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Original Paper

Defined Contribution Plan Participant's Position after the Subprime Crisis

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Abstract

The growing number of Defined Contribution Plans available in the U.S. has presented many in the U.S. work force with investment decisions. Decisions many of these workers have not been faced with in the past. An analysis of the Survey of Consumer Finance data over the early portion of the sample period, 1992-2010 has shown that the annual average percentage of liquid retirement plan savings allocated to equity assets increased from 43.02% to 66.42%. In 2010, after the subprime crisis, the allocation to equity declined but remained high at 50.65%, even though the market in 2001 and 2008 changed the allocation for many participants. Researchers attempt to find the reason that retirement savings plan participants have chosen to take a riskier position over the years. After controlling for factors such as age and income classifications, this study finds the educational classification to be a significant factor in explaining the percentage that participants allocate to the relatively riskier assets.

Keywords

defined contribution plan, asset allocation, education

1. Introduction

The growing number of Defined Contribution Plans available in the U.S. has presented many in the U.S. work force with investment decisions. Decisions many of these workers have not been faced with in the past. Investors are now facing investment decision ranging from the size of their contribution to choosing an appropriate investment policy. An investment policy includes the investor's long term asset allocation decision, which is based primarily on the investor's retirement goals, investment horizon, and risk tolerance. The participants of retirement savings plans seem to have taken a riskier position over the years by investing larger portions of their retirement savings to equity assets.

There are many changes that have taken place within the past two decades that are suspect in causing investors to change their risk tolerance levels such as: increases in the percent of retirement plan participants that have at least a high school education and increases in per capita income. For some investors, the riskier position has been found to stem from the investor's failure to rebalance their portfolios after making their initial allocation decision (Rugh, 2003). However, if changes in risk

tolerances have occurred then this translates to changes in the optimal asset allocation in which risk tolerance is a constraining factor.

This study's focus is on the extent to which some common factors such as age classification, education classification, income classification, as well as economic and market conditions, effect participants demand for equity assets. Identifying the effects of these common factors on the asset allocation choices of those investors with retirement savings is the first step of the journey to understanding the increase in the allocations of participants in equity assets. The addition of education classification to the study of the factors behind the asset allocation decision is the key factor that makes this study unique. This finding is thought to be an important contribution to the existent literature since economic policy prior to the sub-prime crisis has focused on the role that education plays in our society.

In his semiannual Monetary Report to the Congress, Chairman Alan Greenspan pointed to education as the most important factor for the U.S. economy's continued success. He stated,

"strengthening elementary and secondary schooling in the United States—especially in the core disciplines of math, science, and written and verbal communications" was important to avoid stark bifurcations in both wealth and income in the U.S. economy and the resultant problems that could be cause by this economic condition (Greenspan, 2005). Policies, such as "No Child Left Behind" occurring while college enrollments across the countries are seeing all-time highs, demand that a focus on education should be considered in analyzing the asset allocation decision.

The study investigates the effects of investor's educational classification on their allocation to equity assets in retirement plans. The Survey of Consumer Finance (SCF) data from 1992 to 2010 shows an increasing percentage of retirement plan participants that have at least a high school diploma or its equivalent. Increases in technology have made the access to information regarding equity assets easier to come by over the sample selection period, 1992-2010. A higher educational classification implies that the probability that the participant understands and access to this type of information will also be higher. Thus, assuming the educational makeup of the SCF exemplifies the educational makeup of those persons in the U.S. who are retirement plan participants, this study may help in the explanation of why participants of defined contribution plans and similar retirement plans have allocated more of their retirement plan savings to equity assets.

The next section of the paper consists of a review of the literature that is meant to give some insight into the factors that have been found by other researchers to influence the asset allocations of investors who participate in retirement savings plans. The literature review is followed by a brief explanation of the data set that was used in the study. The methodology used in forming the panels for the four stages of the analysis directly follows the data section. Then the results section explains the relationships that were found to be significant in the explanation of retirement plan participant's demand for equity assets. After the conclusion of the study, some thoughts for future research have been included.

1.1 Literature Review

The literature that is available on the factors that effect the asset allocation of investors is vast. The

trend toward greater portfolio holdings of equity assets is one that raises questions in the minds of researchers in finance and economics, including behavioral finance (Anoruo et al., 2003). Scholars address the seemingly riskier appetite of investors in a variety of ways each trying to explain the dynamic asset allocation practices of investors in general. Additionally, the rapidly increasing number of defined contribution plan participants, or retirement savings plan participants, when mixed with concerns about the ample provisions of the Social Security System in years to come causes researchers to focus on the asset allocations of participants of these types of savings plans.

Perold and Sharpe (1995) address the fact that risky assets are contained in the portfolio of most investors, and there are different dynamic strategies that these investors use in terms of their retirement plan asset allocations. Some of these strategies include the buy-and-hold strategy, and the constant-mix-strategies. The risk tolerances associated with each of these strategies differ, as do the risk tolerances of investors. The buy-and-hold investors employ the "do nothing" strategy the investor makes the initial allocation decision and does not rebalance. The constant-mix strategy requires rebalancing when the portfolio's asset allocations change due to the changing market values of their underlying assets. The risk tolerances of the investors choosing to employ the constant-mix strategy are found to vary in proportion to their wealth (Perold & Sharpe, 1995).

Rugh (2003) looks as the asset allocation of TIAA-CREF participants over the sample period, 1986-2002. In his study, which references the growing number of defined contribution plan participants, Rugh looks at the initial asset allocation of the 1997 cohort and the 2002 cohort and finds that on average the initial allocations to be 50-50, and 57-43 equity/non-equity, respectively. He finds that less than 4 out of every 10 participants in the 1997 cohort have changed their contribution allocation over the 1997-2002 period. The majority of TIAA-CREF participants have been found not to change their contribution allocations for periods ranging from 10 to 12 years (Ameriks & Zeldes, 2001). Rugh suggests that changes seen in participants' asset allocations may be largely due to the participants' contribution allocations combined with inertia (Rugh, 2003).

Sunden and Surette (1998) use the education classification variable in their study on gender differences in the asset allocation of retirement savings plan participants. They find that Survey of Consumer Finance respondents who are classified as No HS Degree have a decreased likelihood being a defined contribution plan participant, and those with a College Degree have an increased likelihood of being a defined contribution plan participant. The study also found that those respondents with No HS Degree were more likely to allocate their assets mostly to bonds (Sunden & Surette, 1998).

Yook and Everett (2003), studying the types of questionnaires that are used to measure risk tolerance, find that not only risk tolerance, but in some cases age group, household income category, and gender have an effect on the percentage of assets allocated to stocks. Their findings are consistent with the findings of other scholars including Friend and Blume (1975) who found a positive relationship between investor's risk tolerance and income (Yook & Everett, 2003).

The literature provides a solid theoretical basis for the analysis undertaken in this study. The addition of

education classification adds to the existent literature by providing a more detailed investigation of the role of education in understanding asset allocations to equity assets. Further analysis of the use of different risk tolerances based on educational classification in the maximization of expected utility may shed more light on the retirement savings plan investors demand for equity assets.

2. Method

2.1 Data

The Survey of Consumer Finance (SCF) data collected over the 1992-2010 period form the dataset used in this study. The Survey of Consumer Finance is a triennial interview survey, which is sponsored by the Board of Governors of the Federal Reserve System in cooperation with the U.S. Department of the Treasury. A research organization, NORC, at the University of Chicago has been collecting the data for this survey since 1992, and although the survey administration has changed hands, the survey has only experienced minor changes between the years of 1989 and 1992 (Aizcorbe et al., 2003). So, the data collection will not encounter these minor changes. The SCF survey data includes demographic, asset, liability, and pension plan information on the households. From each of the triennial surveys a set of data including composite variables and other variables of interest are available in various formats. The variables are created in the same manner as those in Aizcorbe et al. (2003).

The data used in this study pertains to individuals that have tax-deferred retirement accounts. These accounts include Keogh, IRA, and employer sponsored accounts from current or past jobs from which loans can be made. Similarly, these accounts have the characteristic of being broadly invested across a variety of asset classes. This study focuses on the portion of the accounts that are allocated to equity assets.

As in any survey, sampling and measurement errors are potential problems. In an attempt to reduce sampling error, the SCF took into account certain sources of variability when designing the sample. Measurement error can occur when interviewers do not follow certain protocols or misinterpret interviewee's responses. The SCF ensures that interviewers complete project-specific training in an attempt to minimize the occurrence of this sort of reporting error. Measurement error can also be caused by the respondents' misunderstanding or misinterpretation of the questions asked by the interviewers. The SCF attempts to minimize this sort of error by thoroughly reviewing the data provided by the respondent and going through a series of pre-testing questions (Holden & VanDerhei, 2003).

2.2 Methodology

The SCF data contained variables that compile information regarding respondents' holdings in quasi-liquid retirement accounts. These quasi liquid retirement accounts include individual retirement accounts (IRAs) and accounts from thrift-type plans such as 401(k), 403(b), thrift, saving, SRA, etc. These accounts are termed quasi-liquid because they provide the investor the opportunity to borrow or withdraw funds from the accounts. In the SCF code that is provided by the Federal Reserve and is

published in the triennial Bulletins, the variable *RETQLIQ* is defined to be the sum of these IRAs and thrift accounts for each of the respondents. Thus, $RETQLIQ_{it}$ denotes the sum of the IRAs and thrift accounts for respondent i at any given time $t \in \{1992, 1995, 1998, 2001, 2004, 2007, 2010\}$. The equity portion of the quasi-liquid retirement accounts, *RETEQ*, is also defined in the triennial SCF datasets. The total the thrift amount held in stock by investor i at any given time $t \in \{1992, 1995, 1998, 2001, 2004, 2007, 2010\}$ is denoted by $RETEQ_{it}$.

In this analysis, the focus is on the asset allocation of those that have retirement savings plans. Therefore, the dummy variable *RET* was established to provide a way to distinguish those respondents who had holdings in individual retirement or thrift accounts at the time of the survey from those who had no holdings of this type. All respondents that did not indicate any retirement holdings were dropped from the dataset because income and wealth are no longer related when the marginal propensity to save is zero (Smith, 1978). Detailed information pertaining to the number of respondents interviewed each year of the study, and the number of those respondents who had a positive amount of retirement holdings is provided in Table 1.

Also, included in Table 1 is the percent of respondents surveyed that participate in retirement plans and the percent of retirement plan savings that those participants allocate to equity assets for each of the years in the sample period. These percentages are similar to the results found by Rugh (2003); and Holden and VanDerhei (2003). Thus, the SCF data are thought to show the same growth trends in the number of retirement plan participants and the allocation to equity assets that have been seen in the market.

Table 1. Percentage of Liquid Retirement Plan Participants by Classification by Year

Year	1992	1995	1998	2001	2004	2007	2010
Liquid Ret	9761	11908	12236	13480	13253	13737	18068
Total	19530	21495	21525	22210	22595	22085	32410
Liquid Ret %	49.98%	55.40%	56.85%	60.69%	58.65%	62.20%	55.75%
Ret EQ %	43.02%	49.70%	60.13%	66.42%	56.15%	57.29%	50.65%
Educational Classification							
1:No HS Degree	32.63%	35.99%	46.88%	50.84%	39.07%	45.58%	39.71%
2:HS Diploma	35.37%	42.04%	51.81%	61.12%	46.76%	48.61%	44.25%
3:Some College	40.23%	48.72%	58.98%	67.05%	53.09%	54.73%	45.51%
4:Colege Degree	46.91%	54.18%	64.36%	69.07%	60.57%	61.18%	54.71%
Age Classification							
1:<35	44.33%	54.86%	62.30%	73.13%	54.98%	55.67%	52.88%
2:35-44	44.39%	51.63%	61.82%	71.61%	57.53%	58.95%	52.15%
3:45-54	45.86%	53.89%	64.93%	68.71%	57.55%	58.12%	53.18%

4:55-64	43.93%	47.13%	59.80%	64.71%	58.12%	58.12%	51.09%
5:65-74	34.57%	40.86%	50.82%	53.63%	51.79%	55.95%	45.20%
6:>=75	35.11%	31.92%	39.04%	47.90%	46.63%	51.31%	39.69%
Income Classification							
1:<20%	22.53%	29.25%	36.73%	55.19%	50.04%	47.34%	44.57%
2:20-39.9%	28.16%	38.37%	43.33%	55.22%	47.15%	48.65%	44.33%
3:40-59.9%	40.01%	44.76%	53.77%	62.02%	49.31%	48.70%	45.86%
4:60-79.9%	41.00%	46.69%	60.83%	68.44%	51.45%	54.69%	47.64%
5:80-89.9%	44.22%	52.67%	62.03%	68.64%	52.35%	56.76%	52.09%
6:>90%	47.04%	55.28%	65.76%	69.55%	63.34%	63.33%	56.62%

Note. The measures represent for the educational classification, age classification, and income classification are the annual average percent equity holdings in the quasi-liquid retirement accounts of SCF respondents.

The annual average percentage of the quasi-liquid retirement accounts allocated to equity are also displayed in Table 1 for all of the educational, age, and income classifications defined in the survey data. From the tabled data, it is evident that the percentages of equity holdings were higher for most classifications in 2001. Due to the peak and the recessionary period that followed, special controls are put in place for 2001 in the data analysis.

The expectation that retirement plan participants allocate less to equity assets as the age classification increases held true in the data in general. An examination of the educational and income classification show an increase in equity holdings for participants as they increase their educational classification and as their income classification increases, though the two may go hand in hand. This behavior has been seen in the literature and will be used in the formation of the model used in the study.

The analysis of the retirement plan data is done by using a four-stage approach. In each stage, a new panel dataset is formed. The dependent variable in each of the stages is the percent of retirement savings allocated to equity, *PERCENTEQ*. The method used for the calculation of the dependent variable is similar for each of the stages.

Stage 1 (Average percentage allocated to equity for each year)

$$\text{PERCENTEQ}_{\text{t}} = \frac{\sum_{i=1}^{n_t} \frac{RETEQ_{i,t}}{RETQLIQ_{i,t}}}{n_t}$$

where n is the number of respondents with a positive amount of retirement holdings in any given year $t \in \{1992, 1995, 1998, 2001, 2004, 2007, 2010\}$.

Stage 2 (Average percentage allocated to equity for each age class each year)

$$\text{PERCENTEQ}_{\text{AGECL, t}} = \frac{\sum_{i=1}^{n_{AGECL,t}} \frac{RETEQ_{i,t}}{RETQLIQ_{i,t}}}{n_{AGECL,t}}$$

where $n_{AGECL,t}$ is the number of respondents with a positive amount of retirement holdings in any given $AGECL \in \{1,2,3,4,5,6\}$ in any given year $t \in \{1992,1995,1998,2001,2004,2007,2010\}$.

Stage 3 $\left(\begin{array}{l}\textbf{Average percentage allocated to equity for each}\\ \textbf{education class within each age class each year}\end{array}\right)$

$$\text{PERCENTEQ}_{\text{AGECL, EDCL,t}} = \frac{\sum_{i=1}^{n_{\text{AGECL,EDCL},t}} \frac{RETEQ_{i,t}}{RETQLIQ_{i,t}}}{n_{\text{AGECL, EDCL},t}}$$

where $n_{AGECL,EDCL,t}$ is the number of respondents with a positive amount of retirement holdings in any given $\text{EDCL} \in \{1,2,3,4\}$ in any given $\text{AGECL} \in \{1,2,3,4,5,6\}$ in any given year $t \in \{1992,1995,1998,2001,2004,2007,2010\}$.

Stage 4 $\left(\begin{array}{l}\textbf{Average percentage allocated to equity for each income class}\\ \textbf{within each education class within each age class each year}\end{array}\right)$

$$\text{PERCENTEQ}_{\text{AGECL, EDCL, INCCAT, t}} = \frac{\sum_{i=1}^{n_{\text{AGECL, EDCL, INCCAT, }t}} \frac{RETEQ_{i,t}}{RETQLIQ_{i,t}}}{n_{\text{AGECL, EDCL, INCCAT},t}}$$

where $n_{AGECL,EDCL,INCCAT,t}$ is the number of respondents with a positive amount of retirement holdings in any given $INCCAT \in \{1, 2, 3, 4, 5, 6\}$ in any given $EDCL \in \{1, 2, 3, 4\}$ in any given $AGECL \in \{1,2,3,4,5,6\}$ in any given year $t \in \{1992,1995,1998,2001,2004,2007,2010\}$.

The SCF dataset had contains the *AGECL*, *EDCL*, and *INCCAT* variables that are used in the above *PERCENTEQ* calculations. Included on Table 2 are the characteristics that define these different classes and categories for each year.

Table 2. Percentage of Retirement Plan Participants by Classifications

Year	**1992**	**1995**	**1998**	**2001**	**2004**	**2007**	**2010**
***ACGCL*:Ages**							
1:<35	13.34%	15.51%	12.86%	13.33%	11.07%	10.82%	12.76%
2:35-44	23.62%	23.07%	24.53%	22.68%	19.66%	18.28%	17.10%
3:45-54	25.74%	25.77%	26.92%	28.44%	27.27%	26.79%	26.44%
4:55-64	20.37%	18.57%	19.72%	19.22%	25.08%	24.77%	25.57%
5:65-74	14.60%	13.29%	12.27%	10.93%	11.48%	12.96%	12.14%
6: >=75	2.34%	3.80%	3.69%	5.40%	5.44%	6.38%	6.00%

***EDCL*:Description**							
1:No HS Degree	4.90%	5.10%	4.32%	4.03%	3.18%	3.65%	3.10%
2:HS Diploma	19.03%	21.78%	20.68%	20.35%	19.34%	19.02%	21.00%
3:Some College	14.94%	16.69%	16.39%	15.07%	14.28%	14.42%	15.15%
4:College Degree	61.13%	56.42%	58.61%	60.56%	63.21%	62.90%	60.75%
***INCCAT*:Percentiles**							
1:<20%	2.11%	3.07%	2.80%	3.56%	2.91%	2.73%	4.60%
2:20-39.9%	6.84%	7.65%	7.80%	8.72%	7.62%	8.17%	9.45%
3:40-59.9%	11.31%	13.63%	14.18%	13.81%	14.07%	13.21%	15.64%
4:60-79.9%	17.03%	19.80%	18.76%	19.59%	18.94%	18.81%	21.45%
5:80-89.9%	13.81%	13.55%	11.92%	12.37%	12.25%	12.91%	14.25%
6:>90%	48.90%	42.30%	44.55%	41.95%	44.22%	44.18%	34.61%

Note. The percentages above reflect only those respondents with a positive amount in a retirement savings account captured by the variable, *RETQLIQ*.

Finally, an approach similar to a fixed effects approach is used in which dummy variables are used to determine the effects that are specific to each of the age, education, and income classifications as well as the year has on the percentage of the defined contribution plan assets allocated to equity assets. This approach is used because it is believed that there are characteristics unique to each of the categories that effect the investor's equity allocation decision (e.g., investor's risk aversion may change as they age, as their income increases, or as their education level increases). The dependent variable in this regression analysis is *PERCENTEQ* as it is defined in Stage 4. Again, the classifications and their definitions that are used in the regression analysis are defined on Table 2.

3. Result

In each stage of the analysis, a different panel is formed from the *PERCENTEQ* calculations. In Stage 1 of the analysis, the panel was formed by stacking the *PERCENTEQ* data by *YEAR*. The resulting dataset contains 5 observations. The data from the Stage 1 panel is graphed in Figure 1.

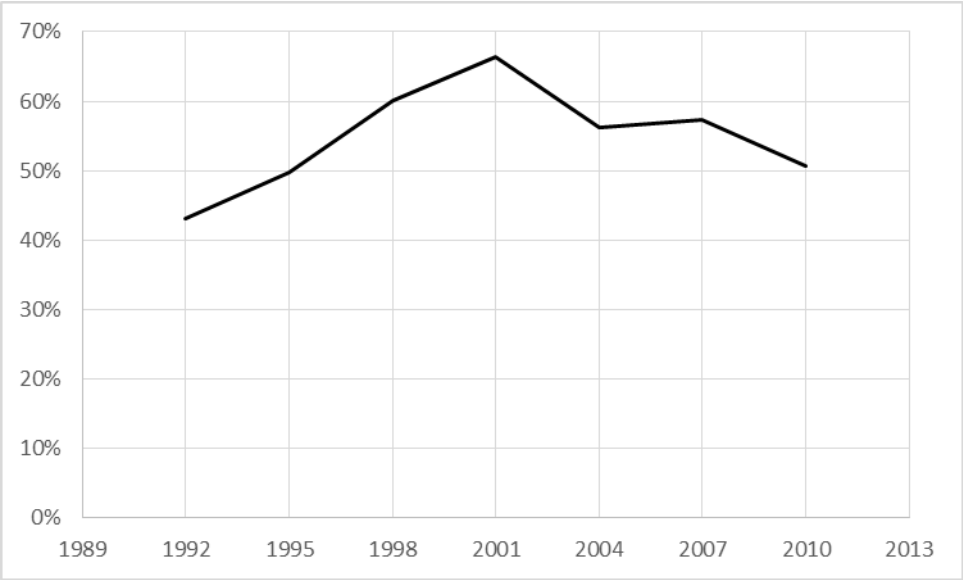

Figure 1. Equity Portion of Retirement Holdings

In Figure 1, it can be seen that on average an increasing percentage of the retirement account holdings are being allocated to stocks over the 1992 to 2001 period, but a slight decline occurred between 2001 and 2004. The decline between 2001 and 2004 captures the bearish equity market that was present during that period. There was also a decline from 2007 to 2010 picking up the results of the Financial Crisis. The results from the regression of the *YEAR* variable on the dependent variable *PERCENTEQ* are shown on Table 3.

The coefficient on the *YEAR* variable is found to be positive and not significant at the 95% confidence level. The number of 401(k) accounts has grown substantially over the sample period. Asset allocation theory would suggest that this result could be caused by an increase in the ratio of younger to older workers that are investing in retirement savings accounts (Riley & Russon, 1995). The asset allocation theory suggests that younger workers, having a longer investment horizon, should allocate a greater portion of their retirement savings in the equity market. The conjecture that the *YEAR* variable could be picking up the effects of a greater number of younger workers contributing to retirement accounts and not some other conditions specific to the year leads to Stage 2 of the analysis.

Table 3. Multi-Stage Aggregate Analysis

	Stage 1	**Stage 2**	**Stage 3**	**Stage 4**
Intercept	0.004	-8.957***	-7.740***	-10.399***
	(0.481)	(0.017)	(0.002)	(<0.001)
Year	0.004	0.005***	0.004***	0.005***
	(0.452)	(0.011)	(0.001)	(<0.001)

AGECL		-0.031***	-0.034***	-0.037***
		(<0.001)	(<0.001)	(<0.001)
EDCL			0.058***	0.039***
			(<0.001)	(<0.001)
INCCAT				0.028***
				(<0.001)
R Square	0.118	0.398	0.465	0.214
Adj R Square	-0.059	0.367	0.455	0.211
# Obs	7	42	168	973

Note. Parentheses contain estimated P-values from the OLS regressions, * Significant at the 90% confidence level, ** Significant at the 95% confidence level, *** Significant at the 99% confidence level.

In Stage 2, a new panel was formed by stacking the *PERCENTEQ* by age class by year resulting in a dataset with 42 observations. The *YEAR* and the *AGECL* variables serve as the independent variables in the regression in this stage of the analysis. The suggested asset allocation strategies given to investors by financial advisors, investment literature, and even the target retirement funds are dependent on the age class of the investor. The asset allocation theory suggests that as investors grow closer to retirement they should invest a lesser percentage of their retirement accounts in equity. The time horizon of the investor is thought to be one of the most important factors in the explanation of the asset allocation process (Blume, 1978; McInish, 1982). Investors with longer time horizons can tolerate a greater amount of risk and consequently expect greater returns from taking on the additional risk. These investors can tolerate the additional risk because they have a longer period of time to recoup from temporary losses due to asset value changes (Riley & Russon, 1995). Thus, *AGECL* is expected to be inversely related to *PERCENTEQ*.

The dataset was divided into six age classes based on the age of the head of household. The age classes can be seen in Table 2. The regression results in Table 3 for Stage 2 confirm the expected inverse relationship. On average, as the investors move from one age class to another, they decrease the percent of their retirement savings allocated to equity by 3.1%. This relationship is found to be statistically significant at the 99% confidence interval.

In Stage 3 of the analysis, the education class of those who hold retirement savings is considered in the creation of the panel. A new panel with 168 observations is created by stacking the *PERCENTEQ* values by year by age class by education class. The addition of education class to the explanation of asset allocation behavior of those with retirement savings plans has not been fully explored in the existent literature, though the relationship between *EDCL* and *PERCENTEQ* seen in Figure 2 show a positive correlation for all years in the sample. At an initial glance, the heads of households' asset allocation to

equity increases with their education classification on average. This perceived relationship is tested in Stage 3.

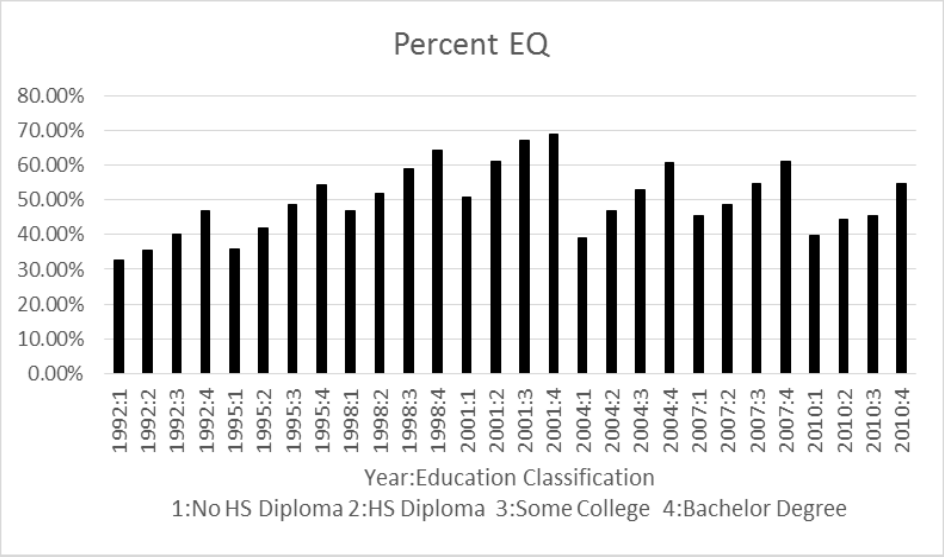

Figure 2. Percent Allocated to Equity Assets by Education Classification by Year

The *YEAR*, *AGECL*, and *EDCL* variables were the independent variables in the regression in Stage 3 and the results are displayed on Table 3. After controlling for the year, and age class, the education class of the head of household is found to be statistically significant at the 99% confidence level. The effect that the education class has on the percent of retirement assets allocated to equity translates to a 5.8% increase in the percent allocated to equity as one moves from one education class to another. Conversely, the lower the educational classification of the participant the lesser the amount of their retirement savings they allocated to equity, holding all other factors constant. This finding is consistent with some of the findings of Sunden and Surette (1998).

Investors with higher educational classification may not be as influenced by the higher levels of short term volatility of the equity market when they are making long term retirement decisions. Those investors that do not understand the difference in the importance of short-term vs. long-term volatility measures when looking at retirement investments that are long-term in nature may have a higher level of uncertainty when dealing with equity allocation decisions. This increase in uncertainty due to a lack of understanding may make the equity market seem riskier to these individual regardless of age class or the changing economic and market conditions, which the *AGECL* and *YEAR* variables attempt to capture.

Additionally, those participants that are more educated may find the opportunity cost of finding information about the investment choices made available to them through their retirement plans lower than those with a lower education classification. The lack of knowledge that those in the lower education classes might have regarding their investment choices may further increase their uncertainty about the

equity instruments that are available, thereby making them set sub-optimal limits on the amount of equities that they choose to allocate to their retirement portfolio.

This explanation is consistent with the theory of bounded rationality (Girgenzer & Selten, 2001), and suggests the need for further research on asset allocation in the area of behavioral economics. Behavioral economists recognize that the costs of gathering and processing information experienced by the participants should be considered as well as the differences in investors' utility function types in order to make models based on rational-agents more realistic (Simon, 1957; Kahneman, 2003).

After controlling for educational class in Stage 3, one might question that the education class variable was influenced by the relationship between the income level of the participant and the percentage allocated to equity assets. As income levels increase, the aversion of risk of the investors typically decreases. Thus, as the income level of the investor increases the amount that the investor might allocate to the riskier equity assets may logically tend to increase. Stage 4 will address this issue.

In Stage 4 of the analysis, a new panel is formed by stacking the calculated *PERCENTEQ* for each of the income classes within each of the education classes within each of the age classes for each year. The new panel is composed of 973 observations. The *YEAR*, *AGECL*, *EDCL*, and *INCCAT* variables were regressed onto the dependent variable, *PERCENTEQ*. The regression results appear on Table 2.

The relationship between *INCCAT* and *PERCENEQ* was positive and proved to be statistically significant at the 99% confidence level. The *INCCAT* variable is a discrete variable ranging from 1 to 6; details on the classification divisions are shown on Table 2. The regression results show the marginal adjustment to equity assets that takes place between each of the income categories is 2.8% regardless of the age classification, education classification, or year. This result is consistent with the findings of Yook and Everett (2003) when they estimated the percent allocated to stock while controlling for Risk Tolerance Score, Sex, and Income. Controlling for income category lowered the effect of education class on the percent allocated to equity assets, dropping the marginal education class effects from 5.8% to 3.9%.

The addition of the income category variable also influenced the marginal effects of age classification on the average percent allocated to equities. The marginal effect of age class in Stage 4 was found to be a decrease of 3.7% allocated to equities as one moves from one age class to another as compared to the decrease of 3.1% and 3.4% that had been found in Stages 2 and 3, respectively. The failure to control for income category in Stages 2 and 3 caused the age class to be measuring some of equity asset allocation effects caused by increases in income due to the fact that income has a tendency to increase with age over most of the classes.

The effects of the *YEAR* variable on the percent of retirement plan assets allocated to equity, while still significant, increased from 0.4% per year to 0.5% per year. The positive effects of income classification on the percent allocated to equity assets was being detected in the coefficient of the *YEAR* variable, which was anticipated to be controlling for economic and market condition. As salaries increase over the years, more of the participants may be moving into higher income categories; and, in those higher income

categories may be willing to allocate a greater percentage of their retirement savings to equity (Riley & Russon, 1995). Simultaneity bias is thought to exist between net worth and percent allocated to equities. Therefore, the income category is used to capture the increase in risk tolerance, or the decrease in risk aversion, that an increase in salary is theorized to cause. No simultaneity bias is thought to exist between income category and the percent of retirement saving allocated to equities, because the percent of retirement plan savings allocated to equity assets does not cause income to increase.

After finding the percentage of defined contribution assets allocated to equity assets differs with age, education, and income classifications as well as the year, it seems harsh to believe that the marginal effects of moving from one classification level to another will always be the same. Thus, the final portion of this analysis seeks to determine the effects that each of the classifications has on the percentage of defined contribution plan assets allocated to equity assets. Table 4 displays the regression results obtained using a dummy variable approach for each of the classifications.

Table 4. Fixed Effects for Each Classification

Variable	Class	Estimates	Variable	Class	Estimates
Intercept		0.546 (<0.001)	INCCAT	1	.
YEAR	1992	-0.243 (<0.001)	INCCAT	2	0.020 (0.012)
YEAR	1995	-0.167 (<0.001)	INCCAT	3	0.052 (<0.001)
YEAR	1998	-0.066 (<0.001)	INCCAT	4	0.08 (<0.001)
YEAR	2001	.	INCCAT	5	0.099 (<0.001)
YEAR	2004	-0.104 (<0.001)	INCCAT	6	0.149 (<0.001)
YEAR	2007	-0.089 (<0.001)			
YEAR	2010	-0.147 (<0.001)	AGECL	1	.
			AGECL	2	-0.033 (<0.001)
EDCL	1	.	AGECL	3	-0.047 (<0.001)
EDCL	2	0.027 (<0.001)	AGECL	4	-0.073 (<0.001)
EDCL	3	0.066 (<0.001)	AGECL	5	-0.132 (<0.001)
EDCL	4	0.102 (<0.001)	AGECL	6	-0.175 (<0.001)

Note. The number of observations used in the regression is 92443, which is the number of SCF participants with a positive amount of retirement savings over the 1992 to 2010 sample period. P-values are given in parenthesis.

The intercept in the regression picks up the classifications that were omitted in order for the model to be fully identified. As usual the intercept gives a baseline from which the effects of the other variables are compared. In this analysis, the baseline value is that of an investor in 2001 who is less than 35 years old, less than a high school education, and is in the lowest income bracket.

The year variable shows how changes in economic conditions as compared to those measured in 2001 effect the percentage of equity assets. The percentages may be capturing increases in the percentage of assets allocated to equity that has occurred due to the inertial buy-and-hold behavior of investors in defined contribution plan participants. The return to equity being expected to be greater than that of the less risky non-equity assets would cause the ratio of equity assets to become greater over time if defined contribution accounts are not rebalanced regularly.

Investors nearing retirement are advised to reduce the amount of equity assets in their portfolio. This recommendation is made so that the risk of loss of principal declines as the investor get closer and closer to the time at which the principal payments are needed as an income source. The results on Table 4 show that as investors age the gap between the investor's equity allocation compared to that of a retired investor's equity allocation narrow.

It had been seen on Table 3 that the percentage allocated to equity assets increased with education classification. The results shown on Table 4 tell the same story as those on Table 3; however, the results on Table 4 show that each of the education classifications are found to have differing effects on the allocations made to equity assets. These differences indicate that those that have a high school diploma allocate approximately 2.7% more than those with no high school diploma, ceteris Paribas. However, those investors who ended their formal education after completing some college and those who did complete college are found to invest approximately 6.6% and 10.2% more than the investor who did not graduate high school, respectively.

Investors that are in the highest income classification are found to have the greatest risk tolerance. The behavior of the investors in the lowest income category is captured in the intercept term. Thus, the coefficients shown on Table 4 for the other income classifications are interpreted as the difference in the percentage allocated to equity assets by the given income classification and that of those investors within the lowest income classification. Thus, the allocations tend to increase as the income classification increases.

The investors tend to decrease their investment in risky assets as they age this is seen in the age classifications. As the age classification increases there is a reduction of equity assets as compared to the youngest age class, those less than 35 years old.

4. Discussion

As the supply of companies offering retirement savings plans grows, so does the appetite for equity assets. The information collected on the asset allocation decisions of retirement plan participants in the SCF dataset over the 1992-2010 period show the same trend toward a growing demand for stock holdings in retirement accounts. This study finds that the percentage of participant's retirement accounts allocated to equity assets varies with time, age classification, education classification, and income.

Further focus on education classification in the investigation of the factors that influence asset

allocation decisions is the primary contribution of this study. In Stages 3 and 4 of the analysis, the education classification has been found to be a significant factor in explaining the demand retirement savings plan participants have for equity assets. The educational attainment and asset allocation decisions of retirement savings plan participants are both long term in nature. Those investors with a college degree not only having expectations of relatively higher wages but also having higher labor force participation rates and lower unemployment rates may have expectations of relatively lower income volatility. The lower level of income risk may allow them to take a riskier position that is displayed in the percentage these investors choose to allocate to equity assets. However, having a low education level and making sub-optimal equity allocation decisions may be symptomatic of a lack of information regarding asset allocation strategies or differences in the rate at which they discount the future.

Differences were seen in the effects that each of the education classifications have on the percent that defined contribution plan participants choose to allocate to equity assets. When the long-run expected returns on equity assets continue to be higher than those of non-equity assets, these differences show that the decisions of these investors will have meaningful effects on the retirement income available to these investors. The implications of the results of this investigation suggest that the decisions of economic policy makers today regarding educational issues will directly impact the bifurcations of wealth and income of future retirees. These differences will increase the degree of exposure to the college educated who have the greatest percentage of quasi-liquid retirement accounts as well as those that are in higher income classifications who also tend to allocate a higher portion of their assets in these accounts to equities. Thus, this group is more exposed to the severe market disturbances seen during the global credit crisis of 2008-2009.

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