THE CHANGES AND CONTRIBUTORS TO THE PERCEPTION OF RETIREMENT INCOME ADEQUACY

A Dissertation
Submitted to
The Temple University Graduate Board

In Partial Fulfillment
of the Requirements for the Degree
DOCTOR OF BUSINESS ADMINISTRATION

---

by
Helen T. Huynh
Diploma Date May 2019

Examining Committee Members:

Martin F. Grace, Ph.D, Advisory Chair, Risk, Insurance, and Healthcare Management
Jackie Volkman-Wise, Ph.D., Risk, Insurance, and Healthcare Management
Conrad S. Ciccotello, Ph.D., Finance, University of Denver
Amir Shoham, Ph.D., External Member, Finance, Temple University

---

ABSTRACT

This study examines the contributing factors that influence the variation in the perception of retirement income adequacy, analyzing U.S. households who are in the nearing retirement stage (age 55-64) in 2007 along with U.S. households who are in the first stage of retirement (age 65-74) in 2016, within the Survey of Consumer Finances. This study performs pair-matching or one-to-one propensity score matching of the cohort nearing retirement in the 2007 SCF dataset with those of the first stage of retirement in the 2016 SCF dataset who share a similar value of the propensity score. Statistically, these are the same households nine years later. Results show that of those households in the near retirement stage, 55.80 percent perceive their retirement to be adequate, while 72.20 percent of those in the first stage of retirement perceive their retirement income to be adequate. This study examined the effect of sociodemographic characteristic, human capital, financial capital, and financial attitude predictors on the perceived adequacy of retirement income. Probit analysis showed retired (first stage of retirement) respondents who were married, white, headed by male, college educated, had sufficient net worth and income, were homeowners, in good health, had saved, took financial risks, had a long-term financial planning horizon, received or expected to receive an inheritance had a defined benefit pension plan, and/or owned a defined contribution plan were more likely to perceive their retirement income to be adequate than otherwise similar households.

Keywords: Retirement, Financial Planning, Perceived Income Adequacy

TABLE OF CONTENTS

Page

ABSTRACT ii

LIST OF TABLES iv

LIST OF FIGURES v

CHAPTER

1: INTRODUCTION 1

2: LITERATURE REVIEW 5

Life Cycle Saving Model 5

Definition of retirement income adequacy 5

3: METHODOLOGY 15

Data and sample 15

Dependent Variable: Perceived Adequacy of Retirement Income 16

Independent Variables 17

Analysis 20

Descriptive Statistics 21

Regression Results 28

Discussion 28

Implications 49

Implications for Pre-Retirees 49

Implications for Financial Educators, Counselors, and Planners 51

Implications for Policy Makers 52

4: CONCLUSION 53

REFERENCES CITED 60

LIST OF TABLES

Table 1: Sample Characteristics of Categorical Variables 23

Table 2: Sample Characteristics of Continuous Variables 25

Table 3: Probit Analysis of Determinants Affecting Perceived Adequacy of Retirement..26

LIST OF FIGURES

Figure 1: The National Retirement Risk Index 1983 – 2016... 8

Figure 2: Households' Subjective Assessment of Retirement Income Adequacy........... 13

Figure 3: Perceived Adequacy of Retirement Income, Matched Sample of Pre-Retirees in the 2007 SCF and Post-Retirees in the 2016 SCF 14

Figure 4: The Marginal Effect of Sociodemographic on Perceived Adequacy of Retirement Income in Pre and Post Retirement 29

Figure 5: The Marginal Effect of Human Capital on Perceived Adequacy of Retirement Income in Pre and Post Retirement 33

Figure 6: The Marginal Effect of Financial Capital on Perceived Adequacy of Retirement Income in Pre and Post Retirement 37

Figure 7: The Marginal Effect of Financial Attitudes on Perceived Adequacy of Retirement Income in Pre and Post Retirement 44

Figure 8: The Marginal Effect of Usual Saving Habits on Perceived Adequacy of Retirement Income in Pre and Post Retirement 46

CHAPTER 1: INTRODUCTION

Retirement adequacy is a pressing concern for U.S. households and policymakers as the population ages and as the nation experiences a massive wave of Americans entering retirement. Some 76 million Americans born between the years 1946 and 1964 (Baby Boomers) are retiring, translating to about 10,000 Baby Boomers retiring daily (Kessler, 2014). With improved life expectancy, current and future retiree households will experience more extended retirement periods than previous generations; hence one of the most important public policy problems we face is dealing with the possibility that retirees outlive their money. Many researchers are looking at this matter and offering mixed conclusions, some studies predicting that a large percentage of the population is at risk for significant hardship in retirement, while others providing a considerably more optimistic outlook.

Many studies on retirement adequacy use objective measurement and generally follow three main approaches: (1) income replacement ratios relative to a target, (2) wealth relative to the present value of future expenditures, and (3) success or failure rates based on personalized planning forecasts. For example, the Retirement Readiness Rating (RRR) study, VanDerhei (2012) finds that about 60 percent of the population will make it through retirement without running out of money, but with substantial differences in income. VanDerhei (2014a) estimates that only 16.8 percent of the lowest-income quartile and 52.6 percent of the second lowest quartile will not run out of money, whereas the success percentages for the top two income quartiles are 71.7 to 86.4 respectively. A study sponsored by Michigan Retirement Research Center, Hurd and Rohwedder (2012) find that 49.3 percent of singles and 76.8 percent of married persons have at least a 95 percent chance of dying with positive wealth, while those with lower education are worse. Furthermore, Hurd and Rohwedder (2015) find that 59 percent of singles and 81 percent of couples are economically prepared for retirement. The National Risk Retirement Index (NRRI), Munnell, Hou, and Sanzenbacher (2018) conclude that half of all households are at risk not having enough retirement income to retire at 65 and maintain their pre-retirement standard of living, based on the 2016 SCF data. The authors of Aon Hewitt Real Deal (2015) project that only 22 percent of employees will retire with sufficient resources, 35 percent of noncontributors and mid-careers hires will be significantly worse.

Meanwhile, for many Americans, the prospect of a comfortable retirement remains an elusive goal. A recent Gallup survey found that 64 percent of Americans saying that they are 'very worried' or 'moderately worried' about not having enough money for retirement (McCarthy, 2016). Since it began polling Americans regarding their financial concerns in 2001, Gallup notes that the top overall concern in each of those sixteen years is that majority of Americans have continually been worried about not being able to afford retirement, and recently concludes that many working Americans simply can't afford to retire (Saad, 2016). Many retirees and workers approaching retirement have limited financial resources. A Federal Reserve report on the economic well-being of U.S. households in 2015 found that 31 percent of non-retirees reportedly have no retirement savings or pension whatsoever (Board of Governors, 2016). According to U.S. Government Accounting Office (GAO) analysis of the 2013 Survey of Consumer Finances, about half of households age 55 and older have no retirement savings, such as in a 401(k) or IRA, and these households have few other resources, such as a defined benefit (DB) plan or nonretirement savings to draw on in retirement. For those households age 65 and older, Social Security remains the most significant component of household income in retirement, making up an average of 52 percent (GAO, 2015).

With findings like these studies and reports prompt some to warn of a "retirement crisis" and to caution that millions of Americans may be forced to muddle through their final years partially dependent on others for financial support and to accept a standard of living significantly below that which they had envisioned (Miller, Madland, & Weller, 2015). On similar sentiment, one of the key research findings in the 2015 National Institute on Retirement Security (NIRS) survey is an overwhelming majority of Americans believe there is a retirement crisis, some 86 percent agree that the nation faces a retirement crisis, and 57 percent strongly agree there is a crisis. Public and private sector workers are equally concerned about retirement, 87 and 88 percent respectively, even though public employees are far more likely to have reliable retirement income from a pension. Surprisingly, the sentiment is highest among those with annual incomes above $75,000, at 92 percent (Oakley & Kenneally, 2015).

In general, previous studies commonly use objective measurement in assessing retirement income adequacy, and several studies find that about half of U.S. households are in danger of not having enough money to maintain their standard of living in retirement. However, these objective measures can be criticized for not being able to capture the entirety of one's economic well-being as these measures do not reflect people's experience enough (Diener & Suh, 1997). Meanwhile, none of these studies have focused specifically on perceived adequacy of retirement income, a subjective measurement of households who are nearing retirement, from age 55-64 and in the first stage of retirement, from age 65-74. The 2016 SCF, as shown in Figure 2, demonstrates that people seem to be mostly happy with their retirement income, 73 percent of nearing retirement (pre-retiree) respondents, 80 percent of the first stage of retirement (retirees), and 71 percent of all respondents (from age 18 to 95) perceive their retirement income as adequate (Bricker et al., 2017).

To remedy the omission, this paper focuses specifically on perceived adequacy of retirement income of households who transition from “near retirement” to retirement using data from 2007 and 2016 Survey of Consumer Finances (SCF). This study aims to explain the determinants of perceived adequacy of retirement income by looking at a matched sample of pre-retirees and post-retirees to see what the determinants of post-retirement income adequacy are related to. Perceptions of adequacy are essential to study because it is an integral part of one’s economic well-being at any age and an especially important indicator for understanding the financial capability of older people. As Litwin and Sapir (2009) noted, information about perceived income adequacy is needed to help develop reliable measures of economic status.

This paper is organized as follows: a brief literature review on retirement adequacy, methodology, data and sample selection, findings, discussion of results followed by conclusion and implications.

CHAPTER 2: LITERATURE REVIEW

Life Cycle Saving Model

The standard model for analyzing retirement saving behaviors is the Life Cycle Saving (LCS) Model (Modigliani & Brumberg, 1954). The LCS Model posits that consumption and saving reflect an individual's stage in the life cycle, which is generally proxied by age. Under the LCS Model, assets are mainly accumulated during an individual's work life to finance consumption during retirement, which means that an individual will save while young and employed, then dissave when old and retired (Ando & Modigliani, 1963). According to the LCS Model, the consumption smoothing can be achieved by borrowing when earnings are low, saving for wealth accumulation when earnings are high, and dissaving in retirement (Browning & Crossley, 2001; Browning & Lusardi, 1996). The LCS hypothesizes that each person desires to maintain the level of consumption over his entire lifetime. A generally accepted goal of retirement planning is to provide enough income in retirement to prevent the standard of living from dropping much below the preretirement level (Schulz, 1992). For retirement adequacy, the LCS model implies that the accumulated financial resources for retirement are equal to or higher than the financial requirements during retirement at the point of retirement (Hatcher, 1997; Yuh, Hanna, & Montalto, 1998).

Definition of Retirement Income Adequacy

To gauge the adequacy of retirement income, researchers typically rely on two main definitions: (1) whether retirement income meets the basic needs for living and (2) whether it allows retirees to maintain their preretirement standard of living. Defining adequacy as satisfying basic needs aims to capture how many retirees are experiencing significant material hardship, such lower bounds may equate to staying above the poverty threshold or being able to afford a necessary set of goods and services. Those approaches yield, respectively, the official federal poverty threshold and elderly needs indexes. Policymakers often use variations of the poverty threshold to establish eligibility for government programs for low-income groups, such as Supplemental Nutrition Assistant Program (SNAP), the Children's Health Insurance Program, and parts of Medicaid. Defining adequacy as maintaining a pre-retirement standard of living is based on the premise that retirement income is sufficient if it enables retirees to enjoy the same quality of life they experienced during their working years (Bodie, Treussard, & Willen 2007; Attanasio & Weber, 2010; Browning & Crossley, 2001). The most widely used measure of the adequacy of retirement income, a threshold based on the standard-of-living definition, is known as the target replacement rate, broadly defined as the amount of income in retirement, expressed as a percentage of income before retirement, that enables retirees to maintain the standard of living they enjoyed while working. Economists and financial advisers generally point to that threshold, the target replacement rate, because achieving that target is supposed to enable workers to maintain their standard of living in retirement. Economists and financial planners generally agree that many retirees do not need to replace 100 percent of working income in order to maintain their standard of living because most retirees probably had reduced expenses, for example, no longer requiring to provide for payroll taxes, retirement saving, and commuting expenses, relative to when they were working (Warshawsky, 2015). Typically, researchers conclude that entering retirement with at least 70 percent of preretirement income allows people to maintain their preretirement consumption; however, that specific target has been criticized in the literature because target replacement rates can vary greatly depending on individual circumstances (Bajtelsmit, Rappaport, & Foster, 2013).

Meanwhile, setting a specific target for and calculating the “replacement rate,” a household’s post-retirement income as a percentage of pre-retirement income required to maintain a household’s standard of living, requires many complicated assumptions (MacDonald & Moore, 2011). For example, higher-income households tend to pay a higher percentage of their income taxes and save more for retirement while working, and they generally require a lower replacement rate in retirement when these expenses decline; for the opposite reasons, lower-income households generally require higher replacement rates (Government Accounting Office, 2016; VanDerhei, 2006). For these reasons, no single replacement rate represents a “success” for retirement income. Several studies have attempted to evaluate the adequacy of retirement income or project the likelihood of current workers having sufficient retirement income. Some of these studies try to judge the retirement readiness of workers by using data on consumption, income, and wealth for working-age households and projecting a replacement rate at retirement; they then compare this projection to a target replacement rate that they estimate to be enough to maintain a standard of living in retirement.

There have been many studies done on retirement income adequacy and generally use these retirement adequacy benchmarks, income replacement ratios relative to a target, wealth relative to the present value of future expenditures, wealth consistent with predictions of lifecycle model, and success or failure rates based on personalized planning forecasts.

The Center for Retirement Research (CRR) at Boston College developed the National Retirement Risk Index (NRRI) to measure the percentage of working-age (between ages 32 and 58) households who are at risk of being financially unprepared for retirement today and in coming decades. The CRR calculates the NRRI involves three steps: (1) projecting a replacement rate – retirement income as a share of pre-retirement income – for each member of a nationally representative sample of U.S. households; (2) constructing a target replacement rate that would allow each household to maintain its pre-retirement standard of living in retirement; and (3) comparing the projected and target replacement rates to find the percentage of households "at risk." Households with replacement rates that fall more than 10 percent below the target are considered "at risk" (Munnell, Hou, & Sanzenbacher, 2018).

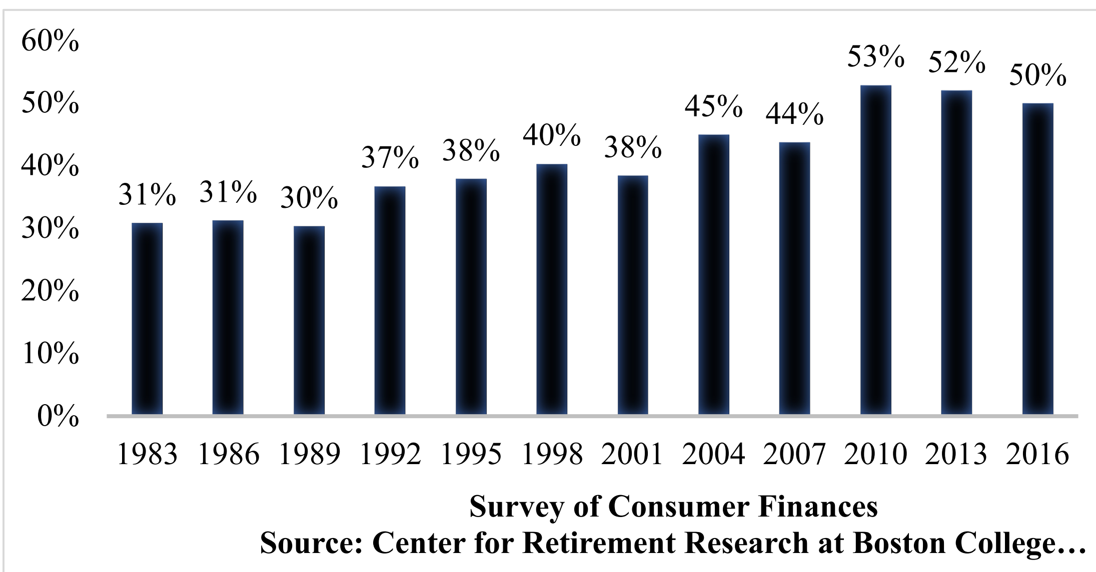

Figure 1: The National Retirement Risk Index (1983-2016)

As shown in Figure 1, results from the 2016 SCF, Munnell, Hou, and Sanzenbacher (2018) conclude that half of working households face the risk of having insufficient retirement income to maintain their standard of living, even if they work to 65 and annuitize all their financial assets including the receipts from reverse mortgages on their homes. This percentage is almost the same as the one calculated from the 2013 SCF and is up from 44 percent in 2007. However, 'at-risk' percentages vary considerably by sub-group in the NRRI. For example, 56 percent of households with income in the lowest third of the income distribution is at risk, and 41 percent of households in the highest-third are at risk of having insufficient retirement income to maintain their pre-retirement standard of living. The numbers are even worse for households led by people between the ages of 30 and 39, where the percentage increases to 56 percent. Furthermore, for households that have been through a divorce, on average, have a seven percentage-point increase in the NRRI, nine-percentage-point increase for couples with a previously divorced spouse, and six-percentage-point increase for single men.

The 2015 National Institute on Retirement Security (NIRS), instead of using a projection model, uses the 2013 SCF to compare net worth among workers to financial industry-suggested savings benchmarks at different ages. Rhee and Boivie (2015) find that approximately two-thirds of workers have savings below the suggested baseline, enough for an 85 percent replacement rate target at age 67.

A 2012 Urban Institute Study, Favreault et al. (2012) focus on Baby Boom workers and retirees, sets a 75 percent replacement rate target, and measures retirement income at age 70. Depending on alternative assumptions they make about whether retirees annuitized retirement assets and how they calculated pre-retirement income, they find about 30 to 40 percent of their sample fell short of their replacement rate target.

The RAND Corporation's Hurd and Rohwedder (2012) estimate consumption paths through retirement using actual spending changes through four waves of the HRS CAMS[1] (2001 through 2007) and project which families have enough financial resources to maintain this consumption path until death. If a household has a 95 percent chance of dying with positive wealth, Hurd and Rohwedder judge it to be adequately prepared for retirement. Their results show that 71 percent of households are likely to be able to maintain their standard of living in retirement, 49.3 percent of singles, and 76.8 percent of married persons have at least a 95 percent chance of dying with positive wealth. However, they find that single households and those with less education are more likely to be unprepared for retirement by the study's objectives. Hurd and Rohwedder find that married couples are substantially better prepared than are singles and that in one group, single, less-educated women, only 27 percent will be able to maintain their preretirement standard of living once they stop working. Single individuals who self-report being in only fair or poor health are also disproportionately at risk, with only 38 percent of that group being able to maintain their standard of living throughout retirement with 95 percent or greater certainty. Hurd and Rohwedder find that, among those who are underprepared for retirement, savings shortfalls can often be substantial, implying that underprepared households must significantly reduce their consumption to avoid running out of money in retirement. They also use their simulation to estimate the impact of various scenarios, including a reduction in consumption and a Social Security benefit cut.

[1] HRS CAMS - The Consumption and Activities Mail Survey (CAMS) is a paper-and-pencil survey that is collected biennially in odd-numbered years. One of its primary objectives is to measure total household spending over the previous 12 months. It is an ongoing supplement to the Health and Retirement Study (HRS) which is a longitudinal survey representative of the U.S. population over the age of 50.

Using consumption-based replacement ratios, Hurd and Rohwedder (2015) find that 59 percent of singles and 81 percent of couples are economically prepared for retirement.

A 2006 study by Scholz, Seshadri, and Khitatrakun uses the Health and Retirement Study to compare individuals' earnings and savings history against wealth predictions of a lifecycle model over a household's lifetime, with different targets for different household characteristics[2]. They find that about 84 percent of U.S. households have enough savings to maintain their standard of living in retirement. In their 2009 extension study coauthored by William G. Gale, where they refined the methodology and added additional birth cohorts to the original research, they conclude that 75 percent of households are adequately prepared for retirement. Their findings emphasize the impact of children and the progressive benefit structure of Social Security, which replaces a higher percentage of income for lower-income earners than higher-income earners, as crucial factors explaining how such a high percentage of households can reach retirement income adequacy. However, even with these factors, Scholz, Seshadri, Khitatrakun, and Gale (2009) find that the percentage of households with adequate retirement income declines with earnings, about 30 percent of lowest-decile earners under save in their estimation, compared to 5 percent of the highest decile.

The Employee Benefit Research Institute (EBRI) uses its Retirement Security Projection Model to project the percentage of workers at risk of having a retirement

[2] A lifecycle model of saving in economics tries to explain patterns of consumption and saving over an individual or household's lifetime. The model generally predicts that individuals seek to smooth consumption over their lives, leading to a prediction of borrowing during younger years, saving during middle-age years, and living off accumulated savings in retirement.

income that is inadequate to cover minimum retirement expenditures[3]. VanDerhei (2012) estimates that about 44 percent of their sample (1948-1954 birth cohorts) fall short of target retirement income, 86.8 percent in the lowest-income quartile, and 2.5 percent in the highest-income quartile. Although the model has typically been used to analyze the current retirement system, the model has also occasionally been used to evaluate the impact of potential changes to Social Security and retirement plans (VanDerhei, 2014a, 2014b, 2015). The analysis focuses on four output metrics: (1) Retirement Readiness Rating (RRR), or the percentage of households that will not run out of money in retirement; (2) Retirement Savings Shortfall or the present value of annual shortfalls; (3) years until the household runs short of money; and (4) the percentage of additional compensation that must be saved annually until retirement to have a 50%, 75%, or 90% chance of covering expenses (EBRI 2016). VanDerhei (2014a) estimates that only 16.8 percent of the lowest-income quartile and 52.6 percent of the second quartile will not run out of money, whereas the success percentages for the top two income quartiles are 71.7 percent and 86.4 percent, respectively. On average, VanDerhei does not find much difference in retirement readiness across age cohorts, with the average RRR being 57 percent to 58 percent for early boomers, late boomers, and Gen Xers.

Most of the academic literature appears to say that people are objectively below where they need to be for retirement with substantial differences by income, marital

[3] EBRI defines this measure as a set of expenses, varying by income, from the Consumer Expenditure Survey, in addition to some health insurance and out-of-pocket health expenses, plus stochastic expenses from nursing home and home health care. ERBI assumes age-65 retirement and assumes that housing equity converted to savings only when other resources are exhausted.

status, education, and health. However, recent evidence from the SCF appears to suggest households are subjectively accessing their income for retirement as adequate.

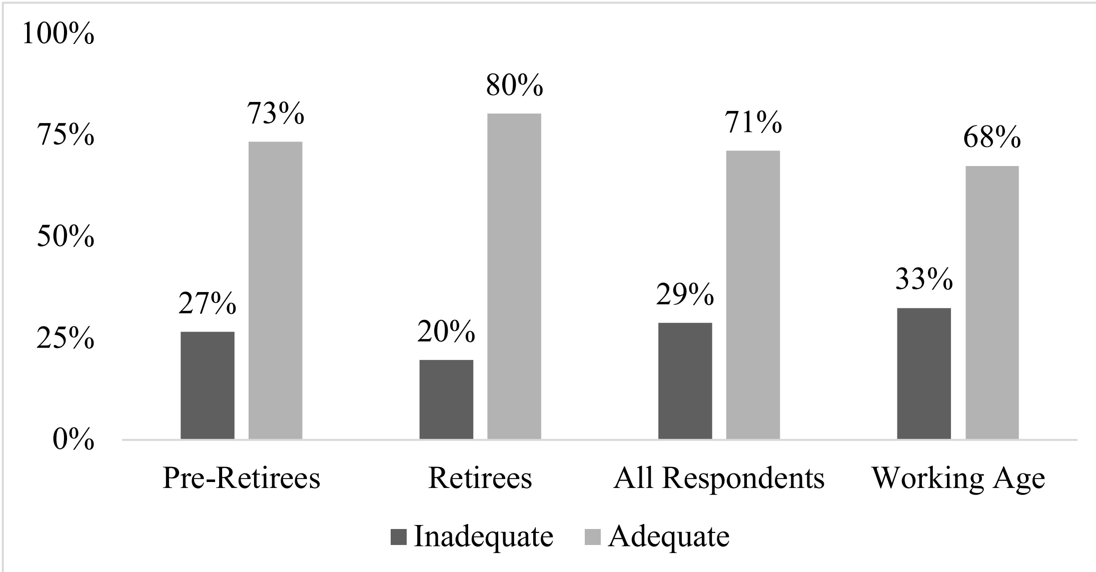

Figure 2: Households' Subjective Assessment of Retirement Income Adequacy, 2016 SCF

As shown in Figure 2, results from the 2016 SCF on question X3023, adequacy of pension and social security income for retirement, including 401(k) accounts and all other types of pensions, show that 71 percent of all respondents (age 18-95), 68 percent of working age (age 32-58) households, 73 pre-retirees (age 55-645), and 80 percent of retirees (age 65-74) households perceived their retirement income as adequate.

Furthermore, when looking at a matched sample of pre-retirees in the 2007 SCF and post-retirees in the 2016 SCF, statistically these are the same households nine years later, retirees are subjectively assessing their post-retirement income as adequate as well.

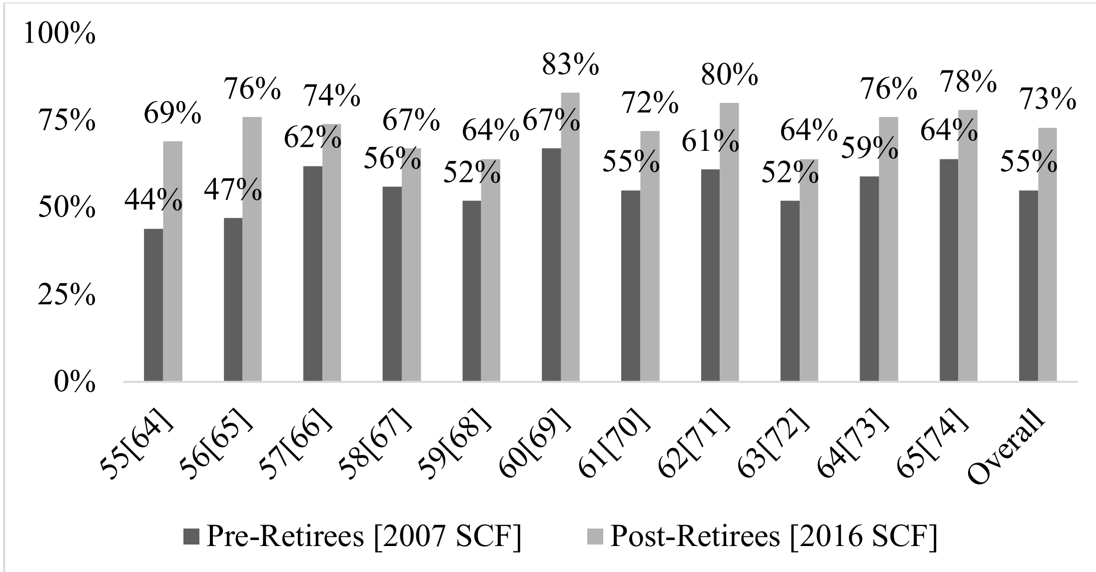

Figure 3: Perceived Adequacy of Retirement Income, Matched Sample of Pre-Retirees in the 2007 SCF and Post-Retirees in the 2016 SCF

As shown in Figure 3, overall retirees' households, 73 percent are subjectively assessing their post-retirement income as adequate in 2016, noting a more optimistic outlook on retirement income as retirees versus as pre-retirees, 55 percent. Evidence from the matched sample seems to suggest that respondent's perception of retirement income adequacy changes over time and that optimism increases with age.

CHAPTER 3: METHODOLOGY

Data and Sample

This study uses the 2007 and 2016 Survey of Consumer Finances (SCF), a cross-sectional dataset created and maintained by the Federal Reserve Board of Governors. The SCF provides comprehensive and detailed information on the financial characteristics of U.S. households (Bricker, J. et al., 2017) and allows for examining retirement adequacy. The 2016 SCF is representative of 126.0 million households, and the 2007 survey represents 116.1 million households. The selected sample is composed of families with a head who is in the nearing retirement age cohort (age 55-64) the 2007 survey and in the first stage of retirement cohort (age 65-74) in the 2016 survey. There were around 19.6 million households of nearing retirement age in the 2007 SCF dataset and 17.8 million households first stage of retirement in 2016 SCF dataset. This study performs pair-matching or one-to-one propensity score matching as defined by Rosenbaum and Rubin (1983) of those in the nearing retirement cohort in the 2007 SCF data set with the first stage of retirement cohort in the 2016 SCF data set who share a similar value of the propensity score. Propensity score matching entails forming matched sets of treated and untreated subjects who share a similar value of the propensity score (Rosenbaum & Rubin, 1983, 1985). Propensity score matching allows one to estimate the ATT, the average effect of treatment on those subjects who ultimately received the treatment (Imbens, 2004). The most common implementation of propensity score matching is one-to-one or pair matching, in which pairs of treated and untreated subjects are formed, such that matched subjects have similar values of the propensity score. This study matches age of household in the 2016 SCF to match age in 2007 SCF plus 9, referencing 9 years later, along with other variables, such as gender, race, marital status, education level, homeownership, year(s) started working, ever had a checking account, ever worked, asset category, and where does the household live. Statistically, these are the same households nine years later. The selected sample in this study consists of (N=10,405), representing 42,110,379 U.S households from age 55-74.

Dependent Variable: Perceived Adequacy of Retirement Income

The dependent variable is the respondent's perception of having adequate retirement income (ADEQUATE). The SCF (variable X3023) assesses the respondent's perception of the adequacy of retirement income with five levels: totally inadequate (coded as 1), inadequate (coded as 2), enough to maintain living standards (coded as 3), satisfactory (coded as 4), and very satisfactory (coded as 5).

> X3023 Using any number from one to five, where one equals totally inadequate and five equals very satisfactory, how would you rate the retirement income you receive (or expect to receive) from all sources?
>
> INCLUDE 401(K) ACCOUNTS AND ALL OTHER TYPES OF PENSIONS
>
> 1. *TOTALLY INADEQUATE
> 2.
> 3. *ENOUGH TO MAINTAIN LIVING STANDARDS
> 4.
> 5. *VERY SATISFACTORY

Though few studies have focused on the retirement perception variable in the SCF survey, it plausibly reflects the respondent's perception of having an adequate retirement (Malroutu & Xiao, 1995). For the purpose of this study, the subjective measurement is a dichotomous indicator of households' perception of having an adequate retirement with a value equal to 1 if the value of the indicator is 3, 4, or 5 (ADEQUATE); otherwise, the value is 0 (INADEQUATE). This study also undertook a multinomial model for all variables, where enough to maintain living standards was the reference category. The overall results were similar to the probit model. However, the probit approach uses here is more easily interpreted and provides substantially similarly results.

Independent Variables

The independent variables in the model act as predictors of the dichotomous dependent variable. A positive (negative) coefficient indicates that the variable increases (decreases) the probability of perceiving adequate retirement income in retirement. Presumably, a respondent's perceived adequacy of retirement income depends on these four categories of predictors: sociodemographic, human-capital, financial capital, and financial attitude.

Sociodemographic Predictors: Sociodemographic predictors consist of age, gender, race, and marital status. This study focuses on two age groups, those nearing retirement, from age 55-64 and those in the first stage of retirement, from age 65-74. Gender measures with a dummy variable for a male. Race/ethnicity of head of household is measured with five dummy variables: White, non-Hispanic, Black/African-American, non-Hispanic, Hispanic or Latino, and Other or Multiple Race. Marital status measures with two dummy variables. The first one is married/living with a partner if the householder is married or living with a partner and the second one is a dummy if the head of the household is neither married nor living with a partner, if the householder is separated, divorced, widowed, or never married.

Human-Capital Predictors: Human-capital predictors consist of income, education, and health status. The annual income of household measures with the SCF variable household normal income to avoid transitionary variables in current income. For example, some households have unusually high or low income in the survey year compared to the income in a normal year; thus, the use of normal income eliminates the effect of transitionary income. To reduce heteroskedasticity, we use the natural logarithm of the normal income instead of the dollar amount. Educational attainment of the head of household is measured by four dummy variables: no high school diploma/GED, a high school diploma or a GED, some college or Assoc. degree, and a bachelor degree or higher. Health status is measured with four dummy variables: excellent, good, fair, and poor reflecting the subjective assessment of the respondent's health.

Financial Capital Predictors: Financial capital predictors consist of net worth, housing tenure status, ownership of defined benefit or defined contribution plans, inheritance amount received, and inheritance amount expected. On the Federal Reserve's website, under Survey of Consumer Finances, the Net Worth Flowchart shows the definition of SCF assets and debt categories in the calculation of net worth, where household net worth measures with the SCF variable total net worth [NETWORTH], total assets [ASSET] minus total debt [DEBT]. For this study, we use adjusted household net worth by subtracting quasi-liquid retirement accounts [RETQLIQ] from NETWORTH since we are using individual retirement accounts/Keoghs [IRAKH] and pension accounts valued separately to avoid multicollinearity and endogeneity. Since households' net worth range from negative (-) $2,089,970 to $1,703,800,000, a standardized adjusted net worth is used by adding the largest negative amount of net worth. To reduce the effects of heteroskedasticity, we use the natural logarithm of the standardized adjusted net worth instead of the dollar amount. A household's homeownership class is measured with a dummy variable: own ranch/farm/mobile home/house/condo coop/etc. or otherwise. Value of defined contribution plans measures by SCF variable individual retirement accounts/Keoghs [IRAKH], and to reduce heteroskedasticity, we use the natural logarithm of the plan's value instead of the dollar amount. The value of defined benefit plans is measured by SCF variable account-type pensions on the current job [THRIFT], future pensions [FUTPEN], and currently received account-type pension [CURRPEN], and to reduce the effect of heteroskedasticity, we use the natural logarithm of the plan's value instead of the dollar amount. The total inheritance amount received is calculated by summing all inheritances received of the head of household and or spouse, and to reduce the effect of heteroskedasticity, we use the natural logarithm of the total inheritance amount received instead of the dollar amount. We also obtain the expected inheritance amount measured with the SCF variable inheritance amount expected of the head of household and or spouse. Again, to reduce the effect of heteroskedasticity, we use the natural logarithm of the total inheritance amount expected instead of the dollar amount.

Financial Attitude Predictors: Financial attitude predictors consist of planning horizon for saving and spending, feelings about investment return and risk, and usual saving habits. The household's planning horizon for saving, and spending is measured with five dummy variables: next few months, next year, next few years, next 5-10 years, and longer than 10 years. The household's feelings about investment return and risk are measured with four dummy variables: take substantial financial risks expecting to earn substantial returns, take above-average financial risks expecting to earn above-average returns, take average financial risks expecting to earn average returns, and not willing to take any financial risks. Usual saving habits are measured with six saving motives

(Katona, 1975) dummy variables, where respondents are asked to indicate their saving habits by selecting from a list of statements: (1) don't save - usually spend more than income; (2) don't save - usually spend about as much as income; (3) save whatever is left over at the end of the month - no regular plan; (4) save income of one family member, spend the other; (5) spend regular income, save other income; and (6) save regularly by putting money aside each month. Three saving habit categories derived from Katona (1975): save regularly (4, 6), save irregularly (3, 5), and do not save (1, 2). Save regularly considers as discretionary saving discussed by Katona (1975) while saving irregularly is deemed to be extra saving, as these households are saving whatever leftover or income.

Analysis

As the outcome variable is dichotomous, probit analysis is used to observe the statistical significance of sociodemographic, human-capital, financial capital, and financial attitude predictors of perceived adequacy of retirement income at each retirement stage, nearing and the first stage of retirement.

Perceived Adequacy of Retirement Income = *f* (retirement stage, X, and retirement stage * X) + e. The probit model is:

$$P(y=1) = 1 - \Phi\left(\sum_{k=1}^{k} \beta_k X_k\right) \; and \; P(y=0) = 1 - \Phi\left(\sum_{k=1}^{k} \beta_k X_k\right),$$

where Y = {$p \geq 0.5$, 0 $p < 0.5$} and A Φ (.) is the cumulative distribution function (c.d.f) The marginal effects on the probability are calculated as:

$$\frac{\partial prob\ (y=1)}{\partial x_k} = \Phi\left(\sum_{k=1}^{k} \beta_k X_k\right) \beta_k \frac{\partial prob\ (y=0)}{\partial x_k} = -\Phi\left(\sum_{k=1}^{k} \beta_k X_k\right) \beta_k$$

where Φ (.) is the probability density function.

Where retirement stage is the indication of households' retirement status, nearing retirement (pre-retirees from age 55-65), first stage of retirement (retirees from age 65-74) and X is a vector of explanatory variables such as: sociodemographic (gender, race, marital status), human capital (income, education, health), financial capital (homeownership class, net worth, retirement plans value, pension plans value, total amount of inheritance received, total amount of inheritance expected), and financial attitude (planning horizon for saving and spending, feeling about investment return and risk, usual saving habits). IBM SPSS Statistics Version 25 with Model 1 in the PROCESS macro provided by Hayes (2018) use for data analysis.

Descriptive Statistics

A summary of sample characteristics is in Table 1 for categorical variables and Table 2 for continuous variables. The majority of the sample households composed of white (74.5%), married (78%), male (70.6%) in the nearing retirement age (56.7%), who were college educated (60.6%), and in good (48.2%) to excellent health (20.3%). Those who were in the first stage of retirement, 72.20% reported having adequate retirement income. The sample households had an average annual income of $110,325 (*SD* = $503,351) ranging from zero to $305,775,692, where the median income was $58,733, had accumulated an average net worth of $1,053,673 (*SD* = $6,363,777) ranging from negative (-) $2,089,970 to $1,703,800,000, where the median net worth was $258,342.

The majority of the sample owned (79.6%) their residences, had never received an inheritance (70.4%), nor expected to receive an inheritance (91.8%). The average inheritance amount received was $61,139 (*SD* = $710,995) ranging from zero to $334,630,000, and the average inheritance amount expected was $40,551 (*SD*

=\$697,162) ranging from zero to \$174,490,000. The majority of the sample households did not have ownership in any defined contribution plans (61%) but had ownership in defined benefit plans (65.7%). The average retirement plan value was \$98,523 (*SD* = \$339,514) ranging from zero to \$23,623,506, and the average pension plan value was \$84,028 (*SD* = \$375,620) ranging from zero to \$65,060,000.

Regarding planning horizon for saving and spending, the majority of the sample households tended to plan more than the next few years out (69.3%). The majority of the sample households' sentiment toward investment return and risk were average (39.5%) and not willing to take any financial risks (44.4%). Only a small percentage of the sample households were non-savers, where usual saving habits (1) don't save - usually spend more than income was 6.2 percent, and usual saving habits (2) don't save - usually spend about as much as income was 15.6 percent, while 31.1 percent of sample households saved residual incomes as usual saving habits (4) save income of one family member, spend the other, and 43.3 percent of the sample households were regular savers as usual saving habits (6) save regularly by putting money aside each month.

Table 1

Sample Characteristics of Categorical Variables (N=10,405)

Predictors	n 10405	% (weighted)* 100	Perceived Retirement Income Inadequate	Adequate
Age Group**				
Pre-Retirees	5638	56.70	44.20	55.80
Retirees	4767	43.30	27.80	72.20
Gender**				
Male	8332	70.60	34.10	65.90
Female	2073	29.40	44.50	55.50
Race/Ethnicity**				
White, non-Hispanic	8494	74.50	36.60	63.40
Black/African-American, non-Hispanic	821	12.60	35.60	64.40
Hispanic or Latino	401	5.00	37.70	62.30
Other or Multiple Race	689	7.80	44.00	56.00
Marital Status**				
Married/living with partner	7159	68.80	33.50	66.50
Neither married nor living with partner	3246	31.20	41.90	58.10
Educational Attainment**				
No high school diploma/GED	859	12.10	48.50	51.50
High school diploma or GED	1991	27.30	40.10	59.90
Some college or Assoc. degree	2138	25.80	36.30	63.70
Bachelor degree or higher	5417	34.80	29.50	68.50
Health Status**				
Excellent	3351	20.30	32.80	67.20
Good	4689	48.20	32.80	67.20
Fair	1741	22.90	41.90	58.10
Poor	624	8.60	58.70	41.30
Negative Net Worth**				
Yes	291	4.20	56.50	43.50
No	10114	95.80	36.30	63.70
Homeownership Class**				
Owns	8844	79.60	33.50	66.50
Otherwise	1561	20.40	51.20	48.80
Ownership of Defined Contribution**				
Yes	5531	39.00	28.70	71.30
No	4874	61.00	42.50	57.50

** Chi-square test for independence was statistically significant, $p < 0.05$
* Weighted percentages are provided to account for the oversampling techniques utilized by the SCF. The weighted sample represents 42,110,379 U.S. Households from age 55-74.

Table 1 (continued)

Sample Characteristics of Categorical Variables (N=10,405)

Predictors	n 10405	% (weighted)* 100	Perceived Retirement Income Inadequate	 Adequate
Ownership of Defined Benefit**				
Yes	6568	65.70	29.00	71.00
No	3837	34.30	52.60	47.40
Received Inheritance**				
Yes	3797	29.60	30.90	69.10
No	6608	70.40	39.70	60.30
Expecting Inheritance**				
Yes	1169	8.20	39.90	60.10
No	9236	91.80	3690	63.10
Planning Horizon for Saving and Spending**				
Next Few Months	1515	20.30	53.30	46.70
Next Year	903	10.30	33.80	66.20
Next Few Years	2583	28.50	32.40	66.60
Next 5-10 Years	3219	27.90	33.00	67.00
Longer than 10 Years	2185	12.90	31.50	68.50
Feelings about Investment Return and Risk**				
Substantial	409	2.20	30.20	69.80
Above-Average	2212	13.90	37.00	63.00
Average	4568	39.50	30.00	70.00
Not willing to take any financial risk	3216	44.40	43.90	56.10
Usual Saving Habits**				
Don't Save: Spending > Income	509	6.20	64.20	35.80
Don't Save: Spending = Income	1193	15.60	54.30	45.70
Save Irregularly: Save whatever is left	3219	31.10	35.00	65.00
Save Irregularly: Save income of one family member	150	1.50	34.90	65.10
Save Regularly: Save other income	874	6.10	18.50	81.50
Save Regularly: putting money aside each month	4931	43.30	31.50	68.50

** Chi-square test for independence was statistically significant, $p < 0.05$
* Weighted percentages are provided to account for the oversampling techniques utilized by the SCF. The weighted sample represents 42,110,379 U.S. Households from age 55-74.

Table 2

Sample Characteristics of Continuous Variables (N = 10,405)

Predictors	Mean	Median	Std. Dev.	Minimum	Maximum
Normal Income	110,325	58,733	503,351	$0.00	305,775,692
Log Normal Income	10.98	10.98	1.08	0.00	19.54
Net Worth	1,053,673	258,342	6,363,777	- 2,089,970	1.7B*
Log Net Worth	11.71	12.46	3.22	0.00	21.26
Inheritance Received	61,139	0.00	710,995	0.00	334,630,000
Log Inheritance Received	3.27	0.00	5.12	0.00	19.63
Inheritance Expected	40,551	0.00	697,162	$0.00	174,490,000
Log Inheritance Expected	0.98	0.00	3.31	0.00	18.98
Pension Value	84,028	0.00	375,620	0.00	65,060,000
Log Pension Value	3.56	0.00	5.32	0.00	17.99
Retirement Accounts Value	98,523	0.00	339,514	0.00	23,623,506
Log of Retirement Accounts	4.38	0.00	5.59	0.00	16.98
Adj. Net Worth	871,122	193,620	6,228,784	- 2,089,970	1.7B*
Log Adj. Net Worth	11.31	12.17	3.41	0.00	21.26
Log Adj. Net Worth (standardized)	14.76	14.64	0.37	2.30	21.26

*1,703,800,000

Table 3

Probit Analysis of Determinants Affecting Perceived Adequacy of Retirement

Predictors	Nearing Retirement b (se)	Nearing Retirement Odds Ratio	First Stage of Retirement b (se)	First Stage of Retirement Odds Ratio
	Sociodemographic			
Gender:				
Male vs. Female	0.24* (0.11)	1.27	1.84*** (0.08)	6.30
Marital Status:				
Married vs. Single	0.17* (0.09)	1.19	1.69*** (0.08)	5.42
Race/Ethnicity: White, non-Hispanic is the Reference Category				
Black/African American	0.09 (0.74)	1.09	-1.37*** (0.09)	0.25
Hispanic or Latino	0.01 (0.09)	1.01	-1.53*** (0.12)	0.22
Other or Multiple Race	0.10 (0.08)	1.11	-0.75*** (0.11)	0.47
	Human-Capital			
Log Normal Income	-0.15** (0.05)	0.86	1.10*** (0.03)	3.00
Educational Attainment: No High School/GED is the Reference Category				
High School Diploma/GED	0.64*** (0.05)	1.90	0.41*** (0.08)	1.51
Some College or Assoc. Degree	-0.01 (0.15)	0.99	1.29*** (0.08)	3.63
Bachelor Degree or higher	0.10 (0.09)	1.11	3.13*** (0.09)	22.87
Overall Health: Excellent is the Reference Category				
Good	-0.44*** (0.12)	0.64	-1.26*** (0.10)	0.28
Fair	-0.24 *** (0.03)	0.79	-2.57*** (0.12)	0.08
Poor	-1.13*** (0.05)	0.32	-3.28*** (0.13)	0.04
	Financial Capital			
Homeowner vs Renter	0.21** (0.07)	1.23	2.59*** (0.07)	13.33
Log Adj. Net Worth (standardized)*	-0.40*** (0.10)	0.67	1.57*** (0.04)	4.81
Log Retirement Accounts Value	-0.01 (0.00)	0.99	0.18*** (0.01)	1.20
Log Pension Accounts Value	0.04*** (0.01)	1.04	0.13*** (0.01)	1.14
Log Total Inheritance Amount Received	-0.04*** (0.01)	0.96	0.13*** (0.01)	1.14
Log Inheritance Amount Expected	-0.20*** (0.04)	0.82	0.04 (0.01)	1.04

**p* < 0.05, ** *p* < 0.01, *****p* < 0.001, b = coefficient, se = standard error

Table 3 (continued)

Probit Analysis of Determinants Affecting Perceived Adequacy of Retirement

	Nearing Retirement		First Stage of Retirement	
Predictors	b (se)	Odds Ratio	Predictors	b (se)
	Financial Attitudes			
Planning Horizon for Saving and Spending: Next Few Months is the Reference Category				
Next Year	0.63*** (0.05)	1.88	1.57*** (0.10)	4.81
Next Few Years	0.64*** (0.04)	1.90	1.88*** (0.08)	6.55
Next 5-10 Years	0.27*** (0.06)	1.31	3.18*** (0.10)	24.05
Longer than 10 Years	-0.19 (0.23)	0.83	3.70*** (0.10)	40.45
Feelings about Investment Return and Risk				
Above-Average	-1.51*** (0.19)	0.22	0.88** (0.30)	2.41
Average	-1.01*** (0.09)	0.36	0.43 (0.28)	1.54
Not willing to take any financial risk	-1.14*** (0.07)	0.32	-2.00*** (0.28)	0.14
Usual Saving Habits				
Don't Save: Spending > Income	-0.80*** (0.08)	0.45	-2.49*** (0.11)	0.08
Don’t Save: Spending = Income	-0.65*** (0.07)	0.52	-1.78*** (0.09)	0.17
Save Irregularly: Save whatever is left	-0.37 (0.22)	0.69	0.09 (0.08)	1.09
Save Irregularly: Save income of one family member	-0.47*** (0.09)	0.63	0.30 (0.20)	1.35
Save Regularly: Save other income	0.90*** (0.07)	2.46	1.88*** (0.14)	6.55
Save Regularly: putting money aside each month	0.37*** (0.11)	1.45	0.91*** (0.08)	2.48

*$p < 0.05$, ** $p < 0.01$, ***$p < 0.001$, b = coefficient, se = standard error

Regression Results

Table 3 shows the results of the marginal effects at different retirement stage, at nearing retirement (pre-retirees, from age 55-64) and at first stage of retirement (retirees, from age 55-74) to investigate the contributing factors that impact the perceived adequacy of retirement income. The results from the probit model are broken up by explanatory variables, in each table, there are coefficients (b), p-value (*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$) standard errors (se), and odds ratios (OR), which is the exponent of the coefficient (b). The indicated retirement stage is along the columns, and the predictors are along the rows. Overall, the model goodness-of-fit, Pseudo (Nagelkerke) R-Squared is 0.282, and the model is 78.20 percent accurate in classifying all predictors and constant.

Discussion

This study aims to explain the determinants of perceived adequacy of retirement income by looking at a matched sample of pre-retirees and post-retirees to see what the determinants of post-retirement income adequacy are related to. The descriptive analysis shows clear differences in the perceived adequacy of retirement income across the retirement stage, at pre-retirees and retirees. Probit analysis results confirm that sociodemographic, human capital, financial capital, and financial attitude are significant predictors that influence the variation in the perception of retirement adequacy of respondents in the first stage of retirement. The determinants in the model act as predictors of the dichotomous dependent variable, where a positive (negative) coefficient indicates that the variable increases (decreases) the probability of perceiving adequate retirement income in retirement. Where the odds ratios (OR), which is the exponent of the coefficient (b), are indicators of the relative increase or decrease in the likelihood of respondents' perceived adequacy of retirement income.

A graphical representation of the marginal effect of sociodemographic determinants (gender, marital status, and race) on perceived adequacy of retirement income in pre- and post-retirement shows in Figure 4.

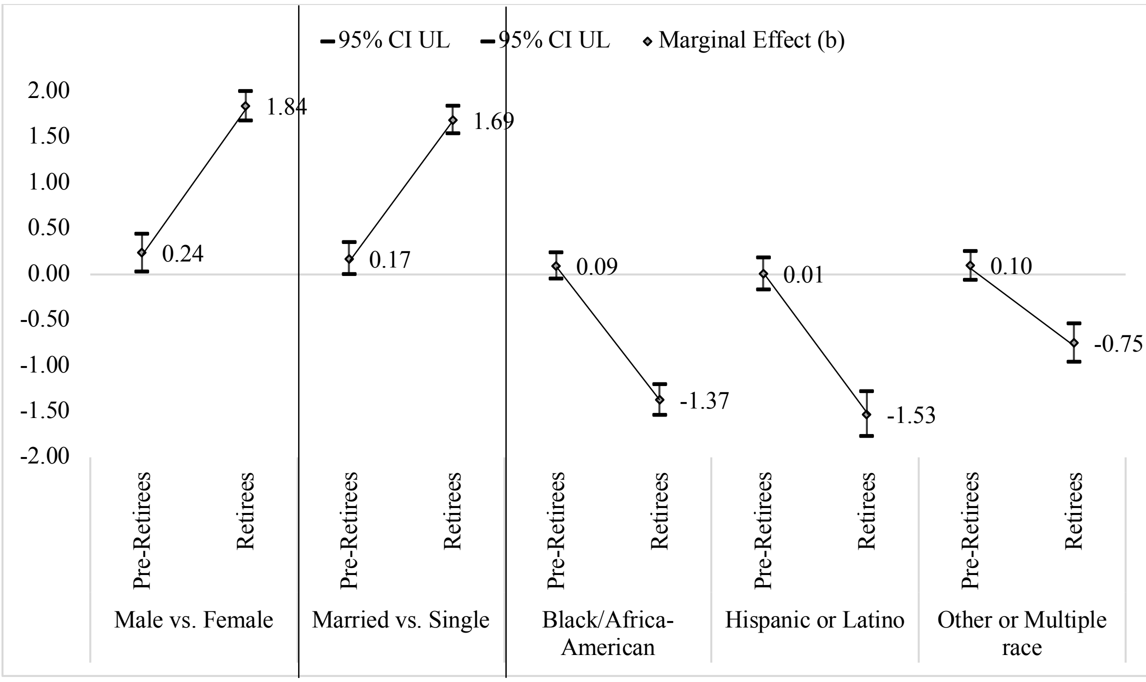

Figure 4: The Marginal Effect of Sociodemographic on Perceived Adequacy of Retirement Income in Pre and Post Retirement

Interpreting the marginal effect is as follows: explanatory variable/determinant [X] predicting perceived adequacy of retirement income [Y] at each level of retirement stage, pre-retirees, retirees [M], basically, how the coefficient of interest (explanatory/determinant variable) changes when transitioning from pre-retirement to retirement. This method provides a way of looking at how the probability of perceived adequate retirement income changes for a particular variable, pre and post retirement. For example, what effect does the value of 'Male' have on the probability of perceived adequacy of retirement income? As shown in Table 3 and its graphical representation in Figure 4, we obtain a marginal effect (b) for pre-retirees and one for retirees along with its standard errors (SE) at 95% confidence interval (CI). In this case, the estimate (b) for pre-retirees and its standard error (SE) at 95% confidence interval (CI) is b = 0.24* (0.11) [0.03, 0.44] and for retirees is b = 1.84*** (0.08) [1.68, 2.00]. We can see that the standard errors do not overlap, so they are statistically different from each other and zero at 95% confidence interval in this case. We can see that 'Male' is a significant determinant in predicting perceived adequacy of retirement income for both pre-retirees (*p < 0.05) and retirees (***p < 0.001). The determinant 'Male' in the model acts as a predictor of the dichotomous dependent variable, in this case, the coefficient of interest is positive which indicates that the variable increases the probability of perceiving adequate retirement income in retirement relative to 'Female' respondent. We can see that the coefficient of interest changes when transitioning from pre-retirees b = 0.24*(0.11) to retirees b = 1.84*** (0.08), where the variable 'Male' is more important, more significant, and the probability of perceiving adequate retirement income increases more in retirement relative to 'Female' respondent when transitioning from pre-retirement to retirement.

When looking at what effect does the value of 'Married/Living with Partner' have on the probability of perceived adequacy of retirement income, we can see that the coefficient of interest is important and positive, indicates that the determinant 'Married/Living with Partner' increases the probability of perceiving adequate retirement income relative to 'Neither Married nor Living with Partner' at significant level $*p < 0.05$ for pre-retirees and $***p < 0.001$ for retirees. We can see that the coefficient of interest changes when transitioning from pre-retirement, where b = 0.17*(0.09) [0.00, 0.35] to retirement, where b = 1.69*** (0.08) [1.54, 1.84]. In this case, the standard errors do not overlap, so they are statistically different from each other and zero at 95% confidence interval, where the determinant of 'Married/Living with Partner' is more important, more significant, and the probability of perceiving adequate retirement income increases more in retirement relative to 'Neither Married nor Living with Partner' respondent when transitioning from pre-retirement to retirement.

When looking at what effect of the values of other races/ethnicities, such as 'Black/African-American', 'Hispanic or Latino', 'Other or Multiple Race' relative to 'White, non-Hispanic' have on the probability of perceived adequacy of retirement income, we can see that the coefficients of interests are not statistically significant in the pre-retirement stage, however, at the retirement stage, other races/ethnicities, all are negatively sloped and statistically significant at ***$p < 0.001$ relative to White, non-Hispanic respondents. In this case, the estimate for Black/African-American respondent is b = -1.37*** (0.09) [-1.54, -1.20], Hispanic or Latino respondent is b = -1.53*** (0.12) [-1.77, -1.28], and Other or Multiple Race respondent is b = - 0.75*** (0.11) [-0.96, -.054], where we can see that the standard errors are not overlapping, and therefore they are statistically different from each other and zero at 95% confidence interval. The coefficients of interests are negative, indicate that the variables decrease the probability of perceiving adequate retirement income in retirement.

When looking at the marginal effect of sociodemographic (gender, marital status, race) characteristics on perceived adequacy of retirement income transitioning from pre-retirement to retirement, we can see that Black/African-American, Hispanic or Latino, Other or Multiple Race, Separated, Divorced, Widowed, Never Married, and Women respondents are at risk of perceiving inadequate retirement income in retirement. Results from this study are consistent with Munnell, Hou, and Sanzenbacher (2018) study on race/ethnicity, where Black and Hispanic households are more at risk of unable to maintain their standard of living in retirement than White households. Furthermore, for households that have been through a divorce, on average, have a seven percentage-point increase in the NRRI, nine-percentage-point increase for couples with a previously divorced spouse, and six-percentage-point increase for single men. Results from this study are also consistent with Hurd and Rohweder (2012) study where they find that married couples are substantially better prepared than are singles and that in one group, single, less-educated women, 73 percent will not be able to maintain their pre-retirement standard of living once they stop working. Furthermore, Fethke (1989) concludes that divorce is likely to significantly undermine retirement security by disrupting savings and depleting existing assets. According to the American Psychological Association (2000), about 40 percent to 50 percent of marriages in the United States end in divorce, about 40 percent of first marriages end in divorce, and those who have been divorced once and remarry are more likely to get divorced, with as much as 60 percent of second marriages ending in divorce. Marriages end over a host of issues, including infidelity, stress, money troubles, and personal changes by one or both partners throughout a marriage. Divorce can be an emotionally wrenching experience and can fracture families. For many children, divorce leaves scars that never heal. For pre-retirees, it is not feasible to change gender or race, however, it is realistic to reconcile marital status to increase the chance of retirement adequacy. For financial educators, counselors, and planners, it is prudent to bring about the awareness and education programs to at-risk sociodemographic groups to enhance their probability of adequate retirement.

A graphical representation of the marginal effect of human-capital determinants (income, education, and health status) on perceived adequacy of retirement income in pre- and post-retirement is shown in Figure 5.

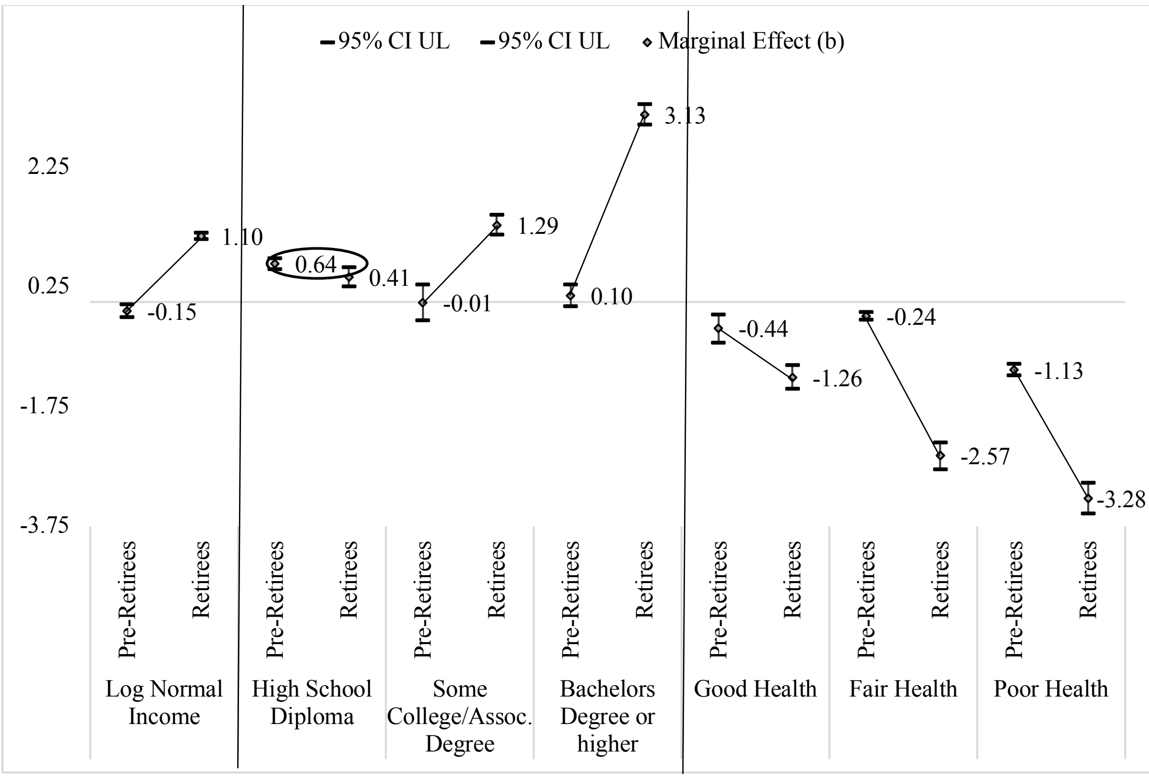

Figure 5: The Marginal Effect of Human-Capital on Perceived Adequacy of Retirement Income in Pre and Post Retirement

When looking at what effect does the value of 'Log Normal Income' have on the probability of perceived adequacy of retirement income, as shown in Table 3 and its graphical representation in Figure 5, we can see that the coefficient of interest is significant, where $^{**}p < 0.01$ for pre-retirees and $^{***}p < 0.001$ for retirees and positive, which indicates that the variable increases the probability of perceiving adequate retirement income when transitioning from pre-retirement to retirement. We can see that for a 1-standard deviation *(SD)* increase in the natural logarithm of income results in a 3-fold increase in the odds of perceived adequacy of retirement income, where b = 1.10*** (0.03).

When looking at what effect of the values of 'Educational Attainment Level' such as 'High School Diploma/GED, 'Some College or Assoc. Degree', 'Bachelor's Degree or Higher' relative to 'No High School Diploma/GED' have on the probability of perceived adequacy of retirement income, we can see that the coefficients of interests are not statistically significant in the pre-retirement stage, however, at retirement stage, educational attainment level higher than no high school diploma, all are positively sloped and statistically significant at ***$p < 0.001$. In this case, the estimate for Some College or Assoc. Degree respondent is b = 1.29*** (0.08) and Bachelor's Degree or Higher respondent is b = 3.13*** (0.09). The coefficients of interests are positive, indicate that the variables increase the probability of perceiving adequate retirement income in retirement when transitioning from pre-retirement to retirement.

When looking at what effect of the values of 'Overall Health' such as 'Good', 'Fair', 'Poor' relative to 'Excellent' have on the probability of perceived adequacy of retirement income, we can see that the coefficients of interests are statistically significant in both pre-retirement and retirement, where ***p < 0.001, all are negatively sloped, indicate that the variables decrease the probability of perceiving adequate retirement income in retirement. We can see that the coefficients of interest are negative when transitioning from pre-retirees to retirees, where the variables are more important, more significant, and the probability of perceiving adequate retirement income decreases significantly more in retirement. In this case, the estimate for 'Good' overall health relative to ‘Excellent’ in pre-retirement is b = -0.44*** (0.12) and in retirement is b = -1.26*** (0.10), ‘Fair’ b = -0.24*** (0.03) versus b = -2.57*** (0.12), and ‘Poor’ b = -1.13*** (0.05) versus b = -.328*** (0.13), respectively. We can see that the standard errors do not overlap, so they are statistically different from each other and zero at 95% confidence interval.

When looking at the marginal effect of human-capital (income, education, overall health) determinants on perceived adequacy of retirement income transitioning from pre-retirement to retirement, we can see that respondents who are low-income earner, not college educated, and in poor health are at risk of perceiving inadequate retirement income in retirement. Results from this study are consistent with VanDerHei (2012) study that estimates about 44 percent of their sample (1948-1954 birth cohorts) fall short of target retirement income, while an astounding 86.8 percent in the lowest-income quartile, and 2.5 percent in the highest-income quartile. Results from this study are consistent with Malroutu and Xiao (1995) and Chan et al., (2002),) on education is positively associated with retirement income adequacy. Results from this study are consistent with Hurd and Rohwedder (2002) study where they find that single individuals who self-report being only fair or poor health are disproportionately at risk, with only 62 percent of that group is not being able to maintain their standard of living through retirement with 95 percent or greater certainty. Human-capital determinants are factors pre-retirees can invest early to influence and to improve the probability of retirement income adequacy, especially with overall health. The Employee Benefit Research Institute (ERBI)’s analysis of household spending by age cohort in the Health and Retirement Study, Banerjee (2014) shows that consumption declines with age, while health expenditure remains one of the most significant expenses in retirement. Households can adopt healthy living to reduce health expenditure cost in retirement, while financial security and health have long been recognized as part of a successful retirement. Other significant expenses that many households may face while working but not while retired include the cost of raising children (who are likely grown and financially independent by the parents' retirement age) and of housing if homeowners pay off their mortgage by retirement.

Conversely, health costs may represent a more considerable expense for a household in retirement than while working. As seniors age, they may struggle to afford soaring health care costs while their incomes are shrinking. According to a recent study by the ERBI, a U.S. couple retiring in 2017 at age 65, needed $280,000 of savings to cover future medical costs. The $280,000 includes premiums for Part B doctor coverage, Part D drug coverage, and it does not include long-term care or assisted the living. Policymakers can contribute to retirement adequacy by offering affordable health care systems and alternatives beyond Medicare, Medicated, and the Veterans Administration. Furthermore, future retirees who are planning to retire in the next decade to be cognizant that many current retirees, particularly those with low incomes, are heavily dependent on Social Security benefits for their retirement income, and with the anticipated depletion of Social Security funds in 2030, which would trigger automatic across the board benefit reductions of 25 percent or more, would have a dramatic negative effect on Americans' retirement income security (Schultz and Nickerson, 2013). For financial educators, counselors, and planners, it is prudent to bring about realistic financial resources needed in retirement for future retirees and create financial awareness and financial literacy programs in schools or at workplaces to their chance for retirement adequacy.

A graphical representation of the marginal effect of financial capital determinants (homeownership, net worth, ownership of defined contribution, ownership of defined benefit, an inheritance received, and inheritance expected) on perceived adequacy of retirement income in pre and post retirement is shown in Figure 6.

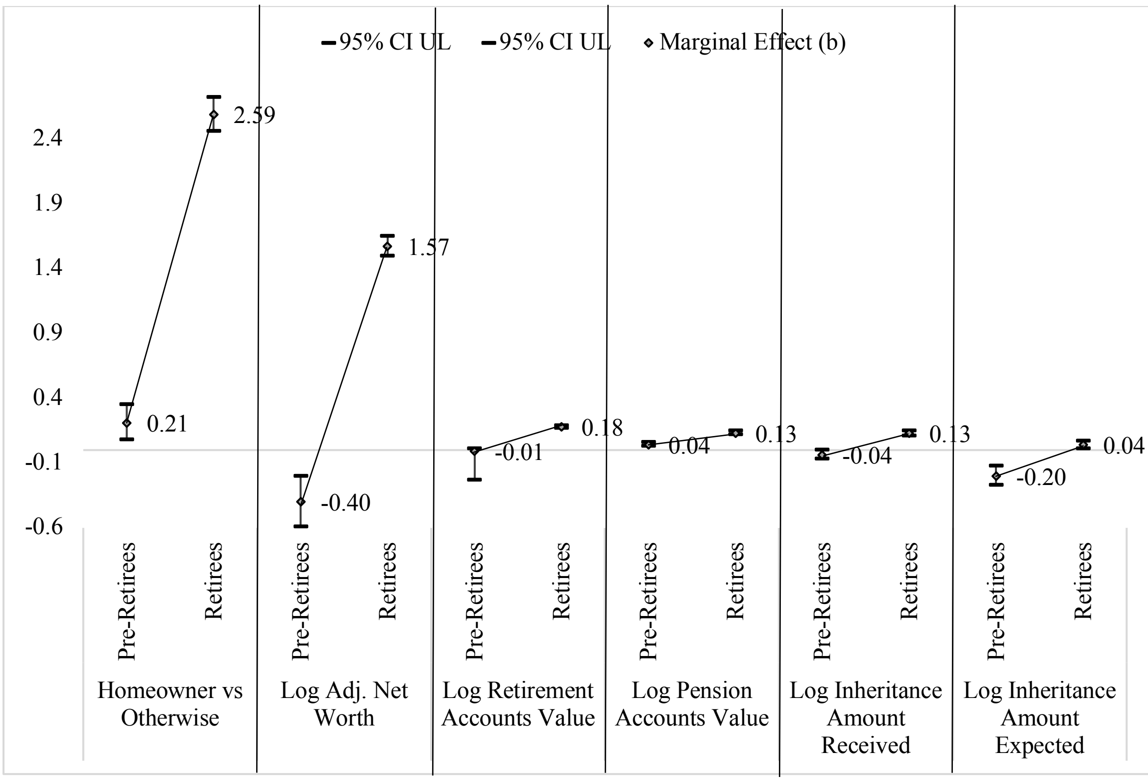

Figure 6: The Marginal Effect of Financial Capital on Perceived Adequacy of Retirement Income in Pre and Post Retirement

When looking at what effect does the value of 'Homeowner' have on the probability of perceived adequacy of retirement income, as shown in Table 3 and its graphical representation in Figure 6, we can see that the coefficient of interest is important and positive, indicates that the determinant 'Homeowner' increases the probability of perceiving adequate retirement income relative to 'Otherwise' at significant level $^{**}p < 0.01$ for pre-retirees and $^{***}p < 0.001$ for retirees. We can see that the coefficient of interest changes when transitioning from pre-retirement, where b = 0.21**(0.07) [0.08, 0.35] to retirement, where b = 2.59*** (0.07) [2.46, 2.72]. In this case, the standard errors do not overlap, so they are statistically different from each other and zero at 95% confidence interval, where the determinant of 'Homeowner' is more important, more significant, and the probability of perceiving adequate retirement income increases more in retirement relative to the non-homeowner respondent.

When looking at what effect does the value of 'Log Net Worth (adjusted, standardized)' have on the probability of perceived adequacy of retirement income, as shown in Table 3 and its graphical representation in Figure 6, we can see that the coefficient of interest is significant, where $^{***}p < 0.001$ for both pre-retirees and retirees and positive for retirees, which indicates that the variable increases the probability of perceiving adequate retirement income when transitioning from pre-retirement to retirement. We can see that for a 1-(*SD*) increase in the natural logarithm of net worth results in a 4.81-fold increase in the odds of perceived adequacy of retirement income, where b = 1.57*** (0.04).

When looking at what effect does the value of 'Log Retirement Accounts Value' have on the probability of perceived adequacy of retirement income, we can see that the coefficient of interest is not significant for pre-retirees, however, transitioning to retirement, it's significant ($^{***}p < 0.001$) and positive, which indicates that the variable increases the probability of perceiving adequate retirement income when transitioning from pre-retirement to retirement. We can see that for a 1-(*SD*) increase in the natural logarithm of retirement accounts value results in a 1.20-fold increase in the odds of perceived adequacy of retirement income, where b = 0.18*** (0.01).

When looking at what effect does the value of 'Log of Pension Accounts Value' have on the probability of perceived adequacy of retirement income, we can see that the coefficient of interest is significant (***$p < 0.001$) and positive for both pre-retirees and retirees, which indicates that the determinant increases the probability of perceiving adequate retirement income when transitioning from pre-retirement to retirement. We can see that the natural logarithm of pension account(s) value changes when transitioning from pre-retirement, where the estimate is b = 0.04*** (0.01) [0.03, 0.06] to retirement, where the estimate is b = 0.13*** (0.01) [0.12, 0.15]. We can see that the standard errors do not overlap, so they are statistically different from each other and zero at 95% confidence interval, where the determinant of 'Log of Pension Accounts Value' is more important, more significant, and the probability of perceiving adequate retirement income increases more when transitioning into retirement.

When looking at what effect does the value of 'Log Total Inheritance Amount Received' have on the probability of perceived adequacy of retirement income, we can see that the coefficient of interest is significant (***$p < 0.001$), negative for pre-retirees, while positive for retirees. The determinant in the model act as predictors of the dichotomous dependent variable, where a positive (negative) coefficient indicates that the variable increases (decreases) the probability of perceiving adequate retirement income in retirement. We can see that the natural logarithm total inheritance amount received changes when transitioning from pre-retirement, where the estimate is b = -0.04*** (0.01) [-0.07, 0.00] to retirement, where the estimate is b = 0.13*** (0.01) [0.11, 0.15].

We can see that the standard errors do not overlap, so they are statistically different from each other and zero at 95% confidence interval, where the determinant of 'Log Pension Accounts Value' is more important, more significant, and the probability of perceiving adequate retirement income increases more when transitioning into retirement.

When looking at what effect does the value of 'Log Inheritance Amount Expected' have on the probability of perceived adequacy of retirement income, we can see that the coefficient of interest is significant (*** $p < 0.001$) and negative for pre-retirees, however, not significant when transitioning to retirees. We can see that for a 1-(*SD*) increase in the natural logarithm inheritance amount expected results in an 18 percent decrease in the odds of perceived adequacy of retirement income, where b = -.20*** (0.04).

When looking at the marginal effect of financial-capital (homeowner, net worth, retirement account value, pension account value, inheritance received, and inheritance expected) determinants on perceived adequacy of retirement income transitioning from pre-retirement to retirement, we can see that respondents who are not accumulating financial capital are at risk of perceiving inadequate retirement income. Results from this study seem to show that the odds of homeowners perceived adequacy of retirement income increase by 13.33 times more likely, where b = 2.59*** (0.07) when transitioning from pre-retirement to retirement relative to non-homeowner respondents. From the selected sample, about 80 percent of retirees own their homes, and most have paid off their mortgage before retirement, hence making home equity one of the largest asset categories for low-and-middle-income retirees. The value for homeowners who pay off their mortgage by retirement reflects in the sentiment of retirement income adequacy from reducing the significant expenses of housing costs. In various retirement adequacy studies, home equity values assume with differently, Munnel, Hou & Webb (2014) include the amount of imputed rent as retirement income in the numerator of the replacement ratio and also as the denominator as a component of pre-retirement income, Hurd and Rohwedder (2012) assume that the household will retain the home until all other wealth is drawn out, and Bajtelsmit, Rappaport, and Wang (2015) also implies the family will preserve the home in the base case but analyzes other alternatives, such as downsizing the house and using a reserve mortgage to access the home equity. The benefits of homeownership, such as tax deduction, build equity, and provide a nest egg for the future are more significant in retirement since housing cost is the most expensive expenditure category (Banerjee, 2014). Home ownership without a mortgage increases the probability of having adequate retirement income and home equity represents a valuable potential resource available to finance expenditures during retirement through reverse mortgage mechanism. Results from this study are consistent with Scholz, Seshadri, and Khitatrakun (2006) research where they find that 84 percent of US households have enough savings to maintain their standard of living in retirement, a more optimistic assessment of the adequacy of household retirement adequacy comparing with other studies factoring Social Security, traditional pensions, and home equity.

Results from the selected sample show that around 30 percent of our sample on average received $61,139 in the inheritance with the range from zero to $334,630,000 and the standard deviation of $710,995. Researchers often do not include bequests as sources of income in retirement because they are not related to the retirement system or pre-retirement income. Results from this study seem to show that for the 1-*SD* increase in the natural logarithm of total inheritance amount received increase the probability of retirees perceived retirement income adequacy by 14 percent, where the estimate is b = 0.13*** (0.01). Recipients of inheritance households may consider converting these assets into an income stream in retirement as a form of a retirement income supplement to enhance retirement income adequacy.

According to the Social Security, Office of Retirement and Disability Policy Income of the Aged Chartbook (2014), majority (53.10%) of a retiree sources of income comes from Social Security (32.2%) and personal retirement account (20.9%), while 32.2 percent comes from current employment earnings and 9.7 percent comes from investments. Likewise, Springstead and Biggs (2008) study find that for all retirees ages 64 to 66 in 2005, combined Social Security and defined benefit pension benefits make up 49 percent of household incomes. Results from this study suggest that ownership of defined benefit and defined contribution plans, which overall contribute to ones' net worth, increases the probability of perceived adequacy of retirement income when transitioning from pre-retirement to retirement are consistent with empirical results reported by Yuh, Hanna, and Montalto (1998), Chen (2007), and Kim, Hanna, and Chen (2014). Pension ownership increases retirement income, thus increasing the probability of adequate income in retirement and it is consistent with previous studies of Li, Montalto, and Geistfeld (1996), Kotlikoff, Spivak, and Summers (1982). Results from this study are consistent with the National Retirement Risk Index, Munnell, Hou, and Sanzenbacher (2018) identify that 67 percent of working-age households that have no ownership in defined benefit/defined contribution plans are projected to be at risk of being unable to maintain their pre-retirement standard of living in retirement while 20 percent of sample households that have ownership with both a defined benefit and a defined contribution plan is projected to be at risk. However, only 65 percent of private sector workers had access to a retirement plan through their employer, and just 48 percent participated in the plan as of 2014. For full-time employees, more than 25 percent lack access to an employer-sponsored retirement plan, and more than 40 percent did not participate in one. These numbers have declined substantially since 2000. Long-term analysis studies indicate that the share of private sector employees with access to workplace retirement plans is lower now than it was in the late 1980s (Miller, Madland, & Weller, 2015). Individuals who have access to defined benefit and defined contribution plans at work when young and employed are encouraged to participate and to take advantage of these opportunities to accumulate financial resources in preparation for an adequate retirement. One of the factors commonly associated with retirement inadequacy is financial illiteracy. Financial educators, counselors, and planners are to create financial education programs for workers and raise awareness of available pension programs, encourage and facilitate participation, and assist workers in accessing the adequacy of their retirement savings.

A graphical representation of the marginal effect of financial attitudes determinants (planning horizon for saving and spending and feelings about investment return and risk,) on perceived adequacy of retirement income in pre and post retirement is shown in Figure 7.

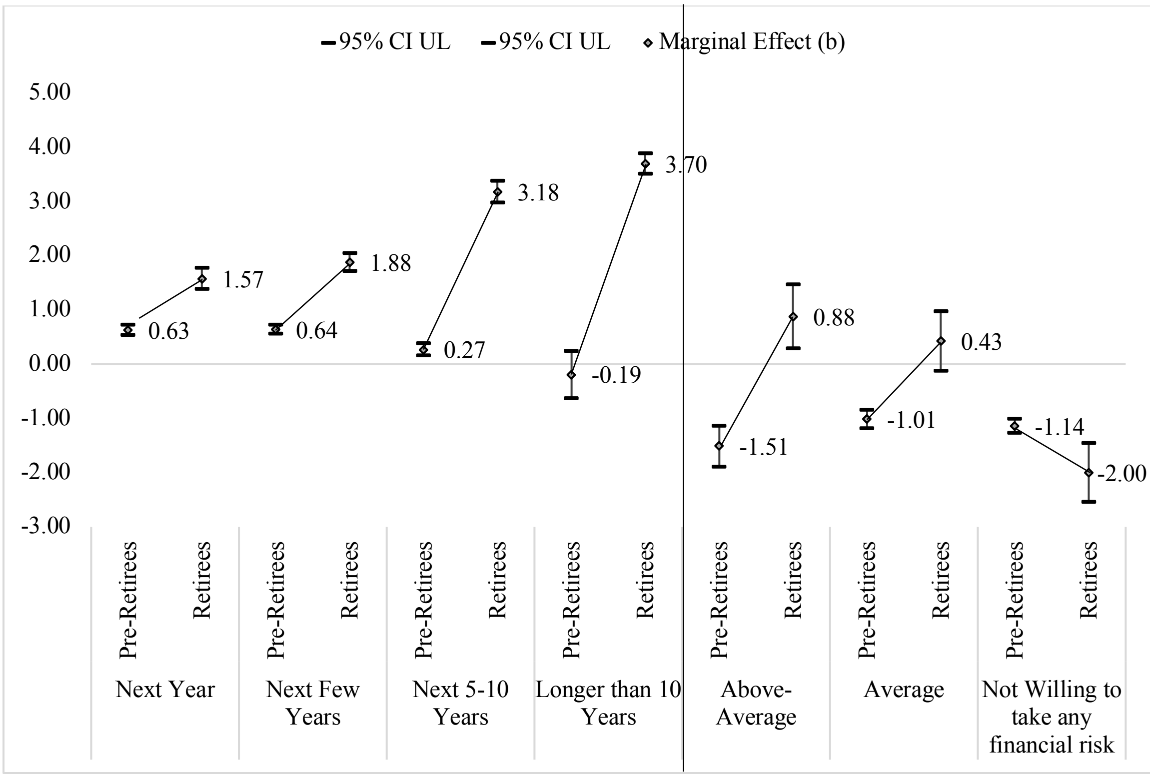

Figure 7: The Marginal Effect of Financial Attitudes on Perceived Adequacy of Retirement Income in Pre and Post Retirement

As shown in Table 3 (continued) and its graphical representation in Figure 7, when looking at what effect of the values of 'Planning Horizon for Saving and Spending' such as 'Next Year', 'Next Few Years', 'Next 5-10 Years', 'Longer than 10 Years' relative to 'Next Few Months' have on the probability of perceived adequacy of retirement income, we can see that the coefficients of interests are positively sloped and statistically significant at ***$p < 0.001$ in both stages, except for one variable, 'Longer Than 10 Years' in the pre-retirement stage. We can see that the coefficients of interests change to more sharply positive slopped when transitioning from pre-retirement into retirement. For example, the estimate for planning horizon for saving and spending in the 'Next Year' respondent is b = 0.63*** (0.05) [0.54, 0.73] in pre-retirement and b = 1.57*** (0.10) [1.38, 1.77] when transitioning into retirement, 'Next Few Years' b =

0.64*** (0.04) [0.56, 0.72] versus b = 1.88*** (0.08) [1.72, 2.04], 'Next 5-10 Years' b = 0.27*** (0.06) [0.16, 0.38] versus b = 3.18*** (0.10) [2.98, 3.38], and 'Longer than 10 Years' is statistically insignificant versus b = 3.70*** (0.10) [3.51, 3.89], respectively. We can see that the standard errors do not overlap, so they are statistically different from each other and zero at 95% confidence interval, where the determinants of longer than 'Next Few Month' in Planning Horizon for Saving and Spending are more important, more significant, and the probability of perceiving adequate retirement income increase sharply when transitioning from pre-retirement into retirement.

When looking at what effect of the values of 'Feelings about Investment Return and Risk' such as 'Above-Average', 'Average', 'Not willing to take any financial risk' relative to 'Substantial' have on the probability of perceived adequacy of retirement income, we can see that the coefficients of interests are statistically significant (***p < 0.001) in both stages, except for one variable, 'Average' in the retirement stage. We can see that the estimates of the determinants are transitioning from negatives in the pre-retirement stage to positives in the retirement stage for financial risk takers, while continue to stay in the negative slopped for non-financial risk takers. In this case, respondents who were willing to take 'Above-Average' financial risks expecting to earn above-average returns in pre-retirement stage, the coefficient of interest is b = -1.51*** (0.19) [-1.89, -1.14], and in retirement stage, the coefficient of interest is b = 0.88*** (0.30) [0.29, 1.47], while, for respondents who were not willing to take any financial risks, b = -1.14*** (0.07) [-1.27, -1.01] versus b = -2.00***(0.28) [-2.54, -1.46], respectively. We can see that the standard errors do not overlap, so they are statistically different from each other and zero at 95% confidence interval, where the determinants of

'Above-Average' and 'Not willing to take any financial risk' are more important, more significant, and the probability of perceiving adequate retirement income increases more when transitioning into retirement for 'Above-Average' financial risk taker and vice versa for 'Not willing to take any financial risk' respondent relative to respondent who is willing to take 'Substantial' risks expecting to earn 'Substantial' returns.

A graphical representation of the marginal effect of usual saving habits on perceived adequacy of retirement income in pre and post retirement is shown in Figure 8.

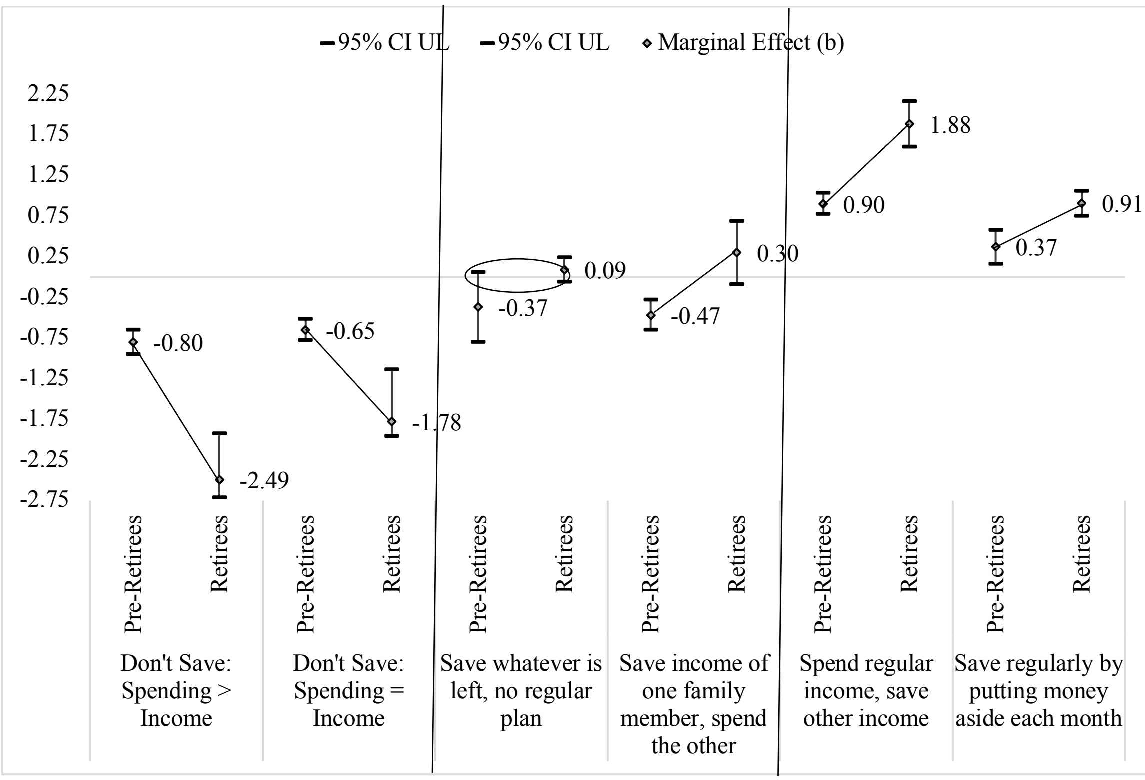

Figure 8: The Marginal Effect of Usual Saving Habits on Perceived Adequacy of Retirement Income in Pre and Post Retirement

When looking at what effect of the values of 'Usual Saving Habits' such as 'Don't Save', 'Save Irregularly', 'Save Regularly' relative to 'Otherwise' have on the probability of perceived adequacy of retirement income, as shown in Table 3 (continued) and its graphical presentation in Figure 8, we can see that the coefficients of interests are statistically significant in both stages where ***p < 0.001, except for variable, 'Save Irregularly' in both retirement stages. We can see that the estimates are sharply slopped in the same direction when transitioning from pre-retirement to retirement. In this case, the coefficient of interest for respondent who (1) don't save - usually spend more than income in pre-retirement is b = -0.80*** (0.08) [-0.95, -0.65] and b = -2.49*** (0.11) [-2.71, -1.93] when transitioning into retirement, while (2) don't save - usually spend about as much as income is b = -0.65*** (0.07) [-0.78, -0.52] and b = -1.78*** (0.09) [-1.96, -1.14], respectively. We can see that the standard errors do not overlap, so they are statistically different from each other and zero at 95% confidence interval, where the determinants of (1) don't save - usually spend more than income and (2) don't save - usually spend about as much as income are more important, more significant, and the probability of perceiving adequate retirement income decreases when transitioning from pre-retirement into retirement. Conversely, the coefficient of interest for respondent who (5) save income of one family member, spend the other in pre-retirement is b = 0.90*** (0.07) [0.77, 1.03] and b = 1.88*** (0.14) [1.60, 2.16] when transitioning into retirement, while (6) save regularly by putting money aside is b = 0.37*** (0.11) [0.16, 0.58] and b = 0.91*** (0.08) [0.75, -1.06], respectively. We can see that the standard errors do not overlap, so they are statistically different from each other and zero at 95% confidence interval, where the determinants of (5) spend regular income, save other income and (6) save regularly by putting money aside each month are more important, more significant, and the probability of perceiving adequate retirement income increases sharply when transitioning from pre-retirement into retirement.

When looking at the marginal effect of financial attitude (planning horizon for saving and spending, feelings about investment return and risk, and usual saving habits) on perceived adequacy of retirement income transitioning from pre-retirement to retirement, we can see that respondents with short-term financial planning horizon, not willing to take any financial risk, and non-saver are at risk of perceiving inadequate retirement income in retirement. Results from this study are consistent with Hurd and Rohwedder (2012) on long-term planning horizon is positively associated with retirement income adequacy, where they identify that the lowest rates of retirement preparedness are among people with shortest financial planning horizons. Households can adopt the habit of planning for saving and spending long-term, which can help reduce unexpected significant expenses or shocks, and in turn, increases the probability of retirement income adequacy. Results from our study are consistent with Hatcher (1997) and Yuh, Hanna, and Montalto (1998) study where individuals who adopt regular saving habits while young and employed to increase ones' saving rates to accumulate enough financial resources needed for retirement requirements during retirement. Results from this study are consistent with DeVaney and Zhang (2001); Chen and DeVaney (2002); DeVaney and Chiremba (2005); Yao, Gutter, and Hanna (2005); Hanna, Wang, and Yuh (2010) on risk tolerance positively related to retirement savings behavior and is among the most influential factors in having a large amount save for retirement. Risk tolerance is a crucial factor that influences a wide range of personal financial decisions (Snelbecker, Roszkowski, & Cutler, 1990). Risk tolerance is an underlying factor within financial planning models, investment suitability analyses, and consumer decision frameworks. The debt versus savings decision individuals regularly make, the type of mortgage selected, and the use and management of credit cards are examples of situations where a person's financial risk tolerance can influence behavior (Campbell, 2006). Households partake in financial risks early to lessen the fear of investment, learn about investment risk, and become financially savvy, and to borrow from Campbell (2006), a better understanding of risk tolerance may contribute to definitions of financial literacy, as well as help explain why individual households maximize wealth accumulation over time while others do not.

Implications

The problem of outliving one's retirement savings is most pressing for those already in or about to enter retirement. Although there is no real substitute for a lifetime of wise financial planning and dutiful saving, options do exist that can help supplement one's later-in-life income and emergency preparedness. Results from this study shred insights on the determinants that affect perceived adequacy of retirement income where pre-retirees, financial educators, counselors, planners, and policymakers can glean on to gain perspectives in their decision making.

Implications for Pre-Retirees

Pre-retirees themselves can strive for a more financially secure retirement by planning and preparing for it. One option is to take advantage of home equity. In a report commissioned by the Bipartisan Policy Center (BPC), researchers found that the net worth of half of all homeowners 62 and older is in their homes; they are "home-rich, but cash-poor." Results from this study seem to show that the odds of homeowners perceived adequacy of retirement income increase by 13.33 times more likely, where b = 2.59*** (0.07) when transitioning from pre-retirement to retirement relative to non-homeowner respondents. From selected sample, about 80 percent of retirees own their homes, and most have paid off their mortgage before retirement, hence making home equity one of the largest asset categories for low-and-middle-income retirees. Homeowners may access their home equity via a home equity line of credit or reverse mortgage as a form of supplement to one's retirement income.

Another option in planning and preparing for a more financially secure retirement is to investment in education, especially with financial education. Studies have found that many Americans are financially illiterate, with a large percentage of households unfamiliar with the basic economic concepts necessary for making decisions about investing and saving. The problem is seen to be particularly acute among those who are most economically vulnerable, such as minorities, women, and those with the least education. Not surprisingly, those who are least financially literate are also the least likely to be well-prepared financially for retirement. More specifically, financially literate Americans are more likely to plan for their retirements, and planners are better prepared for retirements—with significantly higher wealth levels—than nonplanners (Lusardi and Mitchell, 2007 and 2011). Results from this study suggest that college educated respondents are more likely to perceived adequate retirement income in retirement. For example, the odds of a Bachelor's Degree or Higher respondent perceived adequacy of retirement income is 22.87 times more likely, where b = 3.13*** (0.09) relative to a No High School Diploma/GED respondent. Hence, increase education, particularly on matters of personal finance, has also been shown to be effective in improving retirement security, where more critical knowledge of personal finance leads to greater awareness for the issue of retirement security, and ultimately smarter decision-making when it comes to proper retirement planning.

Implications for Financial Educators, Counselors, and Planners

Many findings in this study can be used by financial educators, counselors, and planners to increase the probability that clients will perceive the adequacy of retirement income. Save regularly significant increases the likelihood of perceived adequacy of retirement income. Financial planners and retirement counselors can stress the importance of establishing to save periodically habit to clients in preparation for retirement. Ownership of defined benefit and defined contribution plans significantly increases the likelihood of perceived adequacy of retirement income. One of the factors commonly associated with retirement inadequacy is financial illiteracy, that is, those who fail to understand basic economic and financial concepts may lack adequate tools for determining how—and how much—to save, as well as how to draw down assets in retirement. Financial education programs for workers can raise awareness of available pension programs, encourage and facilitate participation, and assist workers in accessing the adequacy of their retirement savings. Poor health significantly decreases the likelihood of perceived adequacy of retirement. One of the significant expenses in retirement years is unexpected health expenditures, out-of-pocket health spending (Benerjee, 2014). Financial planners when working clients to consider substantial unanticipated costs, such as, unexpected medical expenses, that are not part of the households' regular budget to create a more robust and realistic retirement plan for clients. Long-term financial planning horizon significantly increases the likelihood of perceived adequacy of retirement income, and therefore the importance of aggressively planning for retirement and starting the planning process early need to be emphasized.

Implications for Policy Makers

It is important that policy makers understand the influence of pre-retirement determinants on post-retirement income adequacy. This could serve as a background for policy formation, and more broadly, in understanding the process of economic well-being among the older population. Policy makers should pay special attention to sub-groups of women, minorities, non-homeowners, less educated when formulating retirement policies. Women are living longer and many are in danger of outliving their economic resources. Policy makers concerned with aiding the well-being of retirees should take into consideration that minorities, non-homeowners, less educated are not active in preparing for retirement. While intervention aimed at increasing participating in retirement preparation should continue to be vigorously supported, the recurrence of this finding infers that the problem is deeper and more systemic in nature than simply increasing an awareness for participation.

CHAPTER 4: CONCLUSION

There is no simple indicator of income adequacy in retirement, whether it is as an objective or subjective measurement. Objective measurement of retirement income adequacy generally falls under two definitions: (1) whether retirement income meets the basic needs for living and (2) whether it allows retirees to maintain their pre-retirement standard of living. Results from this literature review of the selected retirement income adequacy studies show a range of 16 percent to 70 percent of sample households are projected to experience inadequate retirement income in retirement. Question X3023 observes subjective measurement of retirement income adequacy in the Survey of Consumer Finances (SCF) shows that 23 percent of pre-retirees (age 55-64), 20 percent of retirees (age 65-74), 33 percent of working-age (age 35-58), and 29 percent of all households (age 18-95) perceive inadequate retirement income in the most recent 2016 SCF. Results from the subjective assessment of retirement income adequacy seem to suggest that households are more optimistic toward their retirement adequacy comparing with the objective assessment.

Given the nature of this study sample selection of households age range from 55-74, our sample is part of the "senior sandwich generation". The "senior" in the sandwich concept is created because the men and women in the middle-aging boomers—are involved with their older-age planning and preparation, sandwiched between (i) traditional responsibilities for their children (including adult children) simultaneously with (ii) new responsibilities for long-lived elder parents (Wassel, 2006; Spillman & Pezzin, 2000; Neal & Hammer, 2007). The traditional concept of a sandwiched generation was introduced in the 1980s by Eileen Brody who referred to women (with a few male caregivers) in their 40s sandwiched between raising young children and caregiving for “older” parents mainly in their 60s and 70s. Family size has always been a critical factor affecting household investment decision-making behavior (Browning, 1992). Parker and Patten (2013) find that in 2005 around 12 percent of middle-aged adults were providing financial support to both an aging parent and a child and by 2012 that number had increased to 15 percent. The selected sample of this study is part of an overwhelmed generation that is caught between the demands of an older and younger generation.

This study aims to explain the determinants of perceived adequacy of retirement income by looking at a matched sample of pre-retirees and post-retirees to see what the determinants of post-retirement income adequacy are related to. The importance of identifying the determinants associated with post-retirement income adequacy is in turn identifying determinants related to economic well-being and financial capability older people. Results from this study provide a road map to perceived adequacy of retirement income from households who are in the first stage of retirement, and it serves as planning guidance for other households to achieve retirement income adequacy.

Given the nature of this study looking at a matched sample of pre-retirees and post-retirees, the determinants that effect perceived adequacy of retirement for the first stage of retirement households can be divided into two categories, factors that households can control and factors that households cannot control. For instance, gender, race, education, and inheritance received are determinants that households cannot control, while income, health, net worth, marital status, homeownership class, ownership of defined benefit and/or defined contribution plans, financial planning horizon, financial risk tolerance, and saving habits are factors that households can control.

Results from this study show that households led with minimum education attainment, non-white, female are at risk for retirement income adequacy. Results from this study are consistent with Munnell, Hou, and Sanzenbacher (2018) on race/ethnicity, where Black and Hispanic households are more at risk of unable to maintain their standard of living in retirement than White households. Results from this study are consistent with Malroutu and Xiao (1995), Chan, Ofstedal and Hermalin (2002), Hurd and Rohwedder (2012) on education is positively associated with retirement income adequacy.

On the contrary, there are many determinants relate to post-retirement income adequacy that households can influence to improve the probability of adequately prepared for retirement. Households can start planning and preparing for retirement parallel to their stage in the lifecycle matching Life Cycle Saving Model, where assets are mainly accumulated during an individual's work life to finance consumption during retirement, which means that an individual will save while young and employed, then dissave when old and retired (Ando & Modigliani, 1963).

Results from the probit analysis show retired (first stage of retirement) respondents have sufficient net worth and income, homeowners, in good health, savers, financial risk taker, long-term financial planner, recipients of inheritances, have defined benefit pension plan, and/or owned a defined contribution plan are more likely to perceive their retirement income to be adequate than otherwise similar households.

Results from this study are consistent with Hurd and Rohwedder (2012) on long-term planning horizon is positively associated with retirement income adequacy, where they identify that the lowest rates of retirement preparedness are among people with shortest financial planning horizons. Households can adopt the habit of planning for saving and spending long-term, which can help reduce unexpected significant expenses or shocks, and in turn, increases the probability of retirement income adequacy.

Results from this study are consistent with VanDerhei (2012), Munnell, Hou, and Sanzenbacher (2018), Hurd and Rohwedder (2012), Scholz, Seshadri, and Khitatrakun (2006) on income is positively associated with retirement income adequacy, where low-income households are at the highest risk of not having enough resources to maintain pre-retirement consumption, or necessary expenses, including health expenses throughout retirement. Pre-retirees households can adopt regular saving habits while young and employed to increase ones' saving rates to accumulate enough financial resources needed for retirement requirements during retirement (Hatcher, 1997; Yuh, Hanna, & Montalto, 1998).

Results from this study suggest that ownership of defined benefit and defined contribution plans increase the probability of perceived adequacy of retirement income and are consistent with empirical results report by Yuh, Hanna, and Montalto (1998), Chen (2007), and Kim, Hanna, and Chen (2014). Pension ownership increases retirement income, thus increasing the probability of adequate income in retirement and it is consistent with previous studies of Li, Montalto, and Geistfeld (1996), Kotlikoff, Spivak, and Summers (1982). Results from this study are consistent with the National Retirement Risk Index, Munnell, Hou, and Sanzenbacher (2018) identify that 67 percent of working-age households that have no ownership in defined benefit/defined contribution plans are projected to be at risk of being unable to maintain their pre-retirement standard of living in retirement while 20 percent of sample households that have ownership with both a defined benefit and a defined contribution plan is projected to be at risk. Households who have access to defined benefit and defined contribution plans at work when young and employed are encouraged to participate and to take advantage of these opportunities to accumulate financial resources for retirement prepared.

Homeownership is significant determinants relate to post-retirement income adequacy. From our sample, about 80 percent of retirees own their homes, and most have paid off their mortgage before retirement, hence making home equity one of the largest asset categories for low-and-middle-income retirees. The benefits of homeownership, such as tax deduction, build equity, and provide a nest egg for the future are more significant in retirement since housing cost is the most expensive expenditure category (Banerjee, 2014). Home ownership without a mortgage increases the probability of having adequate retirement income and home equity represents a valuable potential resource available to finance expenditures during retirement through reverse mortgage mechanism. Results from this study is consistent with Scholz, Seshadri, and Khitatrakun (2006) research where they find that 84 percent of US households have enough savings to maintain their standard of living in retirement, a more optimistic assessment of the adequacy of household retirement adequacy comparing with other studies factoring Social Security, traditional pensions, and home equity.

Results from this study are consistent with DeVaney and Zhang (2001); Chen and DeVaney (2002); DeVaney and Chiremba (2005); Yao, Gutter, and Hanna (2005);

Hanna, Wang, and Yuh (2010) on risk tolerance positively related to retirement savings behavior and is among the most influential factors in having a large amount save for retirement. Risk tolerance is a crucial factor that influences a wide range of personal financial decisions (Snelbecker, Roszkowski, and Cutler, 1990). Households partake in financial risks early to lessen the fear of investment, learn about investment risk, and become financially savvy, and to borrow from Campbell (2006), a better understanding of risk tolerance may contribute to definitions of financial literacy, as well as help explain why specific households maximize wealth accumulation over time while others do not.

Health is a significant determinant that is related to post-retirement income adequacy, and it is highly likely that individuals can influence this factor to improve the probability of retirement income adequacy. Results from this study are consistent with Hurd and Rohwedder (2012) on health is positively associated with retirement income adequacy. They find that households who self-report being in only fair or poor health are also disproportionately at risk, with only 38 percent of that group being able to maintain their standard of living throughout retirement with 95 percent or greater certainty. According to the Employee Benefit Research Institute (ERBI)'s recent analysis of household spending by age cohort in the Health and Retirement Study, Banerjee (2014) shows that consumption declines with age, while health expenditure remains one of the most significant expenses in retirement. Households can adopt healthy living to reduce health expenditure cost in retirement, while financial security and health have long been recognized as part of a successful retirement.

While researchers may not share the same method in measuring retirement adequacy, there is a widespread consensus on the groups most at risk of financial insecurity in retirement. Single persons, women, minorities, low income, low education, poor health, workers without an employer-sponsored pension, and renters are all at risk of insufficient resources to maintain the pre-retirement consumption level in their retirement years (Korczyck, 2008; Montalto, 2000; Munnel, 2004; Munnell, Golub-Saas, Soto & Webb, 2008). The importance of this research is helped to design targeted programs to improve retirement adequacy and financial literacy program, recognizing that one size does not fit all.

REFERENCES CITED

Ando, A., & Modigliani, F. (1963). The "Life-Cycle" Hypothesis of Saving: Aggregate Implications and Tests. *American Economic Review*, 53, 55-84.

Aon Hewitt (2015). "*The Real Deal: 2015 Retirement Income Adequacy at Large Companies.*"

Attanasio, O., & Weber, G. (2010). Consumption and Saving: Models of Intertemporal Allocation and Their Implications for Public Policy. *Journal of Economic Literature*, vol. 48, no.3. pp. 693–751

Bajtelsmit, V., Rappaport, A., & Foster, L. (2013). Measures of Retirement Benefit Adequacy: Which, Why, for Whom, and How Much? Society of Actuaries, Pension Section and Pension Section Research Committee.

Bajtelsmit, V., Rappaport, A., & Wang, A. (2015). Challenges and Strategies for Financing an Increasingly Long Life. White paper. Chicago: Society of Actuaries.

Banerjee, S. (2014). "How Does Household Expenditure Change with Age for Older Americans?" *EBRI Notes* 35(9).

Board of Governors of the Federal Reserve System (2016). "Report on the economic well-being of U.S. households in 2015". 59-60.

Bodie, Z., Treussard, J., & Willen, P. S. (2007). The Theory of Life- Cycle Saving and Investing, Public Policy Discussion Paper No. 07-3. Federal Reserve Bank of Boston.

Bricker, J., et al. (2017). "Changes in U.S. Family Finances from 2013-2016: Evidence from the Survey of Consumer Finance." *Federal Reserve Bulletin*. Vol. 103, No. 3.

Brody, E. M. (1981). "Women in the middle and family help to older people." *The Gerontologist.*

Browning, M. (1992). Children and Household Economic Behavior. *Journal of Economic Literature* 30 (3): 1434-75.

Browning, M., & Crossley, T. F. (2001). The Life- Cycle Model of Consumption and Saving. *Journal of Economic Perspectives*, vol. 15, no.3, pp. 3–22.

Browning, M., & Lusardi, A. (1996) Household Saving: Micro Theories and Micro Facts. *Journal of Economic Literature*, 34, 1797-1855.

Campbell, J. Y. (2006). Household Finance. *Journal of Finance,* 61 (4), 1553–1604.

Chan, A., Ofstedal, M. B., & Hermalin, A. I. (2002). Changes in subjective and objective measures of economic well-being and their interrelationship among the elderly in Singapore and Taiwan. *Social Indicators Research*, 57, 263–300.

Chen, C. C. (2007). "Changes in retirement adequacy, 1995-2004: Accounting for retirement stages." Dissertation, The Ohio State University.

Chen, Z., & DeVaney, S. A. (2002). What Factors Affect the Household Net Worth of Employees and Business Owners? *Financial Services Review*, Volume 11, Number 4, pp. 381-91.

DeVaney, S. A., & Zhang, T. C. (2001). A cohort analysis of the amount in defined contribution and individual retirement accounts. *Financial Counseling and Planning*, 12, 89–102.

DeVaney, S. A., & Chiremba, S. T. (2005). "Comparing the retirement savings of the baby boomers and other cohorts." Compensation and Working Conditions.

Diener, E., & Suh, E. M. (1997). Measuring quality of life: Economic, social and subjective indicators. *Social Indicators Research*, 40(1–2), 189–216.

Employee Benefit Research Institute (ERBI). (2016). "Summary Description of the Employee Benefit Research Institute's Retirement Security Projection Model." ebri.org.

Favreault, M. M., Johnson, R. W., Smith, K.E., & Zedlewski, S. R. (2012). "Boomers' Retirement Income Prospects." *Urban Institute*. Brief no. 34.

Fethke, C. C. (1989). "Life-Cycle Models of Saving and the Effect of the Timing of Divorce on Retirement Economic Well-Being." Journal of Gerontology 44(3): S121-S128

Gale, W. G, Scholz, Karl, J. & Seshadri, K. (2009), "Are All Americans Saving "Optimally" for Retirement?"

Government Accountability Office (2015). "Retirement Security: Most Households Approaching Retirement Have Low Savings." GAO-15-419.

———. (2016). "Retirement Security: Better Information on Income Replacement Rates Needed to Help Workers Plan for Retirement." GAO-16-242

Hanna, S. D., Wang, C., & Yuh, Y. (2010). Racial/ethnic differences in high return investment ownership: A decomposition analysis. *Journal of Financial Counseling and Planning*, 21 (2), 44–59.

Hatcher, C. B. (1997). A model of desired wealth at retirement, *Financial Counseling and Planning*, 8(1), 57-64.

Hayes, A. F. (2018). Introduction to mediation, moderation, and conditional process analysis. (2nd Ed.). New York: The Guilford Press.

Hurd, M., & Rohwedder, S. (2012). Economic Preparation for Retirement. *Investigations in the Economics of Aging*, ed. David A. Wise. Chicago: University of Chicago Press, 77-113.

———. 2015. "Measuring Economic Preparation for Retirement: Income versus Consumption." Working paper 2015-332. Ann Arbor: Michigan Retirement Research Center.

Imbens, G.W (2004). Nonparametric estimation of average treatment effects under exogeneity: A review. *The Review of Economics and Statistics*.86:4–29.

Katona, G. (1975). Psychological economics. New York: Elsevier.

Kazdin, A.E. (2000). Encyclopedia of Psychology.

Kessler, G. (2014). "Do 10,000 baby boomers retire every day?" The Washington Post.

Kim, K., Hanna, S. D., & Chen, S. C. (2014). Consideration of retirement income stages in planning for retirement. *Journal of Personal Finance*, 13(1), 52–64.

Korczyk, S. (2008). Who is ready for retirement, how ready, and how can we know? AARP Public Policy Research Report.

Kotlikoff, L. J., Spivak, A., Summers, L.H. (1982). The adequacy of savings. *The American Economic Review*, 72(5). 1056-1069.

Li, J. P., Montalto, C. P. & Geistfeld, L. V. (1996). Determinants of financial adequacy for retirement. *Financial Counseling and Planning*, 7, 39-48.

Litwin, H., & Sapir, E. V. (2009). Perceived income adequacy among older adults in 12 countries: Findings from the survey of health, ageing, and retirement in Europe. *The Gerontologist*, 49, 397–406.

Lusardi, A., & Mitchell, O. S. (2007). Baby boomer retirement security: The roles of planning, financial literacy, and housing wealth. *Journal of monetary Economics*, 54(1), 205-224.

——— . (2011). “Financial literacy and planning: Implications for retirement wellbeing.” NBER working paper, No. 17078

MacDonald, B. J., & Moore, K. D. (2011). “Moving Beyond the Limitations of Traditional Replacement Rates.” Society of Actuaries

Malroutu, Y. L., & Xiao, J. J. (1995). Perceived adequacy of retirement income. *Journal of Financial Counseling and Planning*, 6(1), 17–23.

McCarthy, J. (2016). “Americans Financial Worries Edge Up in 2016.” GALLUP

Miller, K., Madland, D., & Weller, C. E. (2015). “The Reality of the Retirement Crisis.” Center for American Progress.

Modigliani, F., & Brumberg, R.H. (1954) Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data. In: Kurihara, K.K., Ed., Post-Keynesian Economics, *Rutgers University Press*, New Brunswick, 388-436.

Montalto, C. P. (2000). Retirement savings of American households: Asset levels and adequacy. Report to the Consumer Federation of America Columbus, Ohio: The Ohio State University.

Munnell, A. H. (2004). Why are so many older women poor? JTF#10. Center for Retirement Research at Boston College.

Munnell, A. H., Soto, M., Webb, A., Golub-Sass, F., & Muldoon, D. (2008). Health care costs drive up the national retirement risk index. *Center for Retirement Research Issue Brief,* #8-3.

Munnell, A. H., Hou, W., & Webb, A. (2014) NRRI Update Shows Half Still Falling Short. Center for Retirement Research at Boston College, Number 14-20.

Munnell, A. H., Hou, W., & Sanzenbacher, G. T. (2018). National Retirement Index Shows Most Improvement in 2016. Center for Retirement Research at Boston College, Number 18-1.

Neal, M.B., Hammer, L.B., (2007). Working Couples Caring for Children and Aging Parents: Effects on Work and Well-being. Lawrence Erlbaum Associates, Inc., Publishers, Mahwah, NJ.

Oakley, D., & Kenneally, K. (2017) Retirement Security 2017: Americans' Views of Retirement of the Crisis and Solutions. National Institute on Retirement Security. 1-34

Parker, K., Patten, E. (2013). The Sandwich Generation: Rising Financial Burdens for Middle-Aged Americans. PEW Research Center, Social and Demographic Trends.

Rhee, N., & Boivie, N. (2015). "The Continuing Retirement Savings Crisis. National Institute on Retirement Security." Washington, D.C.

Rosenbaum P.R., & Rubin D.B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*. 70:41–55.

———. (1985) Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician*. 39:33–38.

Saad, Lydia (2016). "Three in 10 U.S. Workers Foresee Working Past Retirement Age." GALLUP

Scholz, J. K, Seshadri, A., & Khitatrakun, S. (2006), Are Americans Saving 'Optimally' for Retirement? *Journal of Political Economy*. vol. 114, no. 4. 607-643.

——— . (2009). What Replacement Rates Should Households Use? Working Paper 2009-214. Michigan Retirement Research Center.

Schultz, J., & Nickerson, D. (2013). Unfunded Obligation and Transition Cost for the OASDI Program. *Actuarial Note 2013.1*. Social Security Administration, Office of the Chief Actuary.

Schulz, J. H. (1992). The Economics of Aging. Westport, CT: Auburn House.

Snelbecker, G. E., Roszkowski, M. J., & Cutler, N. E. (1990). Investors' risk tolerance and return aspirations, and financial advisors' interpretations: A conceptual model and exploratory data. *The Journal of Behavioral Economics*, 19 (4), 377–393.

Spillman, B.C., & Pezzin, L.E., (2000). Potential and active family caregivers: changing networks and the "Sandwich Generation". *The Milbank Quarterly* 78, 347–374.

Springstead, G., & Biggs, A. G. (2008). Alternate Measures of Replacement Rates for Social Security Benefits and Retirement Income *Social Security Bulletin*, Vol. 68, No. 2, 2008.

U.S. Census Bureau. (2014). Projections of the Population by Sex and Selected Age Groups for the United States: 2015 to 2060.

U.S. Government Accountability Office. (2015). Gao-15-419, Retirement Security—Most Households Approaching Retirement Have Low Savings.

VanDerhei, J.(2006). "Measuring Retirement Income Adequacy: Calculating Realistic Income Replacement Rates," *EBRI Issue Brief No. 297*

———. (2012). "Retirement Income Adequacy for Boomers and Gen Xers: Evidence from the 2012 EBRI Retirement Security Projection Model." *EBRI, Notes, vol. 33, no. 5*

———. 2014(a) "What Causes EBRI Retirement Readiness RatingsTM to Vary: Results from the 2014 Retirement Security Projection Model®," *EBRI Issue Brief*, no. 396.

———. 2014(b) "Retirement Plans and Prospects for Retirement Income Adequacy." White paper PRC WP2014-06. Pension Research Council, The Wharton School, University of Pennsylvania,

———. 2015. *"*How Much Needs to Be Saved for Retirement after Factoring In Post-Retirement Risks," *EBRI Notes*, no. 3

Warshawsky, M. J. (2015), "The Retirement Crisis Controversy," Tax Notes.

Wassel, J. I. (2006). Financial Planning and the 'Senior Sandwich' Generation. *Journal of Financial Service Professionals* 60, No. 2: 22-26

Yao, R., Gutter, M. S., & Hanna, S. D. (2005). The financial risk tolerance of Blacks, Hispanics and Whites. *Journal of Financial Counseling and Planning*, 16 (1), 51–62

Yuh, Y., Hanna, S. D., & Montalto, C. P., (1998). Are Americans prepared for retirement? *Financial Counseling and Planning*, 9(1), 1–12.