Demographics of risky investing

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ABSTRACT

Using a unique data set that combines detailed demographic information from the Florida Department of Education's annual survey of school districts with investment information from the Florida State Board of Administration for 2008, this paper examines the risk preferences of plan participants. The regression analysis shows that women and Blacks invest more conservatively than men and Whites, respectively. The analysis also reveals the different paths that investors have taken to portfolio allocations and the expected impact on their retirement assets.

Keywords: pension, risk preference, investing, portfolio theory, demographics

INTRODUCTION

This paper addresses the investment choices across demographic groups in a defined contribution plan. As more retirement assets move from defined benefit to defined contribution plans, the need for financial education is growing. Participants, now, more than ever, must take an increased role in their retirement planning. They should have the education to be able to choose the most efficient portfolio given their risk and return requirements. Prior literature, however, shows that women and certain minority groups tend to invest more conservatively than their male and White counterparts (Bajtelsmit & Bernasek, 1996; Chiteji & Stafford, 1999). A greater understanding of the roles of race and gender will help plan sponsors target education and research to help ensure that participants are investing appropriately.

This paper seeks to understand the choices of certain demographic characteristics in investment choice. Using regression analysis to evaluate investment allocations at a point in time, the roles of gender, race, education, employment and financial standing are examined with respect to risk/return preferences that have been revealed through investment choices. The research is conducted using a unique data set that combines investment choice information from the Florida Retirement System's (FRS) defined contribution plan with demographic information gathered from the Florida Department of Education's (FLDOE) annual surveys of school districts for the state of Florida. The FLDOE survey provides detailed, individual level demographic data on an annual basis, while the FRS data set provides a history of defined contribution plan investments. The combination of these two data sets creates a unique set of data that provides actual financial holdings at the individual level along with a variety of demographic and control variables.

LITERATURE REVIEW

The roles of gender and education on investment preferences have been the focus of recent literature. The goal has been to identify what demographic factors affect participants' investment choices with regard to risk. While there is limited work that includes race as a contributing factor, there is evidence that suggests that it also plays a role and should be explored further. Grable and Lytton (1999) examine whether demographic factors would be good predictors of financial tolerance based on a university survey from 1997 that includes both faculty and staff. Grable and Lytton highlight the role of financial education in determining risk taking, with the more financially educated participants more likely to take risk (Grable & Lytton, 1999). Bajtelsmit and Bernasek summarize the literature that explored risk taking differences between men and women, attempting to reach a consensus on why women invest differently. They find that the literature supports the argument, both through experiments and field data, that women make more conservative decisions than men and that they make more conservative decisions with respect to investments (Bajtelsmit & Bernasek, 1996). Hinz, McCarthy and Turner find that the female effect persists after demographic controls showing that men are more likely to invest in risky assets (Hinz, McCarthy, & Turner, 1997). Agnew notes that human capital can and should play a role in investment decisions, especially when considering company stock as an option (Agnew, 2003). Not only is the level of human capital important for investment decisions, but also the correlation. Fortunately, company stock is not an option for FRS participants, so correlation issues between the expected returns and expected income should

be minimal. The difference in investment preference across genders has received much attention. The responsibility for the difference has been placed on both men and women by the research. Most of the research reports that women invest more conservatively than men (Bajtelsmit & VanDerhei, 1997; Croson & Gneezy, 2009). But the reasons for the differences are more diverse. Barber and Odean look at the overconfidence of men in trading patterns as the explanation for the phenomena (Barber & Odean, 1999). The potential for overconfidence in the valuation of securities may push men to choose riskier strategies or make them more likely to rebalance away from default investments.

On the other side of the gender argument, Croson and Gneezy summarize the research covering gender differences in investments and argue that it is women's level of risk aversion that pushes them to choose the less risky portfolios (Croson & Gneezy, 2009). Using 401(k) investment data and a limited set of demographics, Agnew studies the role of gender and age in participant investment decisions. The study finds that men are more likely to own a higher percentage of company stock, generally considered a riskier strategy because of the lack of diversification with wage variability (Agnew, 2003). Papke examines investment choices using the 1992 NLS of Mature Women showing that there is not a significant gender effect on the choice of stock allocation (Papke, 1998). Studies based on the Survey of Consumer Finances (SCF) report that a larger percentage of women are not willing to accept any financial risk at all. Sunden and Surette (1998), using the SCF data from 1992 and 1995, study gender differences in investment allocation decisions, while controlling for household assets, marital status and a risk aversion measure, and find that single men are more likely than single and married women to choose mostly stocks (Sunden & Surette, 1998). Gender differences in allocation decisions are explored further in a series of papers by Lusardi and Mitchell. Using the 2004 HRS, they study the responses of men and women to gauge the relationship between financial literacy and preparedness. Their study shows that women are less likely than men to be able to answer financial knowledge questions correctly and that the ability to answer those questions is correlated with a propensity to plan for retirement. The survey also shows that there are racial differences in financial education, with Blacks and Hispanics less able to answer the financial education questions (Lusardi & Mitchell, 2007A, 2007B, 2007C). In another paper, Mitchell, Mottola, Utkus and Yamaguchi study the lack of attention that investors pay to their investments. They examine, by demographic characteristics, what groups are more or less likely to rebalance their portfolios. They find that most participants are inattentive in the oversight of their accounts and that men are more likely to trade (Mitchell, Mottola, Utkus, & Yamaguchi, 2006). It opens the question, however, of whether it is simple inertia or a lack of knowledge about the benefits of rebalancing that causes individuals to avoid rebalancing.

Blau and Graham study the accumulated wealth differences across race. They find that measurable characteristics, including income, left more than 75% of the difference unexplained when comparing single and married Blacks to single and married Whites. Blau and Graham speculated that the difference may be best explained by intergenerational transfers, and the uncertainty of income (Blau & Graham, 1990). Hurst, Luoh and Stafford study asset ownership by race and show several important differences between African Americans and all others. First, accounting for income and age, African Americans are less likely to hold a transactions account (checking or savings) and they are less likely to hold stock. Using probit analysis on the Michigan Panel Study of Income Dynamics (PSID) for 1984, 1989 and 1994, they show that African Americans are 19.3% less likely to own stock, controlling for marriage, family size, income, age, gender and years of education (Hurst, Luoh, & Stafford, 1998). Hurst et al.'s

analysis supports the argument that Blacks have been less financially involved and have tended to take less financial risk.

Chiteji and Stafford examine the inter-generational effects of stock allocation and find that parents that hold stocks are more likely to have children that hold stocks as young adults. This effect diminishes the effects attributed to race, as fewer Black parents held stock than non-Black parents (Chiteji & Stafford, 1999). Gittleman and Wolff report that both higher incomes and higher inheritances contribute to the gap in wealth accumulation between races (Gittleman & Wolff, 2004).

BACKGROUND AND DATA

The Florida Department of Education (FLDOE) data set is based on an annual survey that the FLDOE collects from school districts regarding their employees. This data set provides detailed demographic information on the FLDOE employees as of September 2008. The FLDOE conducts an annual survey of all school districts and maintains a database to provide both student and teacher/employee information for a variety of users. The information includes race[1], gender, income, school, district, location, experience, education, date of birth (DOB) and job code.

The Florida Retirement System (FRS) data set contains the investment choice data for the defined contribution plan participants. The defined contribution plan allows participants to manage their retirement assets individually. The employer (school district, government agency, etc.) pays a fixed percentage of salary (currently 9% for most participants) into an account, which is then invested by the employee. Participants, therefore, do not choose how much to invest, but rather only choose which funds to invest in. Unlike a defined benefit plan, the participants assume all the risk and return of their investments. The plan currently offers 20 investment choices to choose from, ranging from money markets and balanced funds through actively traded domestic and foreign equity funds. Most major asset classes are covered with multiple choices in several classes. Plan participants are defaulted into a moderate balanced fund (State Board of Administration, 2008C). This fund consists of a diversified and managed allocation to several of the funds already available to participants. According to plan documentation and the financial planning information available to the employees, this fund provides the level of risk appropriate for the average investor. There are two other balanced funds made available to the participants, a conservative balanced fund and an aggressive balanced fund. The purpose of those funds is to provide low cost managed diversification to participants dependent upon risk aversion. Participants are provided with an online trading platform, online and print educational documents and telephone access to advisors to assist them in making their decisions (State Board of Administration, 2009).

Contribution allocations are used to determine participants' investments in each period. Using the allocations, instead of a market valuation of holdings, prevents an apparent reallocation due to allocation drift within a participant's portfolio caused by market movements. The contributions reflect risk preference changes when a participant changes their allocations

[1] The racial definitions used by the FLDOE survey are: *White* – White, Non-Hispanic: Persons having origins in any of the original peoples of Europe, North Africa of the Middle East; *Black* – Black, Non-Hispanic: Persons having origins in any of the Black racial groups of Africa; *Hispanic* – Hispanic: Persons of Mexican, Puerto Rican, Cuban, Central and South American or other Spanish culture or origin, regardless of race.

rather than when the market is changing their allocations. The quarterly contribution allocations are based on the 3 month period of actual contributions in July, August and September 2008.

The major benefit of using these data sets is the overlap of individuals that are in both the FLDOE set and the FRS defined contribution plan. While the matched data set limits the number of participants and creates a potential selection bias, it adds key variables to the financial information. The matched data set limits the number of participants to a subset of approximately 34,000 participants, as of 3rd quarter 2008, out of over 350,000 employees that responded to the survey.

There are a few caveats for this data set. First, as discussed above, the dataset with the full demographic set of variables will be a subset of the defined contribution plan population. Therefore, the subset may not necessarily be representative of the total FRS or FLDOE populations. The FLDOE employees may not be representative of the larger population of state workers and defined contribution plan participants may not be representative of all FRS employees. Further, the individuals that are included have made a few key choices that should be acknowledged. The participants have chosen a public employer over a private one and have chosen to enter the defined contribution plan over the defined benefit plan.

Second, the data set lacks information on marital status, family size and outside financial information. Based on previous literature, marital status is shown to have mixed effects on an individual's investment preferences. Hinz, McCarthy and Turner show that married individuals take less risk, and that both married men and married women take less risk than their unmarried counterparts (Hinz, McCarthy, & Turner, 1997). Sunden and Surette, however, show that marriage may not have an effect unless interacted with gender, and that married women are more likely than single women to hold riskier portfolios (Sunden & Surette, 1998). Including outside investments and marital status would add value to the study and would aid in understanding where the defined contribution plan investments fit within a household's overall financial situation. Unfortunately, that information is not available for these participants at this time. Despite those short comings, the data that is available still provides an increased understanding of the contributing factors that influence an individual's investment preferences and help affirm and dispel previously theorized relationships between risk, race, gender and education.

MEASURING RISK

Taking advantage of the level of detail found in the FRS data set, the following risk/return measures variables are used:

- Expected portfolio standard deviation – based on 5-year fund performance.
- Asset allocation – percentage allocation to risky asset classes (US Stock plus Foreign Stock).
- Expected portfolio return – based on 5-year fund performance.
- Investment choice – percentage allocation to Moderate Balanced Fund (MBF).

Expected portfolio standard deviation measures the actual level of risk that participants expect to take in a given period, based upon prior results. The risk/return optimization prescribed by Markowitz was based on the use of expected portfolio standard deviation (Markowitz, 1959). Similarly, expected portfolio return measures the actual expected return based on prior results. Using both of those measures as risk/return measures for participants provides more detail into

how they choose their portfolios because it accounts for the benefits of portfolio diversification. Examining those results in combination with asset allocation and the investment choice variables provides a clear view into how participants make decisions and allocated their portfolios. Expected portfolio standard deviation and return are calculated based on the contribution allocation histories and historical fund performance.

Expected portfolio standard deviation is calculated for each participant based on five-year monthly fund returns. The expected portfolio standard deviations are annualized for scale purposes and to make them more comparable to other studies. This measure may provide a greater understanding of the level of risk that a participant takes than asset allocations, as it accounts for the correlations and diversification benefits of the investments. As with the expected portfolio standard deviations, the expected portfolio returns are based on five-year monthly returns and are annualized to make interpretation and comparison easier.

The asset allocations are based on the allocation of holdings within the funds themselves at each point in time. Each fund's asset class allocation is known for each point in time: Cash (money market), US Equity, Debt, Foreign Equity and Other. For each participant, the asset allocations were determined by weighting the individual funds' asset allocations and summing across funds. The portfolio asset allocation for US Equity would therefore be,

$$A_{i,US} = \sum_{k=1}^{N} w_{ki} a_{k,US}$$

where $A_{i,US}$ is the asset class allocation of participant i for asset class US Equity, w_{ki} is the participant's allocation to fund k, $a_{k,US}$ is the US Equity allocation of fund k and N is the number of funds available for investment. The participant asset class allocations are calculated based on the breakdown of asset class allocations provided by each fund on a quarterly basis. The asset allocation analysis focuses on participants' risky asset allocation, which is defined as the allocation to the US Equity and Foreign Equity asset classes, combined.

Finally, the allocation to the default investment, the Moderate Balanced Fund, is included. This dependent variable is based directly on the contribution allocations to the particular fund and required no calculation or manipulation. The Moderate Balanced Fund (MBF) is a managed fund comprising of other available funds with the goal of providing a diversified investment vehicle at an "average" level of risk, it acts as the default investment. The variety of available risk/return measures allows for more depth in forming conclusions for participant behavior as differing measures of risk and return can reveal more information about investing preference and have different properties relative to the market over time.

SUMMARY STATISTICS

Table 1 (Appendix) shows the summary statistics for the FRS dataset. The notable exception between the full FRS set of participants and the FLDOE participants is the percentage of male participants. Men account for 37.70% of defined contribution plan participants, while only 25.73% of FLDOE defined contribution plan participants are male. This is important when considering the application of results based on the FLDOE participants to the broader defined contribution plan population. Unfortunately, the data does not allow comparisons of race and education between the broader defined contribution plan population and the FLDOE subset. This difference, however, suggests that the conclusions drawn from the subset may not be applicable

to the full FRS defined contribution population. The difference in profiles between the FLDOE participants and other defined contribution plan participants is likely driven by the selection into the FLDOE. This was not unexpected as the types of jobs present in the FRS vary greatly and the majority of the jobs in the FLDOE (e.g., teaching positions, administrators and support personnel) are a specialized subset of those jobs. Other differences to note are that the FLDOE subset is slightly older (1.2 years) with less experience (6.8 months).

Table 2 (Appendix) shows the racial, educational, and employment status breakdowns for the FLDOE subset. With respect to education, 38.3% of the defined contribution plan participants are listed as "Not Applicable", this occurs when the participant's job does not require that education be collected, as in janitorial services, certain support staff and others (Florida Department of Education, 2009). The racial breakdown is reflective of the racial profile of Florida. There is a concentration of education at the Bachelors, Masters and Not Applicable levels. This is due to the job requirements found in the Department of Education, with the majority of the employees being teachers. The Not Applicable category represents the employees where education is not collected based on job type, this is found for many support roles (maintenance workers, bus drivers, etc.).

As the focus of the paper is on both gender and racial differences in investment preferences, it is important to look at the differences in summary statistics across both as highlighted in Table 3 (Appendix). Men have a larger portfolio value, and higher salaries, but are also older with more months of service. Controlling for these differences is critical to properly evaluating the difference in risk preferences.

Table 4 (Appendix) highlights the differences in demographic means across races. A notable difference is the difference in portfolio value between Blacks and the other races. This is largely driven by the structural relationship between service and portfolio value. As discussed earlier, contributions are made by employers as a fixed percentage of income. So, longer service would dictate a greater portfolio value on average. Whites have a higher than average occurrence of both bachelors and masters degrees, while having a lower than average occurrence of positions where education is Not Applicable. The summary statistics begin to shed some light on some of the differences that previous literature suggested. Evidence in the literature suggests that Blacks and Hispanics may invest more conservatively, based on their responses to financial education questions (Croson & Gneezy, 2009). Table 4 (Appendix) suggests a higher level of risk aversion through the length of service credit for Blacks. With a service credit that is 60% higher than the average of the other FLDOE defined contribution plan participants (other's average 59.6). The tendency towards staying with an employer longer, rather than switching jobs, implies an inclination towards more risk-averse decisions when it comes to work and retirement.

Also of importance are the risk and job characteristics of the participants. Grades A through F represent the grade that the school that the participant is affiliated with received in its annual evaluation in 2008. "No Grade" implies that the school was not graded. "% Free and Reduced Lunch" is the average percent of students eligible for the free and reduced lunch program by teachers of a particular race. The remaining characteristics define the distribution of job roles as defined by the FLDOE (Florida Department of Education, 2009). Fewer Blacks teach in "A" rated schools and are more likely to hold support positions than the other races. With "A" rated schools less likely to implode than "D" and "F" rated schools and support positions less likely to have tenure than teaching positions, it is reasonable to believe that Blacks, on average, have less secure employment, although to say this with confidence would require a thorough

analysis. These characteristics are included in the regression analysis of to help control for the potential effects of job security.

Table 5 (Appendix) summarizes the risk/return means by gender and race. The means show slight differences between genders and races for the risk/return characteristics. Men have slightly larger expected standard deviation, return and risky asset allocation. Women have larger investments in the Moderate Balance Fund and are more likely to have only invested in the Fund. Blacks have a lower expected standard deviation than Whites. However, they hold smaller portions of the Moderate Balanced Fund and are less likely to have only invested in the Fund. The regression analysis explores if these differences are significant once the financial and other demographic characteristics are included.

EMPIRICAL RESULTS

Regression analysis is used to control for key factors that may affect a participant's risk preferences. The general structure of the model is,

$$r_i = f\left(financials_i, demographics_i, employment_i, school_i, e_i\right)$$

where r is an appropriate risk/return measure, financials is a vector of financially based characteristics (salary, portfolio value, accumulated benefit obligation (ABO)), demographics is a vector of demographic characteristics (race, education, age, gender), employment is a vector of job specific characteristics (months of service, current job status, job type), school is a vector of school specific characteristics (school grade, stability, % free and reduced lunch) and e is the error term.

When using the regression analysis, multiple specifications are used to allow for potential non-linearity within several of the variables, these include age, service, income and portfolio value. The varying specifications allow for a variety of relationships between the dependent and independent variables. Each risk/return measure used has 3 regression specifications:

Regression Specification 1: Race and Gender variables
Regression Specification 2: Race and Gender interactions
Regression Specification 3: Race and Gender interactions and District fixed effects

The expected standard deviation and expected return measures will utilize an OLS framework with linear independent variables as follows:

$$r_i = \alpha + \beta_1 financials_i + \beta_2 demographics_i + \beta_3 employment_i + \beta_4 school_i + e_i$$

Table 6 (Appendix) shows a summary of the regression results including the standard errors using expected portfolio standard deviation as the measure of risk. Restricting the RHS variables to linear relationships[2], men have a .0042 greater standard deviation than women. Recalling the mean standard deviation for the sample, .0766, this would represent and 5.5% increase, all else equal. When comparing race, Blacks take significantly less risk than Whites, a .0047 decrease in standard deviation represents 6.1% less than Whites. The other races showed mixed results, with none of the occurrences significant at the 95% level.

[2] The results for Asian/Pacific Islander and American Indian have been suppressed because of the small sample size, as well as the coefficients for the control variables.

When allowing for race/gender interaction in Table 7 (Appendix), the results were consistent and showed a compounding effect with respect to women and Blacks. Black women, for example, have 12.6% less standard deviation than White men, while White women have 5.8% less standard deviation and Black men have 5.1% less standard deviation when the district fixed effects were not included. The differences were slightly higher, in general, when the district fixed effects are included. Women across all race categories exhibited more risk aversion.

Tables 6 and 7 (Appendix) also use expected portfolio returns to measure the expected effect of the risk choice. The results reflect the modern portfolio theory that higher expected risk should lead to higher expected return. Participants that took more risk should expect to be rewarded with greater returns. Using expected returns as the risk/return measure, men would expect a 0.19 percentage point higher return than women, which amounts to 2.9% greater returns than women on average, based on an average expected return of 6.72%. Blacks should expect 0.16 percentage point lower return than Whites or a 2.4% smaller return.

Allowing for the race/gender interactions, the expected results continue to hold. Black men and White women give up 0.14 and 0.20 percentage points respectively, while Black women give up the most at 0.38 percentage points or 5.7% of the average return. While including the district fixed effects, the differences increase, in general. Overall, the estimations provide a range of returns relative to White men of between 5.27% and 5.97% less for Black women.

Risky asset allocation and Moderate Balanced Fund (MBF) allocation are also used for risk/return measures. In contrast to the standard deviation and return measures, participants are likely to invest on the corners of the available range of [0,1]. To acknowledge the potential censoring of the investments, a censored Tobit model is used. Using 0 as a lower limit and 1 as an upper limit, the following model will be estimated for risky and MBF asset allocations:

$$r_i^* = \alpha + \beta_1 financials_i + \beta_2 demographics_i + \beta_3 employment_i + \beta_4 school_i + e_i$$

$$r_i = \begin{cases} 0 \text{ if } r_i^* < 0 \\ 1 \text{ if } r_i^* > 1 \end{cases}$$

where r_i^* is the latent (unobserved) risk preference and r_i is the observed risk preference. This construct allows for a large portion of participants at the corners, rather than imposing a linear relationship throughout.

The results for the regressions based on the MBF are included in Tables 8 and 9 (Appendix). This fund acts as the default investment, and is the most highly subscribed to of all of the funds. Participants are placed into this fund at a 100% allocation when they choose the defined contribution plan and must switch their allocation if they want to invest in other funds. Both the level of allocation and a binary on whether or not a participant maintains a 100% allocation to the fund are important in gauging risk tolerance and financial participation. When examining the results of the independent variables on the level of MBF investment, males hold a lower percentage of the balanced fund than females, while Hispanics hold less than Whites. When restricting to a linear relationship and no race/gender interaction, males hold 47.1% less MBF than women. While the male effect holds when allowing for non-linear variable relationships, the Hispanic effect disappears, except when district effects are also included. When allowing for race/gender interactions, the female racial groups invest similarly, holding approximately 50% more, dependant on specification and use of district fixed effects. Without district fixed effects,

Hispanic and Black men invest similarly to White men, while with district fixed effects they appear to hold approximately 3.5% more moderate balanced fund. With the large percentage of censored participants, it is important to use the Tobit framework instead of an OLS framework, as the magnitude of the effects can be quite different.

In order to make this study comparable to survey based research, broadly defined asset allocations are also used. Using risky assets as a left-hand side variable will allow comparison to Survey of Consumer Finance (SCF) based research, which compares the use of stocks, or risky assets, with that of bonds, or non-risky assets. This measure fails to account for the magnitude of risk in each asset class and will not reflect the within asset class changes over time, but does reflect a common investor sentiment on the relative riskiness of the differing asset classes. As described above, risky assets is defined as the total allocation to US and foreign stocks, with bonds, cash and other (mostly TIPS) making up the remainder. As would be expected based on the previous literature, men hold significantly more risky assets than women, while Blacks hold significantly less than Whites. As shown in Table 9 (Appendix), when allowing for non-linear relationships and race/gender interactions, Black men hold 3.14% less risky assets than White men, while White women hold 3.7% less risky assets and Black women hold 8.37% less risky assets. This follows the trends set by the previous risk measures, it also reinforces the ability to use the broad measures of risk when more detailed ones are not available. The consistency of the significance, direction and relative size of the coefficients in these regressions relative to the ones using portfolio standard deviation builds confidence in the prior studies' ability to properly measure risk.

It is also of interest to look at investment choice between those participants that attempt to manage the investments individually and those that hold only the default investment. The MBF is used as the default investment and is the most subscribed to fund available to participants. Using a probit framework as follows,

$$r_i^* = \alpha + \beta_1 financials_i + \beta_2 demographics_i + \beta_3 employment_i + \beta_4 school_i + e_i$$

$$r_i = \begin{cases} 0 \text{ if } r_i^* < 1 \\ 1 \text{ if } r_i^* = 1 \end{cases}$$

where the latent variable r_i^* is the true desire to invest in the MBF. Clearly, the actual allocations are known, however participants may view the MBF option as a binary choice, where they either choose to allocate 100% to the funds or rebalance with other funds.

Tables 8 and 9 (Appendix) show the results from the probit analysis on MBF investment, reporting marginal effects. Men are 9.1% less likely than women to hold a 100% allocation to the MBF, while Blacks are 1.8% more likely than Whites in Specification 1. When allowing for the non-linear relationships and race/gender interactions, the results hold. Black men are 2.5% more likely, Black women are 11.3% more likely and White women 9.5% more likely than White men to hold a 100% allocation to the default investment. This continues to support the evidence from the prior results on risk preferences, and may begin to shed light on the underlying issue with the difference across races and gender. The results from Table 8 (Appendix) show that Black men and White women choose similar levels of risk, however, when comparing that to the results from Table 9 (Appendix), White women are 5-6% more likely to use only the Moderate Balanced Fund than Black men.

It is important to put into dollar terms the impact of this sort of investing over time to gauge its potential impact on retirement. Assuming a contribution rate of 9% on the average salary of approximately $34,000 for the period, participants would have $255 contributed monthly to the defined contribution account. If the expected return for White men is 7.7%, then the expected return for similarly positioned Black women would be 7.3% (94.5% of the 7.7%). Over a thirty year investment period, assuming wages do not increase in real terms, the White man would expect to have $357,676 while the Black woman would expect to have $328,610, a difference of $29,066 or 91.9% of the White man's expected wealth in today's dollars. These are the extreme cases for the results as the differences between the other participants (e.g., White women, Black men etc.) are expected to be smaller. In general, if real contributions are steady over time, the ratio of expected future values, G, is dependent on the number of periods, N, the expected rate of return of the base case, R, and the factor of difference, A, as follows:

$$G = \frac{\sum_{i=1}^{N}(1+AR)^{N-i}}{\sum_{i=1}^{N}(1+R)^{N-i}}$$

For Black men and White women, the expected difference was approximately 2.5%, or A equal to .975. Table 10 (Appendix) shows a grid of wealth factors, G, using a range of N from 60 to 420 and annual returns ranging from 1% to 12%. As is expected, the ratio decreases as both the expected returns and time period increase. For short investment horizons, the impact is minimal, but for longer periods with reasonable expected long-run returns, the differences can broach 5%. The impact is even greater if contributions cease, but the investment strategy remains, as new contributions are not available to dampen the compounding effect.

The effects of age in the analysis are summarized in Figure 1. When allowing age to have a non-linear relationship with risk, we see risk increase as workers reach peak earning years and then decline as they near retirement. It is both expected and rational for age to have this relationship with investment risk, as workers move from early career to mid career then gain stability and can afford more risk, then as they move in the latter stages of their working life they begin to reduce the risk level to prepare for retirement. It should be noted that the results are significantly different than zero only for age groups below 60.

Education, which is often unavailable in similar studies, sheds a little light on its role in risk preferences. Using "Not Applicable" degree as a baseline, participants with bachelors, masters, and specialist degrees have significantly higher standard deviation. Participants with associate degrees do not have significantly standard deviation. Participants with doctoral degrees have a larger coefficient than those with bachelors and masters degrees, however they are not significantly different than the baseline. It should also be acknowledged that the FLDOE employees are a relatively narrow group with respect to education and that perhaps studying a more diverse group would allow for greater distinction across educational attainment. As expected, the higher risk taking translates into a higher expected return for participants.

Turning to wealth and income, both portfolio value and salary have significant effects on the level of risk aversion. When restricted to a linear relationship, a larger portfolio value is associated with a lower level of standard deviation and a larger salary is associated with a higher level of standard deviation. When allowing for non-linear relationships in portfolio value, as shown in Figure 2, the level of standard deviation generally decreases with an increase in

portfolio value, with standard deviation diminishing at an accelerating rate as portfolio value increases. Salary follows a similar, but opposite pattern, with standard deviation increasing with an increase in salary. This supports the idea of balancing human capital risk with investment risk. For example, for two participants whose only difference is salary, the participant with the larger salary would have a larger human capital value and therefore the portfolio value would account for a smaller portion of overall wealth, and more risk could be taken.

CONCLUSION

This paper provides estimation results and discussion that support the initial hypotheses regarding the roles of race/gender in investment preferences. Using multiple specifications and leveraging multiple risk/return measures, the evidence pointed to significant effects with respect to both race and gender. Estimations using direct measures for standard deviation and return yielded a decrease in expected standard deviation of approximately 5% – 6% for Black men from White men and a corresponding decrease in expected return of 2% - 2.4%, relative to the average. Women, in general, were shown to take less risk than men, in general, with a 5.5% decrease in expected risk, and a corresponding decrease in expected return of 2.9%. The largest difference occurred in Black women, however. They had a decrease in expected risk of 12.6% with a corresponding decrease in expected returns of approximately 5.5%.

While the results based on standard deviation and return may be subject to market movements, the allocation to the Moderate Balanced Fund (MBF) is not. The estimations using the MBF show a strong inclination for women to use the MBF, while race shows fewer differences. When combining that information with the results using the risky asset allocation, in which race and gender are both factors, their roles become more apparent. The role of gender appears to be one of financial participation. All of the participants are defaulted into the MBF once they choose to participate in the defined contribution plan, so reallocation will depend on both the desire to actively choose investments and the risk/return objectives. The evidence provided by the MBF regressions indicate that women are more likely than men to not reallocate their portfolios, opting for a larger portion of the default investment, while Blacks are not significantly less likely to reallocate than Whites.

Despite similar risk/return coefficients when using expected standard deviation and expected return, Black men and White women achieve their risk aversion through different means. Black men appear to actively choose their level of risk, participating in the decision making process and simply opting for a more conservative portfolio. This is supported by their lower expected standard deviation, expected return, and risky asset allocation, but statistically equivalent allocation to the default investment relative to white men. Women, however, seem to default into a more conservative portfolio, rather than actively choose it. This is supported by risk/return characteristics quite similar to Black men, except for the allocation to the MBF, which is significantly higher. The higher allocation suggests that women may be opting out of the reallocation process at a higher rate and may not be actively choosing their risk level. The MBF has a lower expected standard deviation and lower expected return than the average portfolio, both inclusive and exclusive of participants that have the MBF.

The differences in approaches to investing have strong implications for how to address the financial education of participants going forward. The scope of this paper is not to judge what the appropriate portfolios are for participants and whether one group is investing “better” than another group, however, it is important to highlight the investing differences between the

demographic groups so that education can be targeted properly. The evidence suggests that men, both Black and White, take an active role in their portfolio allocations, with White men choosing riskier portfolios. Providing men, for example, with financial guidance on the implications of their chosen risk level and helping them understand all of the risks that should be taken into consideration when making those decisions will assist in determining if they have chosen the appropriate risk level for their situation. Women, however, may need assistance with the reallocation process and the benefits of it in general. While there is no way of stating with certainty that the women in the sample have not actively chosen to remain in the MBF as part of their reallocation process, it appears that there is a tendency among the women to not reallocate. Targeted education, for example, may focus on ensuring women understand the reallocation process and feel comfortable making those decisions before the focus can be placed on the appropriate risk/return level.

The analysis provides evidence that gender and race play a role in investment preferences, and while the scope of the paper was not to identify the root cause of differences, the end results are clear. Over a participant's working and contributing life, the investment differences can make significant and substantial differences in retirement wealth. The question still remains whether the differences are justifiable by still unmeasured job or other wealth risk, or if the differences are simply driven by differences in financial education/expectations. For example, the relationship between race and unobserved variables is a potential cause of the difference in risk preferences. Future research may seek to identify more information regarding outside wealth/risks, spousal information/marital status and household size. Adding these controls may attribute the apparent gender/racial differences to other measurable factors.

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APPENDIX

Table 1: Comparison of All DC Members to FLDOE Subset

	All Defined Contribution Plan Members (N = 118463)	FLDOE Subset (N = 34409)
Male	37.70%	25.73%
Age (years)	43.5	44.7
Service (months)	72.4	65.6
Income	$34,020	$35,721

Table 2: FLDOE Subset Summary Statistics (N = 34409)

Race	
White	74.18%
Black	14.57%
Hispanic	9.68%
Asian/Pacific Islander	1.37%
American Indian	0.20%
Education	
Associates	0.08%
Bachelors	36. 01%
Masters	22.96%
Doctorate	1.19%
Specialist	1.42%
Not Applicable	38.33%
Work Status	
Regular Full-Time	93.43%
Regular Part-Time	3.70%
Temporary Full-Time	0.40%
Temporary Part-Time	2.50%

Table 3: FLDOE Subset Summary Statistics by Gender (N = 34409)

	Male	Female
Portfolio Value	$26,451	$18,693
Service (months)	67.6	63.9
Age (years)	48.2	43.6
Salary	$37,953	$34,150
Race		
White	73.30%	74.70%
Black	15.80%	14.20%
Hispanic	9.30%	9.70%
Asian Pacific Islander	1.40%	1.40%
American Indian	0.30%	0.20%
Education		
Associates	0.10%	0.10%
Bachelors	32.40%	37.40%
Masters	20.90%	23.50%
Specialist	1.50%	1.40%
Doctorate	1.90%	1.00%
Not Applicable	43.20%	36.60%

Table 4: FLDOE Subset Summary Statistics by Race (N = 34409)

	White	Black	Hispanic
Male	25.4%	27.8%	25.1%
Portfolio Value	$17,956	$35,717	$20,174
Salary	$35,861	$33,855	$31,691
Service (months)	59.0	95.4	65.8
Age	44.6	46.1	44.5
Education and Job			
Associates	0.1%	0.2%	0.1%
Bachelors	39.1%	26.3%	29.3%
Masters	24.3%	18.9%	17.4%
Specialist	1.3%	1.8%	1.5%
Doctorate	1.2%	1.3%	1.1%
Not Applicable	34.0%	51.5%	50.6%
% Instructors	70.8%	53.4%	57.6%
% Administrators	2.4%	3.4%	1.5%
% Support	26.8%	43.3%	41.1%
School Variables			
% Free and Reduced Lunch	37.0%	42.3%	40.8%
Grade A	45.6%	23.0%	40.6%
Grade B	15.1%	11.0%	14.1%
Grade C	13.2%	20.2%	14.7%
Grade D	4.4%	9.7%	5.5%
Grade F	0.6%	2.7%	0.8%
No Grade	21.1%	33.4%	24.2%

Table 5: Risk/Return measures by race and gender (N = 34409)

	Expect Portfolio Standard Deviation	Expected Portfolio Return	% Risky Allocation	% Moderate Balanced Fund Allocation	% Only Moderate Balanced Fund
Female	7.6%	6.7%	56.4%	54.2%	47.7%
Male	7.8%	6.8%	58.2%	46.2%	39.8%
Race					
White	7.8%	6.7%	57.5%	53.2%	46.5%
Black	7.3%	6.6%	53.5%	47.8%	42.0%
Hispanic	7.7%	6.8%	56.9%	50.9%	45.2%
Asian/PI	7.8%	6.8%	58.1%	49.8%	43.2%
Am. Indian	7.8%	6.8%	57.9%	50.5%	40.0%
Average	7.7%	6.7%	56.9%	52.1%	45.7%

Table 6: Risk Preferences (OLS) - Specification 1 (N = 34409)

Characteristic	Expected Standard Deviation	Expected Return
Male	0.0043	0.0019
	(0.0003)	*(0.0001)*
Black	-0.0047	-0.0016
	(0.0004)	*(0.0002)*
Hispanic	-0.0003	0.0003
	(0.0004)	*(0.0002)*

Table 7: Risk Preferences (OLS) – Regression Specifications 2 and 3 (N = 34409)

Characteristic	Risk/Return Measure			
	Expected Standard Deviation		Expected Return	
	Spec. 2	Spec. 3	Spec. 2	Spec. 3
Black Male	-0.0039	-0.0043	-0.0014	-0.0017
	(0.0007)	*(0.0007)*	*(0.0003)*	*(0.0003)*
Hispanic Male	-0.0013	-0.0015	-0.0014	-0.0017
	(0.0009)	*(0.0009)*	*(0.0003)*	*(0.0003)*
White Female	-0.0044	-0.0043	-0.0020	-0.0020
	(0.0004)	*(0.0004)*	*(0.0002)*	*(0.0002)*
Black Female	-0.0096	-0.0099	-0.0038	-0.0040
	(0.0005)	*(0.0005)*	*(0.0002)*	*(0.0003)*
Hispanic Female	-0.0050	-0.0052	-0.0019	-0.0021
	(0.0006)	*(0.0006)*	*(0.0003)*	*(0.0003)*

Table 8: Risk Preferences (probit and Tobit) - Specification 1 (N = 34409)

Characteristic	MBF Allocation (Tobit)	Risky Asset Allocation (Tobit)	100% MBF Allocation (probit)
Male	-0.471	0.036	-0.091
	(0.033)	*(0.003)*	*(0.007)*
Black	0.069	-0.041	0.018
	(0.042)	*(0.004)*	*(0.009)*
Hispanic	-0.092	-0.002	-0.010
	(0.048)	*(0.004)*	*(0.010)*

Table 9: Risk Preferences (probit and Tobit) – Specifications 2 and 3 (N = 34409)

Characteristic	Risk/Return Measure					
	MBF Allocation (Tobit)		Risky Asset Allocation (Tobit)		MBF Only (probit)	
	Spec. 2	Spec. 3	Spec. 2	Spec. 3	Spec. 2	Spec. 3
Black Male	0.079	0.170	-0.031	-0.035	0.026	0.042
	(0.077)	*(0.078)*	*(0.007)*	*(0.008)*	*(0.016)*	*(0.017)*
Hispanic Male	0.039	0.172	-0.012	-0.015	0.018	0.046
	(0.095)	*(0.096)*	*(0.008)*	*(0.008)*	*(0.020)*	*(0.020)*
White Female	0.467	0.459	-0.037	-0.036	0.095	0.094
	(0.038)	*(0.038)*	*(0.003)*	*(0.003)*	*(0.008)*	*(0.008)*
Black Female	0.528	0.605	-0.084	-0.087	0.113	0.127
	(0.055)	*(0.057)*	*(0.005)*	*(0.005)*	*(0.011)*	*(0.012)*
Hispanic Female	0.379	0.479	-0.042	-0.045	0.088	0.109
	(0.062)	*(0.064)*	*(0.005)*	*(0.006)*	*(0.013)*	*(0.013)*

Table 10: Grid of future value ratios by rates and period, A = .975.

Rates of Return	Periods						
	60	120	180	240	300	360	420
1%	99.9%	99.9%	99.8%	99.7%	99.7%	99.6%	99.5%
2%	99.9%	99.7%	99.6%	99.5%	99.3%	99.2%	99.0%
3%	99.8%	99.6%	99.4%	99.2%	99.0%	98.7%	98.5%
4%	99.7%	99.5%	99.2%	98.9%	98.6%	98.2%	97.9%
5%	99.7%	99.3%	99.0%	98.6%	98.2%	97.7%	97.3%
6%	99.6%	99.2%	98.7%	98.2%	97.7%	97.2%	96.6%
7%	99.5%	99.0%	98.5%	97.9%	97.3%	96.6%	95.9%
8%	99.5%	98.9%	98.2%	97.6%	96.8%	96.0%	95.2%
9%	99.4%	98.7%	98.0%	97.2%	96.3%	95.4%	94.5%
10%	99.3%	98.6%	97.7%	96.8%	95.8%	94.8%	93.8%
11%	99.3%	98.4%	97.5%	96.4%	95.3%	94.2%	93.0%
12%	99.2%	98.3%	97.2%	96.0%	94.8%	93.6%	92.3%

Figure 1: Impact of Age on Standard Deviation

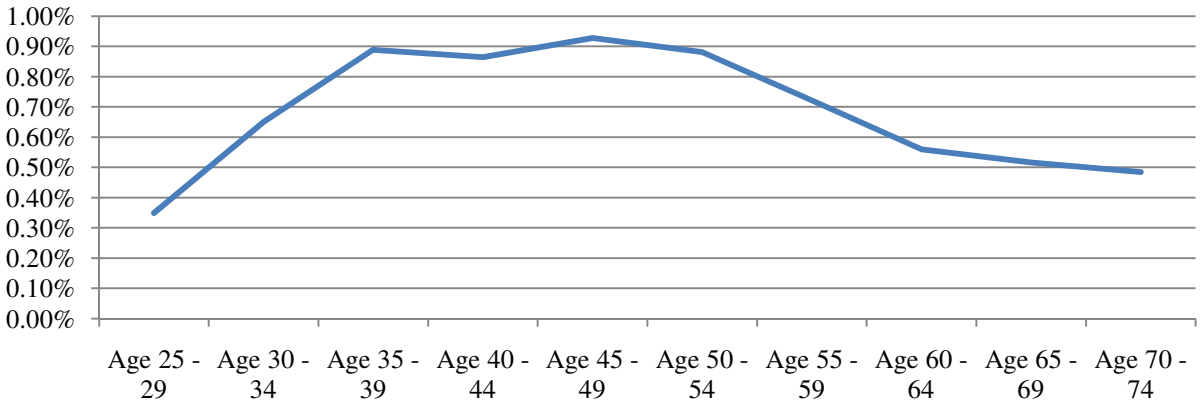

Figure 2: Impact of Portfolio Value on Expected Standard Deviation