r_f)}{\sigma_m^2} * \frac{1}{C} \qquad (1)$$

where:

α = the proportion of the investor assets that are invested in risky assets.

$E(r_m-r_f)$ = the expected difference between the return on risky assets (r_m) and the return on risk free assets(r_f).

σ_m^2 = the variance of returns on the portfolio of risky assets.

C = Pratt's measure of relative risk aversion.

The ratio $\frac{E(r_m - r_f)}{\sigma_m^2}$ is the equilibrium market price of risk and is assumed to be the same for all individuals in the sample. Since α is proportional to C and can be observed, it is possible to make inferences about C from α (Schooley and Worden, 1996).

Since this analysis is concerned with the asset allocation in defined contribution pension plans, equation 1 is modified as proposed by Bajtelsmit et al. (1999) as follows:

$$\alpha 0 = \left(\frac{E(r_m - r_f)}{\sigma_m^2} * \frac{1}{C} \right) - \alpha_1 \qquad (2)$$

where:

α_0 = the proportion of assets in the individual's defined contribution plan that are risky assets.

α_1 = the proportion of the individual's assets outside of the defined contribution plan that are risky assets.

In examining asset allocation, the effect of taxes is not considered. This approach follows the approach of Ballante and Saba (1986) and Bajtelsmit et al. (1999) who find that taxes do not significantly affect asset allocation. The proportion of assets in the individual's defined contribution plan that are allocated to risky assets (α_0) is posited to be a function of (a) demographic variables, (b) attitudinal variables, (c) financial variables, and (d) employment variables.

MODEL SPECIFICATION

The Dependent Variable
      Since the Survey of Consumer Finances treats investment choices in defined contribution plans as a categorical variable, in this analysis those individuals who held stock in their defined contribution pension plans were assigned a value of 1, and those who held only interest earning assets in their plans were assigned a value of 0. Individuals who invested some or all of their plan assets in stock are assumed to be less risk averse than the individuals who did not invest any of their plan assets in stock.

The Explanatory Variables
      The demographic variables that are hypothesized to affect the asset allocation decision are: (a) age, (b) gender-marital status, (c) race, and (d) education. It is posited that individuals are less likely to hold stock in their defined contribution plans as they age. Hallahan, et al. (2004) argue that individuals are expected to become more risk averse and are less likely to hold risky assets such as stock as they age because, as they age, they have less time to recover from the losses incurred from risky investments. Findings by Morin and Suarez (1983) and Riley and Chow (1992) support the proposition that risk aversion increases with age. Age is treated as a continuous variable in the analysis (see Table 1).
      It is posited that an individual's risk tolerance level and asset allocation in the defined contribution plan will be related to the individual's gender and marital status. Specifically, single males will be most likely to hold stock in their defined contribution pension plans followed by married males, and single females. Married females will be least likely to hold stock in their defined contribution pension plans. These hypothesized relationships are based on the findings of Bajtelsmit et al. (1999), Grable (2000), and Jianakoplos and Bernasek (1998) who find that females are less risk tolerant than males, and on the findings of Sunden and Surette (1998) who find that single females and married males are less risk tolerant than single males, and that married females are less risk tolerant than singles females. Since the respondents in the Survey of Consumer Finances are the heads of household and since in married households the male is treated as the head, there are no married female respondents in the sample. Also, as Jianakoplos and Bernasek (1998) indicate, it is not clear how the financial decision-making process operates in married couple households. Even though the male is identified as the head of household for married couple households in the Survey of Consumer Finances and the defined contribution pension plan for married couple households is that of the male head, it is possible that asset allocation decisions for such households are made jointly. It is also possible that the male makes the decisions alone or vice versa. Hence, there may be some ambiguity in interpreting the empirical results with respect to this variable. In the analysis, the three gender-marital status categories are: (a) married male, (b) single female, and (c) single male. Gender-marital status is treated as a categorical variable (see Table 1).
      It is posited that an individual's likelihood of holding stock in the defined contribution plan increases as the individual's level of education increases. Findings by Gutter et al. (1999), Hallahan et al. (2004), Riley and Chow (1992), and Sung and Hanna (1996) all indicate that risk tolerance increases as the level of education increases. It is argued that this relationship holds because the individual's capacity to evaluate the risks associated with investing increases as the individual becomes more educated. With a better understanding of the risks associated with investing, the

individual becomes more willing to assume risk (Hallahan, et al. 2004). Education is treated as a categorical variable in the analysis (see Table 1).

Table 1
Description of Explanatory Variables

Variable	Description
Demographic Variables	
Age	=the individual's age in years.
Gender-Marital Status	
Married couple	= 1 if the individual is married, 0 otherwise.
Single female	= 1 if the individual is a single female, 0 otherwise.
Single male	= 1 if the individual is a single male, 0 otherwise.
Race	= 1 if the individual is White and equal to 0 if the individual is Black.
Education	
Less than 12 years	= 1 if the individual completed less than 12 years of school, 0 otherwise.
High School Graduate	= 1 if the individual completed 12 years of school, 0 otherwise.
College	= 1 if the individual completed more than 12 and less than 16 years of school, 0 otherwise.
College Graduate	= 1 if the individual completed 16 or more years of school, 0 otherwise.
Attitudinal Variables	
Risk Tolerance	= 1 if the individual is willing to take above average or substantial financial risks expecting above average or substantial returns, and 0 if the individual is not willing to take any financial risks or is willing to take average financial risks expecting to earn average returns.
Planning Horizon	= 1 if the individual's planning horizon for saving and spending is longer than 10 years, 0 if 10 years or less.
Saving for Retirement	=1 if the individual indicated that saving for retirement was one of the three most important reasons for saving, 0 otherwise.
Financial Variables	
Household Wealth	=Risky Assets + Risk-Free Assets. Risky Assets=stock holdings less margin loans + mutual fund holdings + bond holdings + net value of investment real estate + net value of owned businesses + value of other miscellaneous assets + IRA and Keogh balances + pension plan balances. Risk-Free Assets=balances in checking, savings and money market accounts + certificates of deposit + U.S. savings bonds.
Risky Assets/ Household Wealth	=(Risky Assets-pension plan balances)/Household Wealth.
Homeowner	= 1 if the individual's household owns its own home, 0 otherwise.
Employment Variables	
Employer Size	= 1 if the individual's employer employs 500 or more employees, 0 otherwise.
Years in Pension Plan	=number of years the individual has been included in the pension plan.

Based on the findings of Coleman (2003), Gutter et al. (1999), and Siegal and Hoban (1991), it is posited that there will be no significant difference between the asset allocation choices of Blacks and Whites, other things being equal. However, since the findings on this question have been mixed, race is included as an explanatory variable. Race is treated as a categorical variable in the analysis (see Table 1).

The attitudinal variables included in the analysis are: (a) attitude toward risk, (b) planning horizon, and (c) reasons for saving. Based on the findings of Gutter et al. (1999) and Schooley and Worden (1996), it is posited that individuals are more likely to hold stock in their defined contribution pension plan as their self-reported

willingness to take risk increases. The self-reported attitude toward the risk variable is treated as a categorical variable in the analysis (see Table 1).

Based on the findings of Gutter et al. (1999) it is hypothesized that as their planning horizon when making saving and spending decisions lengthens, individuals are more likely to be cognizant of the risks and returns of alternative investments and the equity premium associated with investing in stock over the long run and will be more likely to hold stock in their defined contribution pension plans. The planning horizon variable is treated as a categorical variable in the analysis (see Table 1).

It is posited that individuals who save specifically for retirement are more likely to be informed about the risks and returns of alternative investments and the equity premium than individuals who do not save specifically for retirement. Other things being equal, individuals who save specifically for retirement are more likely to hold stock in their defined contribution pension plans compared to individuals who do not save specifically for retirement. The categorical variable, Saving for Retirement, is included in the analysis to differentiate between individuals who indicated that saving for retirement was one of the three most important reasons for saving from those individuals who indicated that saving was not one of the three most important reasons for saving (see Table 1).

The financial variables included in the analysis are: (a) household wealth, (b) risky assets of the household held outside of the individual's defined contribution plan as a proportion of total household wealth, and (c) homeownership status. Based on the findings of Cohn et al. (1975), Riley and Chow (1992), and Schooley and Worden (1996) who find that a higher proportion of total assets are committed to risky assets as household wealth increases, it is posited that the likelihood of holding stock in the pension plan increases as household wealth increases, other things being equal. The measure of household wealth used in the analysis (see Table 1) is that specified by Bajtelsmit et al. (1999).

Presumably, the allocation of assets within the defined contribution pension plan would be carried out within the context of the household's overall asset allocation. The variable measuring risky assets held outside of the individual's defined contribution plan is included in the analysis to control for the level of the household's risky assets that are held outside of the defined contribution pension plan. The variable Risky Assets/Household Wealth is specified as the ratio of risky assets held by the household outside of the defined contribution pension plan to total household wealth (see Table 1).

Since residential housing has investment and consumption aspects (Bajtelsmit et al., 1999), the value of residential housing is not included in the household wealth variable. It is included as a separate control variable and is treated as a dichotomous variable (see Table 1).

The employment variables included in the analysis are: (a) a dichotomous variable that differentiates between individuals who are employed by employers with 500 or more employees and those employed by employers with less than 500 employees and (b) the number of years that the individual has participated in a defined contribution pension plan.

Bayer, Bernheim and Scholz (1996) find that the availability of workplace financial planning educational programs increases as the number of employees in the firm or organization increases. Hence, individuals employed by larger firms or organizations have a greater opportunity to become informed about various aspects of retirement planning, including aspects of asset allocation and the equity premium, compared to individuals employed by smaller firms. It is posited that individuals employed by large firms are more likely to hold stock in their pension plan compared

to individuals employed by smaller firms, other things being equal. The size of employer variable is treated as a categorical variable in the analysis (see Table 1).

Table 2
Characteristics of the Sample[a]

Variable	Percent or Mean
Demographic Variables	
Mean Age	45.56
Gender-Marital Status	
Married male (Percent)	62.47
Single female (Percent)	19.33
Single male (Percent)	18.20
Race	
Black	9.50
White	90.50
Education	
Less than 12 years (Percent)	4.18
High School Graduate (Percent)	26.91
Some College (Percent)	27.79
College Graduate (Percent)	41.12
Attitudinal Variables	
Risk Tolerance	
Not willing to take any financial risk or Willing to take average financial risk (Percent)	56.28
Willing to take above average financial risk (Percent)	43.72
Planning Horizon	
10 years or less (Percent)	76.30
More than 10 years (Percent)	23.70
Saving for Retirement (Percent)	77.29
Financial Variables	
Mean Household Wealth	$311,531.97
Risky Assets / Household Wealth	.79
Homeowner (Percent)	79.05
Employment Variables	
Employer Size	
500 or more employees (Percent)	60.64
Less than 500 employees (Percent)	39.36
Mean Years in Pension Plan	7.13
[a] n=587. Means and Percents are computed using weighted data.	

As the length of time that individuals participate in defined contribution pension plans increases, pension plan assets increase and the length of time until the retirement date decreases. However, the closer individuals are to their retirement date the less time they have to recover from losses in their pension portfolio. If pension assets are heavily concentrated in more risky equities near the retirement date, a large decline in equity prices will increase the risk that the assets in the retirement funds will be depleted early in the retirement period. Thus, as the number of years of participation in the defined contribution plan increases, the likelihood of holding stock in the portfolio decreases. The number of years that the individual participated

in the defined contribution pension plan is treated as a continuous variable in the analysis (see Table 1).

THE FINDINGS

Descriptive statistics for the explanatory variables included in the analysis are shown in Table 1. Table 2 contains the results of the fitted logistic regression equation.[1] Contrary to the hypothesis, the coefficient for the demographic variable age was positive and statistically significant at the .10 level. Other things being equal, as a sample respondent ages by one year, the probability of holding stock in the pension plan increases by 4.3 percent. When the variable age was entered in the equation as age and age squared neither term was statistically significant.

Why do individuals increase their willingness to hold stock in their pension plan as they age? Possibly, as individuals age and begin to think more seriously about retirement, they become more knowledgeable about the risks and rewards of alternative investments and understand that the long run returns on common stock historically have exceeded the returns on bonds and other types of fixed income investments. As they come to recognize this and as they attempt to achieve a desired level of wealth by the time they reach retirement age, they begin to include common stock in their pension plan assets.

With respect to the gender-marital status variable, single females are significantly less likely to hold stock in their pension plans than are married males. Other things being equal, the odds of a single female holding stock in her pension plan is only 41 percent of those of a married male. However, the coefficient of the variable single male is not statistically significant, indicating that the odds of a single male holding stock in his pension plan is not significantly different than that of a married male, other things being equal.

The findings indicate that, after controlling for other factors, the likelihood of holding stock in the pension plan did not differ between Blacks and Whites. Hence, contrary to some previous findings, Blacks are not more risk averse than Whites, at least with respect to how they allocate assets in their defined contribution pension plans.

Individuals are more likely to hold stock in their pension plans as their level of education rises, other things being equal. There is no significant difference in the likelihood of holding stock in the pension plan between individuals who completed high school and those who completed 11 or fewer years of school. However, individuals who completed some college or who graduated from college are more likely to hold stock in their pension plan than are individuals who completed 11 or fewer years of school, other things being equal. Individuals who completed some college and those who graduated from college are almost 2.5 times more likely to hold stock in their pension plan than are individuals who did not complete high school.

With respect to the attitudinal variables, the variables risk tolerance and planning horizon are both highly significant in predicting the likelihood of holding stock in the pension plan. However, the variable Saving for Retirement was not significant. Other things being equal, individuals who indicated that they were willing to take above average risk are 3.7 times more likely to hold stock in their defined contribution pension plan than are individuals who were not willing to take any financial risk or were willing to take only average financial risk. Individuals who indicated that they had a planning horizon of more than 10 years are 2.9 times more

likely to hold stock in their pension plan than are individuals with a planning horizon of less than 10 years.

Table 3
Results of Logistic Regression to Predict Asset Allocation in
Defined Contribution Pension Plans [a]

Variable	Parameter Estimate	P-value	Odds Ratio[b]
Intercept	0.1180	.9316	
Demographic Variables			
Age	0.0421	.0524*	1.043
Gender-Marital Status			
Married male (reference category)	---------	---------	---------
Single female	-0.8971	.0416**	.408
Single male	-.5188	.2047	---------
Race	-0.0112	.9826	---------
Education			
Less than 12 years (reference category)	---------	---------	---------
High School Graduate	.8493	.2216	---------
College	1.1985	.0958*	3.315
College Graduate	1.2247	.0716*	3.403
Attitudinal Variables			
Risk Tolerance	1.5523	< .0001***	4.723
Planning Horizon	1.3690	.0033***	3.931
Saving for Retirement	-.05853	.1140	---------
Financial Variables			
Household Wealth ($1,000's)	-6.29E-6	.0418**	1.000
Risky Assets / Household Wealth	-0.0418	.9507	---------
Homeowner	-.4708	.2816	---------
Employment Variables			
Employer Size	-.3802	.2038	---------
Years in Pension Plan	-.0477	.0407**	.953
Likelihood Ratio=53.1882***			

*P-value<=.10, **P-value<=.05, ***P-value<=.01

[a] n=587. [b]Odds ratios are provided only for variables that are statistically significant.

Contrary to the hypothesis, an individual's likelihood of holding stock in the pension plan decreases as the individual's household wealth increases. Possibly, wealthier individuals who face higher marginal tax rates hold bonds rather than equities in their defined contribution plans because of the more favorable tax treatment of capital gains on assets held outside of defined contribution plans. Capital gains on assets held in defined contribution plans are treated as ordinary income when the plan assets are distributed. Capital gains held outside of the defined contribution plan are taxed at the more favorable capital gains tax rate. The likelihood of holding stock in the pension plan was not affected by the percent of risky assets that the household held outside of the pension plan or by homeownership status.

With respect to the employment variables, the likelihood of an individual holding stock in the pension plan was not affected by the size of the individual's employer. However, the number of years that the individual participated in the pension plan did affect the likelihood of holding stock in the portfolio. Consistent with the hypothesis, for each additional year that the individual participated in the plan, the likelihood of holding stock in the plan decreased by about 5 percent, other things being equal.

SUMMARY, IMPLICATIONS, AND LIMITATIONS

Recent trends in pension and Social Security policy in the United States strongly suggest that Americans will be expected to assume increasing responsibility for managing the assets that are to provide for their economic security during their retirement years. How will they allocate these assets? Will their asset allocation choices be appropriate for the goal of accumulating sufficient wealth to provide economic security during the retirement years? This paper attempts to provide some insight into these questions by identifying some of the factors that account for differences in the allocation choices of participants in defined contribution pension plans.

The findings indicate that the individuals are more likely to hold stock in their pension plans as they age and that single females are less likely than married males to hold stock in their plans. Individuals who completed some college or who graduated from college are more likely to hold stock in their plans than are individuals who completed 12 or fewer years of education. The likelihood of holding stock increases as the self-reported willingness to take risk increases and as the planning horizon for making saving and spending decisions lengthens. As the individual's household wealth increases, the likelihood of holding stock in the pension plan decreases. Other things being equal, the likelihood of stock ownership declines as the number of years that the individual participated in the pension plan increases. The likelihood of holding stock is not significantly different between Black and White individuals or between married males and single males, other things being equal. Finally the likelihood of holding stock in the plan was not affected by risky asset ownership outside of the pension plan, homeownership status, or the size of the individual's employer.

The study results imply that policies to provide for more widespread use of self-directed retirement accounts may succeed only if those policies are accompanied by policies that will provide personal financial planning education for the individuals who will be expected to manage the assets in their accounts. The prospects for accumulating the assets necessary for providing for financial security during the retirement years will be enhanced if individuals plan for retirement beginning at an early age, understand the risk-reward characteristics of alternative investments, and take advantage of the premium that has historically been associated with investment in equities during the early years of work life.

Since the findings of this study indicate that the sample respondents take more rather than less advantage of the equity premium as they age, there is a need to determine whether this finding holds beyond the sample of this study and, if so, why this occurs. If younger plan participants are less likely to hold equities in their plans because of a lack of knowledge about the risk and return characteristics of alternative investments, their economic security during the retirement years would be enhanced by providing them with personal financial planning education about concepts such as the risk-reward characteristics of alternative investments and the time value of money. If the plan assets of older participants are concentrated too heavily in equities as they near retirement, there may be a significant risk that their retirement funds will be depleted early in the retirement period if there is a significant decline in equity prices. Likewise, single females and individuals with less education may be less likely to hold equities in their plans because they have less knowledge about the risk and reward characteristics of alternative investments. If this is the case, they may also benefit from personal financial planning education.

An individual's risk tolerance level and planning horizon were also significant predictors of the likelihood of holding stock in the pension plan. A short

planning horizon and low risk tolerance level reduced the likelihood of holding stock in the pension plan. Possibly individuals have low risk tolerance levels and shorter planning horizons because of a lack of understanding of personal financial planning concepts such as the risk-reward characteristics of alternative investments and the time value of money. If this is the case they may benefit from personal financial planning education.

In summary, the study results suggest that many participants in self directed retirement accounts do not have the requisite personal financial planning skills to manage the assets in their accounts in a manner that maximizes their prospects for accumulating the assets necessary to provide for a secure retirement. This suggests that the successful expansion of self directed retirement accounts and the implementation of private accounts within the Social Security system will require additional education and counseling for individual participants. Possibly this could be accomplished by requiring that primary and secondary schools provide more extensive personal financial education. For the adult population colleges and universities could provide more personal financial planning education through their continuing education programs. Or, perhaps, providers of self directed retirement accounts should be required to provide plan participants with the education and counseling necessary for them to effectively manage the assets in their accounts. If the employees are not able to acquire the necessary skills to effectively manage their plan assets, it may be necessary to develop policies to limit the investment options available to them.

The study has a number of limitations and there is a need for additional research in order to better understand how individuals choose to allocate the assets in their self-directed retirement plans. First, the data used in the analysis were cross sectional data for the year 1998. In addition to the sets of explanatory variables included in the model, an individual's asset allocation may be affected by the individual's assessment of the relative riskiness of equity investments and this assessment may change with changes in equity market conditions. This study utilized data for 1998, a period near the end of the strong bull market of the 1990's. It is possible that asset allocation choices may differ under different equity market conditions. Examining asset allocation decisions under varying equity market conditions over a more extended time period would provide further insight into this question.

Second, the Survey of Consumer Finances treats the asset allocation within defined contribution pension plans as a categorical variable. Data that provide more detailed information about individual asset allocation choices would provide better insight into how individuals allocate their assets. Likewise, because of the manner in which the survey was conducted, the sample does not include married females as sample respondents.

Finally, although self-reported risk tolerance and the length of the planning horizon significantly affect the likelihood of holding stock in the pension plan, the study provides no insight into the underlying causes of these differences. Because individuals who are predisposed to take financial risk and who have longer planning horizons are advantaged when accumulating and managing the assets for their retirement years, there is a need to examine the factors that give rise to differences in risk tolerance levels and the length of planning horizons among individuals and the extent to which these factors are mutable.

ENDNOTES

1. The discriminant analysis technique could have also been used to test the model. Logistic regression was chosen over the discriminant analysis technique because the logistic regression technique is more robust when the assumptions of multivariate normality and equal variance-covariance matrices across groups are not met, and when the explanatory variables are not continuous (Hair, et al, 1998; Tabachnick and Fidell, 1996). In addition, because of its similarity to ordinary regression analysis, economic and finance professionals will find it easier to interpret the results generated by logistic regression.

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