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Essays on Macroeconomics and Financial Economics

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ESSAYS ON MACROECONOMICS AND FINANCIAL ECONOMICS

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by

Maryam Aljahani

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To: Dean John F. Stack, Jr
Steven J. Green School of International and Public Affairs

This dissertation, written by Maryam Aljahani, and entitled Essays on Macroeconomics and Financial Economics, having been approved in respect to style and intellectual content, is referred to you for judgment.

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DEDICATION

To my dear husband, my beautiful children, and my mother's soul.

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ABSTRACT OF THE DISSERTATION

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Professor Cem Karayalcin, Major Professor

This dissertation comprises of three Essays. The first essay classifies households as savers and borrowers based on their wealth during the credit cycle. It examines the wealth effects of the saving and housing decisions of heterogeneous households over a credit cycle. To do so, we employ the Difference-in-Difference estimator and find evidence of a significant difference between the wealth effect for savers and borrowers. In the second essay, we examine the extent to which credit-constrained households are able to accumulate wealth when the macro environment is characterized by the presence of a liquidity trap and borrowing constraints. Our evidence highlights the importance of credit constraints in modeling household saving behavior. In the third essay, we evaluate the role of education, household composition, health expenditures, and bequest motives in determining retiree wealth. We find that the bequest motive positively affects the wealth of retirees as they save more and accumulate assets to ensure that their offspring inherit part of their wealth.

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ABBREVIATIONS AND ACRONYMS

2SLAD Two-Stage Least Absolute Deviations

2SLS Two-Stage Least Squares

HRS Health and Retirement Study

MPC Marginal Propensity to Consume

OLS Ordinary Least Squares

PIH Permanent Income Hypothesis

PSID Panel Study of Income Dynamics

SCF Survey of Consumer Finances

CHAPTER 1

Introduction

The central theme of the first essay is the linkage between the wealth effect of credit cycles and constraints on households' savings and wealth accumulation. According to the Case-Shiller index, houses in large cities lost more than 30 percent of their value during the housing market collapse of 2008, when, for instance, the price of an average house dropped by more than 50 percent in the Detroit metropolitan area. This decline created opportunities for households who had accumulated assets to purchase houses at lower prices. To examine the effects of the saving and housing decisions of heterogeneous households over a credit cycle, we hypothesize that the housing assets of savers appreciate more than those of borrowers, with savers thus accumulating more wealth than the borrowers. These hypotheses are tested using the Difference-in-Difference approach. The evidence shows that the houses owned by savers appreciated, and their wealth increased significantly, while the borrowers experienced significant changes in the opposite direction.

In the second essay, we shed light on how saving decisions respond to credit constraints. Specifically, the research is concerned with the nexus between household savings for asset accumulation and precautionary purposes on the one hand and credit constraints on the other. A crucial finding of this study is that credit constraints preclude households from accumulating wealth, and researchers should account for credit constraints when modeling household saving behavior.

In the third essay, we analyze the role of education, health expenditures, and bequest motives on retiree wealth. We find evidence that while bequest motives positively affect retiree wealth, education, medical expenditures, and household composition have no significant effect on wealth.

CHAPTER 2

The Saving & Housing Decisions of Heterogeneous Households in Credit Cycles

2.1 Introduction

According to the Case-Shiller index[1], houses in large cities lost more than 30% of their value during the housing market collapse of 2008. For example, the average price of a house fell by more than 50% in the Detroit metropolitan area. This decline created opportunities for households to purchase houses at lower prices.

Recent empirical studies (e.g., Fligstein and Rucks-Ahidiana, (2016), Kennickell (2012), Pfeffer et al. (2013)) document the differential wealth effects of the Great Recession on the US households. These findings focus on the US household leveraging (Mian and Sufi, 2011) and deleveraging (Dynan, 2012; Mian, Rao and Sufi, 2013) to provide an account of the latest housing and economic cycle. Recent theoretical work also highlights the essential role played by credit supply cycles in driving housing and mortgage booms and busts, with particular emphasis being placed on the dichotomy of savers and borrowers with their offsetting effects on the economy (Campbell and Hercowitz, 2009; Justiniano et al. 2015, 2019). In addition, Justiniano et al. (2015) utilize Survey of Consumer Finances (SCF) data to conduct model calibration to show that leveraging and deleveraging cycles do not have an impact at the macroeconomic level because lenders and borrowers respond in opposite directions.

This paper fills a gap in the previous literature by introducing home-buying decisions of households during the latest housing cycle to provide a better understanding

[1]See https://fred.stlouisfed.org/series/SPCS20RSA

of housing market dynamics. This paper utilizes a unique data set that identifies savers and borrowers and calculates the net acquisition of housing assets to examine the wealth effects of the saving and housing decisions of heterogeneous households over the credit cycle.

This paper is organized as follows. Section 2.2 presents the literature review. Section 2.3 presents the theoretical framework. Section 2.4 describes the data analysis. Section 2.5 describes the empirical approach. Section 2.6 presents the conclusion.

2.2 Literature Review

Saving and borrowing decisions of households affect their wealth position. For example, Zinman (2014 WP) examines the effect of borrowing choices (intertemporal choices between saving and borrowing and level and growth of debt) on the distribution of the opportunity cost of consumption. Hence, borrowing and saving choices play a substantial role in determining households' wealth. In addition, Campbell and Hercowitz (2009) employ a calibrated general equilibrium model of the middle to upper-middle class to examine the effect of the aggressive deregulation of the mortgage market in the early 1980s, which relaxed credit constraints on saver (patient) and borrower (impatient) households. They find that borrower households' welfare decreases drastically while saver households' welfare increases.

Several studies focus on how savers' and borrowers' behaviors affect the housing and mortgage markets, such as Justiniano et al. (2019), who employ a calibrated model of the interaction between borrower (impatient) and lender (patient) households. They find that obstacles to lending are the main factor explaining fluctuations in the housing market. Therefore, in this paper, we follow Justiniano et al. (2019) and examine the wealth effect of obstacles to lending on saver and borrower wealth.

In other words, we focus on obstacles to lending in credit cycles that affect savers' and borrowers' housing acquisition and wealth.

One of the factors that influence savers' and borrowers' behavior and, thus, their wealth gains and losses is the interest rate. For example, Auclert (2019) utilizes the Italian Survey of Household Income and Wealth (SHIW), Panel Study of Income Dynamics (PSID), and Consumer Expenditures Survey (CEX) to estimate the Bewley-Huggett-Aiyagari model with nominal, long-term, circulating private IOUs to study how monetary policy differentially affects winners and losers through unequal income gains, unexpected inflation and interest rate exposure from real interest rate changes.

The macroeconomics literature has tried to identify the factors that account for the latest housing market collapse. For example, Mian and Sufi (2011 AER) examine the effect of an increase in house prices on homeowner borrowing, utilizing national consumer credit bureau agency data. The main goal of their study is to examine how borrowers respond to an increase in house prices. Their empirical approach is to estimate the increase in house prices using housing supply elasticity at the metropolitan statistical area (MSA) level as an instrumental variable for house prices. They conclude that "house prices, borrowing behavior, and consumption are likely jointly driven by unobservable permanent income shocks."

In this paper, borrowers are impatient and highly leveraged if they are unconstrained. Some studies document that the US household leveraging (Mian and Sufi, 2011) and deleveraging (Dynan, 2012; Mian, Rao and Sufi, 2013) provide an explanation for the latest housing market boom and collapse. In addition, Hurst and Stanfoord (2004) employ data from the PSID on households that continuously owned main homes between 1989 and 1996. They find that houses are used as a means to smooth consumption in response to income shocks for liquidity-constrained

households. Many households in the US use their homes as a means to finance consumption, which provides and accounts for leveraging, and thus, an explanation of the latest housing market collapse. Aladangady (2017) studies the effect of housing prices on consumer spending while accounting for the heterogeneity in the housing market by employing CES data and linking them to local housing prices and MSA-level housing supply elasticity measures. He also links households to national CPI measures to deflate nominal variables and local personal income and employment data from the US Census Bureau and the Quarterly Census of Employment and Wages (QCEW). Further, he links household data from the CES to mortgage refinancing data from the Home Mortgage Disclosure Act (HMDA) and prevailing mortgage rates on existing loans at the time of interviews with McDash/LPS. He concludes that housing wealth has a significant impact on household consumption. In addition, Case et al. (2005) find that housing wealth has an effect on household consumption that is larger than the financial (stock market) effect. By analyzing SCF data from 2007 to 2009, Kennickell (2012) finds that less than two-thirds of households experienced wealth losses from 2007 to 2009. On the other hand, more than one-third experienced gains. He notes that one explanation is that "at least around the center of the groups with gains or losses, those with gains tended to have smaller wealth in 2007 than those with losses". Also, this could indicate that those households who were highly leveraged experienced larger losses.

Indeed, wealth inequality in the US has increased after the latest recession and the housing market collapse. Fligstein and Rucks-Ahidiana (2016) show that the financial crisis had differential impacts on household income and wealth. They find that wealthy households, which are in the top 10% of the wealth distribution, were able to recover from the financial crisis due to the diversity of assets they owned. Households in the bottom 80% of wealth distribution were drastically affected by the

financial crisis, as their wealth was concentrated in their houses. In addition, Kuhn et al. (2018) introduce a new long-run household-level dataset collected from the SCF to examine the joint distribution of income and wealth in the US since 1949. They document that high-income households' assets are concentrated in stock equity, while middle-income households' assets are concentrated in home equity. Thus, a boom in the stock market increases wealth for high-income households, while a boom in the housing market increases the wealth of middle-class households. Furthermore, Wolff (2012) finds that the wealth of middle-class household declined and their indebtedness notably increased over the period from 2007 to 2010, in turn increasing inequality. Middle-class households wealth was concentrated in homes, which was damaged by the Great Recession. Case and Marynchenko (2002) conclude that the appreciation of houses is an important means by which low-income households accumulate wealth. This provides an account for the increase of the wealth inequality in the US recently.

In this paper, we attempt to understand whether the appreciation of houses is an engine for the wealth accumulation of saver households. Drew and Herbert (2012) document that housing crashes did not play a significant role in shifting households away from purchasing homes. They find that households prefer purchasing homes over renting despite the drastic decline in housing prices in the period 2007-2009. Ebelsky and Duda (2002) note that the housing crash of the 1980s represented an opportunity for low-income households to enjoy a gain from purchasing homes. However, this is contingent on the timing of the purchase and sale of the house. Analyzing panel data from the American Housing Survey that span 1985 to 1995, they find that 35% of low-income households purchased homes in 1984 or 1985, while 43% of middle-income households and 47% of high-income homeowners moved

within nine years. Based on these findings, in this paper, we attempt to understand whether savers enjoyed a wealth gain from the housing crash of 2008.

Garriga et al. (2019) study credit conditions that affect housing prices by developing an empirical and theoretical framework to identify a negative relationship between the mortgage rate and housing prices, which is consistent with the theoretical framework stated in section 2.3 of this paper whereby the borrowing rate increases when house prices decrease.[2]

In this paper, we fill a gap in the literature by introducing home buyer households and by identifying saver and borrower households based on their wealth during the credit cycle. The main goal of this paper is to examine whether and how these two groups of households behave differently during the credit cycle.

2.3 Theoretical Framework

Justiniano et al. (2019)[3] define two types of households in the economy: savers (with a high discount factor β_s) and borrowers (with a low discount factor β_b), i = s, b. Households derive utilities from consumption $c_{i,t}$ and housing stock $\nu(h_{i,t)}$ as follows:

$$E_0 \sum_{t=0}^{\infty} \beta_i^t [U(c_{i,t}) + \nu(h_{i,t)}]$$

Subject to the following budget constraint:

$$c_{i,t} + p_t[h_{i,t+1} - (1-\delta)h_{i,t}] + r_{t-1}D_{i,t-1} \leq W_{i,t} + D_{i,t}$$

[2]See Juistiniano et al. (2019).

[3]See Justiniano et al. (2019) for further details on the model.

Where p_t is the price of houses, δ is the depreciation rate of the housing stock, W_i is an exogenous endowment, D_i is the amount of debt, and r is the gross interest rate. Savers' savings (S) are channeled into the debt accumulated by borrowers (D): Savers face a lending constraint (L_t) that may change over time:

$$S_t \leq L_t \tag{2.1}$$

Borrowers face collateral constraints in accumulating debt:

$$D_t \leq \theta p_{b,t} h_{b,t} \tag{2.2}$$

θ here is the loan-to-value ratio (LTV), which is the ratio of one's debt to house value. (2.2) implies higher θ allows borrowers to borrow more. (2.2) also shows that the loan to value is equal to or less than than the ratio of one's debt to house value. We have the following credit market clearing condition:

$$S_t = D_t \tag{2.3}$$

The total housing stock is fixed at $\overline{h}$:

$$h_{s,t} + h_{b,t} = \overline{h} \tag{2.4}$$

Both savers and borrowers maximize their utilities, choosing the wealth positions that clear the credit market and the housing market. A detailed description of this methodology is available in Justinion et al. (2019). The optimality conditions for savers and borrowers are as follows:

$$(1-\mu_t)\,u'(c_{b,t}) = \beta_b r_t E_t u'(c_{b,t+1}) \tag{2.5}$$

$$(1-\mu_t\theta)\,u'(c_{b,t})\,p_t = \beta_b v_b'(h_{b,t+1}) + \beta_b(1-\delta)E_t\left[u'(c_{b,t+1})\,p_{t+1}\right] \tag{2.6}$$

$$c_{b,t} + p_t\left[h_{b,t+1} - (1-\delta)h_{b,t}\right] + r_{t-1}D_{b,t-1} = W_{b,t} + D_{b,t} \tag{2.7}$$

$$\mu_t\left(D_{b,t} - \theta p_t h_{b,t+1}\right) = 0, \quad \mu_t \geq 0, \quad D_{b,t} \leq \theta p_t h_{b,t+1} \tag{2.8}$$

$$u'(c_{s,t})\,p_t = \beta_s v_s'(h_{lt+1}) + \beta_s(1-\delta)E_t\left[u'(c_{s,t+1})\,p_{t+1}\right] \tag{2.9}$$

$$(1+\xi_t)\,u'(c_{s,t}) = \beta_s r_t E_t u'(c_{s,t+1}) \tag{2.10}$$

$$c_{s,t} + p_t\left[h_{s,t+1} - (1-\delta)h_{s,t}\right] + r_{t-1}D_{s,t-1} = W_{s,t} + D_{s,t} \tag{2.11}$$

$$\xi_t\left(-D_{s,t} - L_t\right) = 0, \quad \xi_t \geq 0, \quad -D_{s,t} \leq L_t \tag{2.12}$$

Equations (2.5) and (2.10) are the standard Euler equations for borrower and saver, which represent the inter-temporal consumption decisions. μ_t is the Lagrange multiplier that measures collateral constraint: a tighter collateral constraint precludes borrowers from borrowing the desired amount. ξ_t is the Lagrange multiplier that measures the lending constraint, and thus, a larger ξ_t makes consumption more attractive than saving. Similarly, when the lending constraint binds, savers prefer to

consume rather than to save. Equation (2.6) represents the housing market opportunity cost for borrowers. Where $(1 - \mu_t\theta)$ reduces the opportunity cost to purchase a house when the collateral constraint is not tight. Equations (2.7) and (2.11) refer to the budget constraint of borrowers and savers. Equations (2.8) and (2.12) are the complementary slackness conditions for the collateral and lending constraints.

Depending on the evolution of L_t, one or both constraints (2.1) and (2.2) may be binding. When L_t is low, (2.1) is binding, but (2.2) is not: we thus have a high interest rate, borrowing is low, house prices are low, and savers have to obtain additional housing with a marginal rate of substitution from housing is less than the borrowing rate. When L_t is higher, both (2.1) and (2.2) are binding: the interest rate falls, house prices increase, borrowing increases, borrowers purchase more housing, and savers own less housing than before. As L_t increases further, (2.1) is no longer binding, while (2.2) is binding: the interest rate is low, house prices remain high, borrowing remains high, borrowers purchase the maximum amount that the collateral constraint allows, and savers further scale back their housing position. When L_t falls again, the preceding descriptions move in reverse[4].

This scenario suggests that active savings in non-housing assets of savers cyclically move with housing prices, while their housing acquisitions move countercyclically with housing prices. Borrowers' behavior displays the opposite pattern. Hence, in this paper, we attempt to show that

$$\widehat{p_{b,t}h_{b,t}} < \widehat{p_{s,t}h_{s,t}} \iff \widehat{p_{b,t}} + \widehat{h_{b,t}} < \widehat{p_{s,t}} + \widehat{h_{s,t}}$$

Here hats indicate percentage change; thus, house values appreciate more rapidly

[4]See Justinion et al. (2019) for further details on the characterization of the equilibrium.

for savers than for borrowers or savers acquire additional housing unit, with the consequence that savers accumulate more wealth than borrowers.

2.4 Data Analysis

For empirical analysis, we utilize PSID panel data spanning from 2001 to 2017 that consist of 13960 households to collect information on homeowners' house value, mortgage, active savings, and other characteristics. We classify savers and borrowers according to their wealth positions during the credit cycle.

The outcome variables here are house values, liquid assets, and wealth. Liquid assets comprise checking and savings accounts, the value of stocks, and the value of other financial assets. Wealth is constructed as the sum of the values of farm and business, the value of checking accounts, the value of other real estates, the value of stocks, the value of vehicles, the value of other assets, and the value of annuities taking into account the debt value plus the value of home equity. House value represents the present value of the house [5].

In what follows, we define two types of savers and borrowers to provide a better understanding of their saving and housing decisions during credit cycles. Type I savers are defined as homeowners as of 2001 with a mortgage in 2007 that was *less* than in 2001, net liquid assets in 2007 that were *greater* than in 2001, and who did not buy other real estates during the housing market boom. On the other hand, type I borrowers are defined as homeowners as of 2001, with a mortgage in 2007 that was *greater* than in 2001, net liquid assets in 2007 that were *less* than in 2001, and who purchased other real estates during the housing market boom. Type II savers and borrowers are defined as above, minus net liquid assets.

[5]See PSID data variable description at https://simba.isr.umich.edu/VS/s.aspx

Table 2.1 displays the descriptive statistics of type I savers and borrowers. It shows that 21% of savers are Black, 28% are college graduates, 65% are married, and are on average 57 years old. On the other hand, 21% of borrowers are Black, 26% are college graduates, 80% are married, and they are on average 49 years old. The mean change in the value of a house from 2007 to 2017 is .08 for savers and -.076 for borrowers, while that in liquid assets is -.56 for savers and 1.33 for borrowers, whereas the change in wealth is -.04 for savers and -.73 for borrowers [6].

Table 2.2 displays the descriptive statistics of type II savers and borrowers. It shows that 26% of savers are Black, 24% are college graduates, 60% are married, and they are on average 55 years old. On the other hand, 20% of borrowers are Black, 29% are college graduates, 81% are married, and they are on average 48 years old. The mean change in house value from 2007 to 2017 is .09 for savers and -.029 for borrowers, while that in liquid assets is .63 for savers and .34 for borrowers, whereas the change in wealth is -.05 for savers and -.74 for borrowers.

2.5 Empirical Approach

As mentioned above, we divide households into savers and borrowers based on their wealth to examine the wealth effects of the saving and housing decisions of these households over credit cycles. We hypothesize that housing assets of savers appreciate more than those of borrowers with the consequence that savers accumulate more wealth than borrowers. These hypotheses are inspired by the observance of a drastic decline in a house value and equity[7], as mentioned above, particularly for households who were highly leveraging prior to the housing market collapse. Those

[6]The house value, wealth, liquid assets, mortgage, and income variables are expressed in logarithms.

[7]The home equity is the house value minus the sum of all the house loans.

households who borrowed heavily against their home equity experienced a sharp decline in their housing assets. A high mortgage loan is translated to a large loss of home equity even with a small reduction in a house value, and thus, wealth overall[8].

These hypotheses are tested using the following Difference-in-Difference empirical approach:

$$\widehat{Y_{it}} = \alpha_0 + \alpha_1 S_{it} + \alpha_2 Post_{it} + \alpha_3 (S_{it} \times Post_{it}) + \alpha_4 X_{it} + \epsilon_{it}$$
$$\widehat{Y_{it}} = \eta_0 + \eta_1 B_{it} + \eta_2 Post_{it} + \eta_3 (B_{it} \times Post_{it}) + \eta_4 X_{it} + u_{it}$$

where $\widehat{Y_{it}}$ is the outcome variable (housing asset appreciation, which represents the growth of house value, growth of liquid assets, and growth of wealth accumulation), S_{it} and B_{it} are dummy variables indicating whether households are savers or borrowers, $Post_{it}$ is a dummy indicating whether the year is post-2007, X_{it} is a matrix of household characteristics (level of education, family size, age, race, and marital status), and ϵ_{it} is an error term. The growth here is represented by the following equation: $\widehat{Y_{it}} = \frac{Y_{it-1} - Y_{it}}{Y_{it-1}}$.

Table 2.3 reports the wealth effect of the housing market collapse in 2008 on type I savers and borrowers[9]. The interaction of the saver and borrower dummy variables with the year dummy is our coefficient of interest[10]. It shows that the appreciation of borrowers' houses marginally decreased after the latest housing collapse, while the appreciation of savers' houses increased but not significantly. The post-shock

[8]When the mortgage loan is large, any decline in a house price, even small, shows a large loss in a home equity.

[9]See the data analysis section for the definitions of type I savers and borrowers.

[10]S/B*Post-shock is our coefficient of interest: the saver and borrower dummy variables are interacted with the year dummy variable for the post housing collapse period from 2007 to 2017.

dummy variable is negatively correlated with house appreciation, liquid assets, and wealth for both savers and borrowers. Being a college graduate who is a saver or a borrower positively affects liquid assets and wealth. For both savers and borrowers, older households' house appreciation declined while their liquid assets and wealth increased. Having children in a household is associated with an increase in house appreciation and a decrease in liquid assets for savers and borrowers. Being married is positively associated with house appreciation, liquid assets, and wealth for borrowers but does not affect house appreciation among saver households. Black households experienced a negative effect on their liquid assets and wealth regardless of whether they are savers or borrowers.

Table 2.4 reports the wealth effect of the 2008 housing market collapse on type II savers and borrowers[11]. In contrast to type I savers and borrowers, house appreciation significantly increased for type II savers but significantly decreased for type II borrowers. The wealth of type II borrowers also significantly declined. Being married does not affect house appreciation for borrowers.

Since we employ the Difference-in-Difference estimator, we perform placebo estimation to capture the effect of the period prior to the latest housing collapse on savers' and borrowers' wealth and compare the outcomes with the outcomes of the Difference-in-Difference estimator. The motivation of performing placebo effect is to sort out the wealth effect of the housing market collapse on savers' and borrowers' wealth. To do so, we interact the dummy variables of saver and borrower with the dummy variable of year in which the year is before 2007. Table 2.5 and Table 2.6 report placebo estimations for the wealth effects of the housing collapse on type I and type II savers and borrowers, respectively. They show that in the pre-shock period prior to the housing market collapse, when the economy experienced a housing

[11]See the data analysis section for the definition of type II savers and borrowers.

bubble, there were opposing wealth effects for savers and borrowers of both types. Although, the outputs indicate that there is a wealth effect when it should not be, the outputs suggest that active savings in non-housing assets of savers cyclically move with housing prices, while their housing acquisitions move countercyclically with housing prices. In addition, the outputs of Placebo estimations suggest that there could be other factors that are not captured by this model have wealth effects for savers and borrowers.

One of the concerns about this study is that the appreciation of very high and very low-priced houses could bias the estimation. Therefore, we restrict the sample by excluding house values that exceeded $500,000 and those that are below $100,000. Table 2.7 and Table 2.8 report the findings of the restricted sample. The results reveal a positive effect of post housing collapse dummy on house appreciation and wealth for type I savers at the 5% significance level and strictly significant results for type II savers. The findings also reveal that the post-collapse dummy is negatively associated with the wealth of type II borrowers. Tables 2.9 and 2.10 report placebo estimates obtained using the restricted data, which are similar to the findings in Tables 2.5 and 2.6.

2.6 Conclusion

This paper utilizes a unique data set that identifies savers and borrowers and calculates the net acquisition of housing assets to examine whether and how these two groups of households behave differently during credit cycles. To do so, we employ the Difference-in-Difference estimator and find evidence of a significant difference between the wealth effect for type II savers and borrowers. House values of savers appreciated faster and to a greater extent than those of borrowers. When we ex-

clude high and low house values, we find that savers' houses appreciated and their wealth significantly increased, while those of borrowers significantly decreased. The placebo estimation indicates that there are other unobserved factors that could affect estimation outcomes and raise questions for future research. Additionally, we find that the majority of households engage in some kind of borrowing.

Table 2.1: Descriptive Statistics of Savers & Borrowers Type I

	Savers			**Borrowers**		
	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation
Black	.21	0	.41	.21	0	.41
White	.74	1	.44	.74	1	.44
College	.28	0	.45	.26	0	.44
Married	.65	1	.48	.80	1	.41
Age	57	55	14.8	49.4	49	11.46
# of Children	.53	0	.96	.99	1	1.2
Home Value	.08	.038	.51	-.076	-.02	.47
$\Delta Wealth$	-.04	.20	4.87	-.73	.171	6.32
$\Delta LiquidAssets$	-.56	-.1	2.74	1.33	.895	3.36
$\Delta Mortgage$	-.042	-.12	1.04	-.245	-.204	.625
$\Delta Income$	-.09	.06	1.44	.150	.126	1.73
Observations	1029			563		

All data are taken from the PSID from 2001 to 2017.

Home value, wealth liquid assets, mortgage, and income represent the change from 2007 to 2017.

Table 2.2: Descriptive Statistics of Savers & Borrowers Type II

	Savers			**Borrowers**		
	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation
Black	.26	0	.439	.20	0	.40
White	.70	1	.46	.75	1	.43
College	.24	0	.43	.29	0	.45
Married	.60	1	.49	.81	1	.39
Age	57	55	15.42	49.1	48	11.45
# of Children	.57	0	1.01	.98	1	1.2
$\Delta HomeValue$	.09	.03	.59	-.029	0	.46
$\Delta Wealth$	-.05	.20	5.8	-.74	.16	5.91
$\Delta LiquidAssets$	.63	.29	3.43	.343	.29	3
$\Delta Mortgage$	-.004	-.089	1.14	-.21	-.15	.67
$\Delta Income$	-.085	.07	1.62	.11	.14	1.25
Observations	2831			1221		

All data are taken from the PSID from 2001 to 2017.

Home value, wealth liquid assets, mortgage, and income represent the change from 2007 to 2017

Table 2.3: Difference in Difference Estimation of Savers & Borrowers Type I

	Savers			**Borrowers**		
	House Value	Liquid Assets	Wealth	House Value	Liquid Assets	Wealth
(S/B*Post-shock)	.0.002	-0.02	0.02	-0.006*	-0.02	0.012
	(0.002)	(0.031)	(0.015)	(0.003)	(0.045)	(0.072)
S/B	-0.002**	0.075**	0.115***	0.004*	0.002	0.021
	(0.001)	(0.032)	(0.016)	(0.002)	(0.042)	(0.08)
Post-shock	-0.01***	-0.028***	-0.066***	-0.01***	-0.029***	-0.066***
	(0.0007)	(0.006)	(0.007)	(0.0007)	(0.006)	(0.007)
Age	-0.0003**	0.004***	0.014***	-0.0003**	0.004***	0.0144***
	(0.0001)	(0.001)	(0.001)	(0.0001)	(0.001)	(0.001)
Age^2	.000**	-.000***	-.000***	.0000**	-.000***	-.000***
	(.0000)	(.0000)	(.0000)	(.0000)	(.0000)	(.0000)
Children	0.001**	-0.01*	-0.001	0.006**	-0.01**	-0.001
	(0.0002)	(0.003)	(0.004)	(0.0002)	(0.003)	(0.004)
College	-0.0002	0.08***	0.07***	-0.0002	0.08***	0.0684***
	(0.0004)	(0.006)	(0.01)	(0.0004)	(0.006)	(0.009)
Married	0.001	0.0572***	0.115***	.18***	1.7***	1.03***
	(0.001)	(0.007)	(0.009)	.014	.09	(.044)
Black	0.001	-0.146***	-0.113***	0.001	-0.147***	-0.114***
	(0.001)	(0.008)	(0.01)	(0.001)	(0.01)	(0.01)
Constant	0.023***	-0.196***	-0.77***	0.023***	-0.199***	-0.78***
	(0.0035)	(0.028)	(0.04)	(0.003)	(0.028)	(0.037)
Observations	30,289	44,398	56,596	30,289	44,398	56,596

Clustered standard errors at the households level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 2.4: Difference in Difference Estimation of Savers & Borrowers Type II

	Savers			**Borrowers**		
	House Value	Liquid Assets	Wealth	House Value	Liquid Assets	Wealth
(S/B*Post-shock)	0.00587**	0.0114	0.02	-0.004**	-0.005	-0.09***
	(0.002)	(0.01)	(0.01)	(0.002)	(0.024)	(0.026)
S/B	-0.004***	0.008	0.133***	0.004***	0.03	0.14***
	(0.00105)	(0.0127)	(0.01)	(0.001)	(0.02)	(0.02)
Post-shock	-0.0116***	-0.0305***	-0.0639***	-0.00975***	-0.0292***	-0.0625***
	(0.000668)	(0.00659)	(0.00848)	(0.000746)	(0.00603)	(0.00733)
Age	-0.000332**	0.00379***	0.0142***	-0.000336**	0.00370***	0.0143***
	(0.000133)	(0.00113)	(0.00143)	(0.000140)	(0.00113)	(0.00144)
Age^2	2.28e-06*	-3.04e-05***	-8.12e-05***	2.39e-06**	-2.86e-05***	-7.35e-05***
	(1.26e-06)	(1.04e-05)	(1.27e-05)	(1.21e-06)	(1.04e-05)	(1.29e-05)
Children	0.000524**	-0.00647*	-0.000173	0.000525**	-0.00665**	-0.00114
	(0.000217)	(0.00335)	(0.00395)	(0.000220)	(0.00335)	(0.00396)
College	-0.000129	0.0762***	0.0688***	-0.000204	0.0758***	0.0675***
	(0.000409)	(0.00629)	(0.00946)	(0.000441)	(0.00627)	(0.00947)
Married	0.000864	0.0571***	0.110***	0.000864	0.0573***	0.115***
	(0.000990)	(0.00707)	(0.00904)	(0.000965)	(0.00704)	(0.00905)
Black	0.00108	-0.146***	-0.111***	0.00110	-0.146***	-0.113***
	(0.00131)	(0.00876)	(0.0102)	(0.00130)	(0.00875)	(0.0103)
Constant	0.0243***	-0.197***	-0.769***	0.0227***	-0.198***	-0.778***
	(0.00311)	(0.0284)	(0.0372)	(0.00351)	(0.0286)	(0.0374)
Observations	30,289	44,398	56,596	30,289	44,398	56,596

Clustered standard errors at the households level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 2.5: Placebo Effect: Savers & Borrowers Type I

	Savers			**Borrowers**		
	House Value	Liquid Assets	Wealth	House Value	Liquid Assets	Wealth
(S/B*Pre-shock)	-0.00220	0.0207	-0.0187	0.00553*	0.00787	-0.0122
	(0.00155)	(0.0309)	(0.0145)	(0.00303)	(0.0447)	(0.0723)
S/B	-0.000110	0.0542***	0.134***	-0.00149	-0.00623	0.0330
	(0.000846)	(0.00908)	(0.0141)	(0.00151)	(0.0303)	(0.0505)
Pre-shock	0.0101***	0.0278***	0.0664***	0.00994***	0.0288***	0.0664***
	(0.000731)	(0.00596)	(0.00733)	(0.000707)	(0.00590)	(0.00714)
Age	-0.000335**	0.00363***	0.0142***	-0.000337**	0.00378***	0.0144***
	(0.000139)	(0.00113)	(0.00143)	(0.000139)	(0.00113)	(0.00143)
Age^2	2.36e-06**	-2.84e-05***	-7.45e-05***	2.38e-06**	-2.93e-05***	-7.47e-05***
	(1.20e-06)	(1.04e-05)	(1.28e-05)	(1.20e-06)	(1.04e-05)	(1.28e-05)
Children	0.000518**	-0.00641*	-0.000805	0.000524**	-0.00662**	-0.00107
	(0.000220)	(0.00335)	(0.00396)	(0.000220)	(0.00335)	(0.00396)
College	-0.000168	0.0754***	0.0671***	-0.000188	0.0760***	0.0684***
	(0.000438)	(0.00627)	(0.00948)	(0.000442)	(0.00627)	(0.00948)
Married	0.000905	0.0572***	0.115***	0.000903	0.0579***	0.116***
	(0.000967)	(0.00703)	(0.00903)	(0.000968)	(0.00703)	(0.00903)
Black	0.00107	-0.146***	-0.113***	0.00108	-0.147***	-0.114***
	(0.00130)	(0.00875)	(0.0102)	(0.00131)	(0.00875)	(0.0102)
Constant	0.0130***	-0.224***	-0.839***	0.0130***	-0.228***	-0.843***
	(0.00311)	(0.0277)	(0.0365)	(0.00311)	(0.0277)	(0.0365)
Observations	30,289	44,398	56,596	30,289	44,398	56,596

Clustered standard errors at the households level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 2.6: Placebo Effect: Savers & Borrowers Type II

	Savers			**Borrowers**		
	House Value	Liquid Assets	Wealth	House Value	Liquid Assets	Wealth
(S/B*Pre-shock)	-0.00587**	-0.0114	-0.0200	0.00404**	0.00534	0.0915***
	(0.00239)	(0.0147)	(0.0126)	(0.00163)	(0.0245)	(0.0257)
S/B	0.00195	0.0195*	0.153***	-0.000127	0.0210**	0.0472**
	(0.00212)	(0.0102)	(0.00927)	(0.000585)	(0.00979)	(0.0205)
Pre-shock	0.0116***	0.0305***	0.0639***	0.00975***	0.0286***	0.0625***
	(0.000668)	(0.00659)	(0.00848)	(0.000746)	(0.00603)	(0.00733)
Age	-0.000332**	0.00379***	0.0142***	-0.000336**	0.00370***	0.0143***
	(0.000133)	(0.00113)	(0.00143)	(0.000140)	(0.00113)	(0.00144)
Age^2	2.28e-06*	-3.04e-05***	-8.12e-05***	2.39e-06**	-2.86e-05***	-7.35e-05***
	(1.26e-06)	(1.04e-05)	(1.27e-05)	(1.21e-06)	(1.04e-05)	(1.29e-05)
Children	0.000524**	-0.00647*	-0.000173	0.000525**	-0.00665**	-0.00114
	(0.000217)	(0.00335)	(0.00395)	(0.000220)	(0.00335)	(0.00396)
College	-0.000129	0.0762***	0.0688***	-0.000204	0.0758***	0.0675***
	(0.000409)	(0.00629)	(0.00946)	(0.000441)	(0.00627)	(0.00947)
Married	0.000864	0.0571***	0.110***	0.000864	0.0573***	0.115***
	(0.000990)	(0.00707)	(0.00904)	(0.000965)	(0.00704)	(0.00905)
Black	0.00108	-0.146***	-0.111***	0.00110	-0.146***	-0.113***
	(0.00131)	(0.00876)	(0.0102)	(0.00130)	(0.00875)	(0.0103)
Constant	0.0126***	-0.228***	-0.833***	0.0130***	-0.226***	-0.840***
	(0.00301)	(0.0278)	(0.0366)	(0.00313)	(0.0278)	(0.0366)
Observations	30,289	44,398	56,596	30,289	44,398	56,596

Clustered standard errors at the households level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 2.7: Wealth Effect: Savers & Borrowers Type I

	Savers			**Borrowers**		
	House Value	Liquid Assets	Wealth	House Value	Liquid Assets	Wealth
(S/B*Post-shock)	0.00301*	-0.00423	0.0336**	-0.00216	-0.0284	0.0463
	(0.00170)	(0.0165)	(0.0149)	(0.00358)	(0.0624)	(0.0973)
S/B	-0.00258	0.0389**	0.0475***	0.000128	0.00399	-0.0300
	(0.00187)	(0.0163)	(0.0163)	(0.00323)	(0.0557)	(0.0799)
Post-shock	-0.0138***	-0.0175***	-0.0720***	-0.0136***	-0.0177***	-0.0712***
	(0.000628)	(0.00644)	(0.00820)	(0.000607)	(0.00619)	(0.00783)
Age	-0.000754***	-0.00208*	0.0156***	-0.000760***	-0.00193	0.0156***
	(0.000137)	(0.00118)	(0.00222)	(0.000138)	(0.00118)	(0.00222)
Age^2	5.96e-06***	1.80e-05*	-9.13e-05***	6.02e-06***	1.72e-05	-9.10e-05***
	(1.22e-06)	(1.08e-05)	(1.85e-05)	(1.22e-06)	(1.08e-05)	(1.85e-05)
Children	0.000759**	-0.00535	0.00940*	0.000765**	-0.00547	0.00923
	(0.000323)	(0.00339)	(0.00565)	(0.000323)	(0.00339)	(0.00565)
College	-0.00470***	0.0335***	-0.00935	-0.00471***	0.0339***	-0.00868
	(0.000558)	(0.00608)	(0.0116)	(0.000560)	(0.00609)	(0.0116)
Married	-0.000710	0.00832	0.0135	-0.000691	0.00890	0.0145
	(0.000761)	(0.00852)	(0.0129)	(0.000758)	(0.00851)	(0.0129)
Black	0.00265***	-0.0596***	-0.106***	0.00267***	-0.0598***	-0.107***
	(0.000844)	(0.0114)	(0.0175)	(0.000844)	(0.0114)	(0.0176)
Constant	0.0427***	0.0259	-0.615***	0.0427***	0.0218	-0.618***
	(0.00373)	(0.0311)	(0.0647)	(0.00373)	(0.0311)	(0.0645)
Observations	20,234	20,353	22,330	20,234	20,353	22,330

Clustered standard errors at the households level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 2.8: Wealth Effect: Savers & Borrowers Type II

	Savers			**Borrowers**		
	House Value	Liquid Assets	Wealth	House Value	Liquid Assets	Wealth
(S/B*Post-shock)	0.00342***	-0.00223	0.0710***	-0.00300*	-0.0269	-0.0782***
	(0.00122)	(0.0149)	(0.0133)	(0.00175)	(0.0307)	(0.0300)
S/B	-0.000738	0.0163	0.0351***	0.000993	0.0402	0.0721***
	(0.00148)	(0.0138)	(0.0131)	(0.00163)	(0.0295)	(0.0239)
Post-shock	-0.0144***	-0.0166**	-0.0837***	-0.0133***	-0.0159***	-0.0645***
	(0.000713)	(0.00679)	(0.00976)	(0.000638)	(0.00615)	(0.00811)
Age	-0.000737***	-0.00204*	0.0161***	-0.000744***	-0.00201*	0.0158***
	(0.000135)	(0.00117)	(0.00222)	(0.000138)	(0.00119)	(0.00223)
Age^2	5.66e-06***	1.71e-05	-0.000102***	5.89e-06***	1.80e-05*	-9.25e-05***
	(1.21e-06)	(1.07e-05)	(1.84e-05)	(1.23e-06)	(1.09e-05)	(1.86e-05)
Children	0.000770**	-0.00536	0.00971*	0.000768**	-0.00557*	0.00916
	(0.000324)	(0.00339)	(0.00562)	(0.000323)	(0.00338)	(0.00565)
College	-0.00465***	0.0340***	-0.00722	-0.00473***	0.0337***	-0.00934
	(0.000561)	(0.00606)	(0.0116)	(0.000560)	(0.00609)	(0.0116)
Married	-0.000756	0.00829	0.0119	-0.000668	0.00818	0.0140
	(0.000762)	(0.00854)	(0.0129)	(0.000759)	(0.00851)	(0.0129)
Black	0.00270***	-0.0593***	-0.104***	0.00263***	-0.0596***	-0.107***
	(0.000842)	(0.0114)	(0.0175)	(0.000845)	(0.0114)	(0.0175)
Constant	0.0429***	0.0245	-0.730***	0.0421***	0.0219	-0.629***
	(0.00370)	(0.0311)	(0.0646)	(0.00374)	(0.0314)	(0.0648)
Observations	20,234	20,353	22,330	20,234	20,353	22,330

Clustered standard errors at the households level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 2.9: Placebo Effect: Savers & Borrowers Type I

	Savers			**Borrowers**		
	House Value	Liquid Assets	Wealth	House Value	Liquid Assets	Wealth
(S/B*Pre-shock)	-0.00301*	0.00423	-0.0336**	0.00216	0.0284	-0.0463
	(0.00170)	(0.0165)	(0.0149)	(0.00358)	(0.0624)	(0.0973)
S/B	0.000439	0.0347***	0.0811***	-0.00203	-0.0244	0.0163
	(0.00143)	(0.00733)	(0.0129)	(0.00160)	(0.0492)	(0.0457)
Pre-shock	0.0138***	0.0175***	0.0720***	0.0136***	0.0177***	0.0712***
	(0.000628)	(0.00644)	(0.00820)	(0.000607)	(0.00619)	(0.00783)
Age	-0.000754***	-0.00208*	0.0156***	-0.000760***	-0.00193	0.0156***
	(0.000137)	(0.00118)	(0.00222)	(0.000138)	(0.00118)	(0.00222)
Age^2	5.96e-06***	1.80e-05*	-9.13e-05***	6.02e-06***	1.72e-05	-9.10e-05***
	(1.22e-06)	(1.08e-05)	(1.85e-05)	(1.22e-06)	(1.08e-05)	(1.85e-05)
Children	0.000759**	-0.00535	0.00940*	0.000765**	-0.00547	0.00923
	(0.000323)	(0.00339)	(0.00565)	(0.000323)	(0.00339)	(0.00565)
College	-0.00470***	0.0335***	-0.00935	-0.00471***	0.0339***	-0.00868
	(0.000558)	(0.00608)	(0.0116)	(0.000560)	(0.00609)	(0.0116)
Married	-0.000710	0.00832	0.0135	-0.000691	0.00890	0.0145
	(0.000761)	(0.00852)	(0.0129)	(0.000758)	(0.00851)	(0.0129)
Black	0.00265***	-0.0596***	-0.106***	0.00267***	-0.0598***	-0.107***
	(0.000844)	(0.0114)	(0.0175)	(0.000844)	(0.0114)	(0.0176)
Constant	0.0290***	0.00836	-0.687***	0.0291***	0.00415	-0.689***
	(0.00366)	(0.0311)	(0.0636)	(0.00366)	(0.0310)	(0.0635)
Observations	20,234	20,353	22,330	20,234	20,353	22,330

Clustered standard errors at the households level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 2.10: Placebo Effect: Savers & Borrowers Type II

	Savers			**Borrowers**		
	House Value	Liquid Assets	Wealth	House Value	Liquid Assets	Wealth
(S/B*Pre-shock)	-0.00342***	0.00223	-0.0710***	0.00300*	0.0269	0.0782***
	(0.00122)	(0.0149)	(0.0133)	(0.00175)	(0.0307)	(0.0300)
S/B	0.00268***	0.0141*	0.106***	-0.00201***	0.0133	-0.00610
	(0.000965)	(0.00853)	(0.00871)	(0.000750)	(0.0120)	(0.0218)
Pre-shock	0.0144***	0.0166**	0.0837***	0.0133***	0.0159***	0.0645***
	(0.000713)	(0.00679)	(0.00976)	(0.000638)	(0.00615)	(0.00811)
Age	-0.000737***	-0.00204*	0.0161***	-0.000744***	-0.00201*	0.0158***
	(0.000135)	(0.00117)	(0.00222)	(0.000138)	(0.00119)	(0.00223)
Age^2	5.66e-06***	1.71e-05	-0.000102***	5.89e-06***	1.80e-05*	-9.25e-05***
	(1.21e-06)	(1.07e-05)	(1.84e-05)	(1.23e-06)	(1.09e-05)	(1.86e-05)
Children	0.000770**	-0.00536	0.00971*	0.000768**	-0.00557*	0.00916
	(0.000324)	(0.00339)	(0.00562)	(0.000323)	(0.00338)	(0.00565)
College	-0.00465***	0.0340***	-0.00722	-0.00473***	0.0337***	-0.00934
(0.000561)	(0.00606)	(0.0116)	(0.000560)	(0.00609)	(0.0116)	
Married	-0.000756	0.00829	0.0119	-0.000668	0.00818	0.0140
	(0.000762)	(0.00854)	(0.0129)	(0.000759)	(0.00851)	(0.0129)
Black	0.00270***	-0.0593***	-0.104***	0.00263***	-0.0596***	-0.107***
	(0.000842)	(0.0114)	(0.0175)	(0.000845)	(0.0114)	(0.0175)
Constant	0.0285***	0.00788	-0.699***	0.0288***	0.00604	-0.693***
	(0.00358)	(0.0310)	(0.0637)	(0.00367)	(0.0312)	(0.0636)
Observations	20,234	20,353	22,330	20,234	20,353	22,330

Clustered standard errors at the households level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

CHAPTER 3

The Saving Behavior of Heterogeneous Households and Credit Constraints: A Decomposition

3.1 Introduction

Saving is important for households as it reduces the effect of adverse income shocks, financial emergencies, and unexpected crises. Several factors affect the ability of the households to save. One notable factor is being credit constrained. Credit-constrained households cannot access the credit market and borrow. Borrowing enables households to finance spending and investment. In this paper, we examine the role that credit constraints play in the savings decisions of households by focusing on a well-defined set of reasons for saving. To do so, we classify saving motives as (1) precautionary saving, (2) saving to finance investments, and (3) saving for retirement. Investment here means wealth accumulation through financial assets. In this paper, we use cross-sectional data from the 2016 SCF, which consists of 31,240 observations. SCF data provide rich information not only on wealth and income but also on measures of risk aversion and on credit constraints and saving motivations.

Specifically, this paper is an attempt to understand the extent to which credit-constrained households are able to accumulate wealth when the macro environment is characterized by the presence of a liquidity trap and borrowing constraints[1]. When the main saving motive for constrained households is precautionary savings or securing future liquidity to finance unexpected future expenses, they would not be able to build as much wealth in the presence of borrowing constraints.

[1]See Korinek and Simsek (2016).

Numerous studies focus on the relationship between liquidity constraints and savings. For example, Leland (1968) employs a two-period model to conclude that savings increase with uncertainty. Also, Kennickell and Lusardi (2004) find that the precautionary saving motive does not play a significant role in household wealth accumulation, representing a mere 8% of household wealth holdings.

In this paper, we utilize a probit model using cross-sectional data from SCF to examine the effect of credit constraints on the saving behavior of constrained and discouraged households. To do so, we classify the reasons for saving when saving is motivated primarily by uncertainty (precautionary saving), retirement, or investment needs as provided by SCF data. We also utilize a quantile regression to capture the effect of credit constraints on different levels of household wealth. We provide evidence that credit-constrained households face difficulty saving to accumulate wealth and that the effect of credit constraints on discouraged households decreases as their wealth increases. We define discouraged households as those who face a high probability of loan denials, while constrained households are those whose credit applications are denied by financial institutions[2]. Stylized data indicate that approximately 18% of households are classified as credit constrained or discouraged. Our evidence highlights the importance of credit constraints in modeling household saving behavior.

This paper is organized as follows. Sections 3.2 and 3.3 present the previous studies and the contributions of this paper. Section 3.4 defines credit-constrained, discouraged, and unconstrained households. Section 3.5 describes the data that are used in this paper. Section 3.6 identifies the characteristics of credit-constrained households, the motivation for savings for constrained and discouraged households,

[2]See Jappelli (1990). Discouraged and constrained households are observed in the SCF data.

and the effect of credit constraints on household wealth. Sections 3.7, 3.8, and 3.9 present the implications of this paper, our conclusions, and the suggestions for future research, respectively.

3.2 Previous studies

Several studies have focused on the relationship between liquidity constraint and household saving. For example, Xu (1995) distinguishes between the precautionary saving motives caused, on the one hand, by liquidity constraints and, on the other hand, by income uncertainty. He finds that liquidity constraints have a significant effect on household consumption and savings behavior. Furthermore, he finds that saving to counteract income uncertainty depends on the age and wealth level of the household. The question that we attempt to answer in this paper is: Why do households save? In the macroeconomics literature, several studies attributed the saving motive to uncertainty and vulnerability to negative shocks and risk [see, for example, Carrol and Kimball (2001 WP)]. Following Jappelli (1990), who utilizes Survey of Consumer Finances (SCF) data to study causes of liquidity constraints and to identify constrained and rationed consumers in the credit market, in what follows, we classify households as constrained and discouraged households.

Our empirical approach captures the effect of credit constraints on households savings and confirms the results of Caroll et al. (2012), who find that saving is decreasing in credit availability, and Slacalek and Sommer (2011), who document that saving is mainly affected by credit availability and the difference between actual and desired wealth. Constrained households are not able to access the credit market and meet their desired level of consumption. Campbell and Hercowitz (2019) show that the marginal propensity to consume (MPC) out of tax rebates among

middle-income households is higher than predicted by the permanent income hypothesis (PIH). They attribute this higher increase of the MPC to the households' desire to finance large purchases. This prima facie evidence that credit constraints increase the marginal propensity to consume out of transitory income. Under the assumption that middle-income households are constrained, this finding supports our hypothesis here that credit-constrained households save to counteract liquidity constraints rather than to accumulate wealth.

Borrowing is an instrument that enables people to finance consumption. Deaton (1991) focuses on optimal intertemporal consumption behavior to explain how the demand for saving interacts with borrowing constraints. Zelades (1989) utilizes Panel Study of Income Dynamics (PSID) data to examine the effect of borrowing constraints on consumption. He finds that credit constraints substantially affect the consumption of a large portion of the population. This paper fills a gap in the literature by introducing household saving decisions in the presence of credit constraints.

That saving is an essential tool to mitigate the effects of the adverse shocks is evident in financial emergencies and unexpected crises. Kennickell and Lusardi (2004) find that the precautionary saving motive does not play a significant role in households' accumulation of wealth, accounting for only 8% of household assets holdings. However, they provide evidence that it is important for older and business-owning households. These findings support the argument of this paper that when the major reason for households to save is precautionary, they would not be able to accumulate wealth in the medium run, as they would be decumulated during financial difficulties.

Some studies classify the savings decisions and age cohorts of consumers to evaluate saving behavior. For instance, Gourinchas and Parker (2002) find that young

individuals save to insure against negative shocks and uncertainty in their income and that individuals who are 40 years of age and older save for retirement purposes. This finding supports the evidence presented in this paper that older constrained households are less likely to save for precautionary motives.

The studies mentioned above demonstrate that precautionary saving motives exist in almost all households, but they do not play a significant role in the accumulation of wealth. By the accumulation of wealth, we mean using savings to add to assets instead of using savings as a buffer during financial difficulties. Thus, this paper classifies saving decisions to understand the extent to which credit-constrained households are able to accumulate wealth when the macro environment is characterized by the presence of a liquidity trap and borrowing constraints.

3.3 Contributions

While the existing literature going back to Xu (1995) analytically distinguishes between the precautionary savings caused by liquidity constraints and the precautionary savings accumulated against income uncertainty, in this study, we classify saving decisions into precautionary savings, saving for retirement, and saving for investment in financial assets to accumulate capital stock. In addition, we employ quantile regression to estimate how credit constraints affect household wealth at different levels.

3.4 Background

Jappelli (1990)[3] defines an agent as credit constrained if $C^* - Y - A(1+r) > D$, which is equivalent to $S^* < Y - C^*$, that is, an agent is credit constrained when the optimal level of saving is less than the actual level because she is unable to borrow enough to attain the desired, otherwise feasible consumption level,[4] where S^* and C^* refer to optimal saving and consumption in the absence of the current borrowing constraint. Further, Y, A, and D refer to income, stock of assets, and the amount that households are able to borrow. r is the exogenous real rate of interest.

When a household is a credit-constrained $C < C^*$, that is, credit constraints prevent households from borrowing to reach the optimal consumption level. On the other hand, we define discouraged households as those who perceive a high probability of loan denials. Consumption is a function of observable variables such as income, wealth and demographic characteristics, and idiosyncratic error $\iff$ $C^* = F(X_i, \epsilon_i)$ that determine the consumption behavior of households. Beaton (2009 WP) provides evidence that consumer spending is positively related to credit availability in the United States. In addition, Glick and Lansing (2011) find that changes in credit availability have played a significant role in explaining the variance in the saving rate in the US since the Great Recession. Hence, credit constraints play a significant role in determining the saving behavior of the households.

In what follows, we say that an agent is unconstrained if $S^* = Y - C^* = S < Y - C$ $\iff$ C= C*.

[3]See Jappelli (1990).

[4]See Jappelli (1990).

3.5 Data and Sample Description

In this paper, we use cross-sectional data from the 2016 SCF, which consists of 31,240 observations. SCF data provide rich information on not only wealth and income components but also questions measuring the risk aversion of households and direct questions on credit constraints by asking the following:

"**In the past twelve months, has a particular lender or creditor turned down any request you (or your husband/wife/partner) made for credit, or not given you as much credit as you applied for? and You just indicated that you did not apply for any credit over the past twelve months. Was that because you had no need for additional credit, you thought interest rates were too high, you did not think you would get approved, or something else?**"

The SCF also measures the risk aversion of households by asking the following:

"**On a scale from zero to ten, where zero is not at all willing to take risks and ten is very willing to take risks, what number would you (and your husband/wife/partner) be on the scale?**"

Another example is a direct question related to credit constraints, which is:

"**In the past twelve months, has a particular lender or creditor turned down any request you (or your husband/wife/partner) made for credit, or not given you as much credit as you applied for? IF YES, PROBE: Were you turned down, or did you not get as much as you applied for?** "

A direct way to define constrained households is to ask respondents whether they applied for a loan and were denied [on this see also Attanasio and Weber (2010)]. Jappelli (1990) defines credit-constrained households as any household (agent) whose

loan request is rejected by a lender[5]. Discouraged households, on the other hand, are households that have not applied for a loan due to the cost of applying or because there is a high probability of application rejection. Finally, unconstrained households are households that had applied for a loan and had their applications are approved. Table 3.1 reports the proportion of the three groups of households according to the SCF data sample in 2016. The total number of households is 31,240, of which 2975 are credit constrained, 2741 are discouraged from applying for a loan, and 25,524 are credit unconstrained. Table 3.2 reports the saving decisions for constrained, discouraged and unconstrained households. Saving for liquidity and future income uncertainty represents the primary saving motivation for constrained and discouraged households, where 32.3% of constrained applicants and 35.24% of discouraged households save for liquidity and the future, while the most common motivation to save for unconstrained households is for retirement at 36.42%.

Finally, Table 3.3 reports the reasons that households are constrained and discouraged from accessing the credit market. Interestingly, the most common reason that precludes households from accessing the credit market for both constrained and discouraged applicants is having a credit score that is too low, followed by having adverse credit reports and a lack of established credit history. Lacking sufficient income and having a large amount of debt also play important roles in accessing the credit market. Table 3.3 also shows that discouraged applicants do not access the credit market due to previous experience, inconvenient processes, interest rates, and discrimination in processing the application.

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[5]See also Jappelli et al. (1998) in defining liquidity-constrained households.

3.6 Empirical Approach

3.6.1 Who is Credit Constrained?

First, we follow Jappelli (1990) in estimating the logit model to identify the likelihood ratio of households that are credit constrained. Hence, the response variable is the rejection of a credit application $Credit_i$, which is a binary variable in this model, assuming a value of one or zero, defined as:

$$Credit_i = \begin{cases} 1 & \text{if the } i \text{ -th households credit-constrained} \\ 0 & \text{otherwise.} \end{cases}$$

The probability distribution function of $Credit_i$ is given by:

$$\Pr\{Credit_i = 1\} = \pi_i^{credit_i} (1 - \pi_i)^{1 - credit_i}$$

Therefore, the logit model is defined as:

$$\text{logit}(Pr(Credit_i = 1 \; x_1, ..., x - i)) = \alpha_0 + \alpha_1 X_i$$

Here α_0 is the constant term, and X_i represents the factors that play a role in the rejection of a credit application. Income, wealth, and debt variables are expressed in logarithms. Income consists of wages, business income, interest and dividends, capital gains, pensions and annuities, transfers, net rent, and IRA withdrawals. Wealth consists of cash, checking, savings, money market, and prepaid debit accounts, certificates of deposit, total directly held mutual funds, stocks, bonds, and total quasi-liquid assets, which is the sum of IRAs, thrift accounts, future pensions,

bonds, cash value of whole life insurance, and other financial assets such as future lottery/prize receipts. Debt consists of mortgages, installments, account overdrafts, secured loans, and amounts owed to retirement accounts.

Table 3.4 reports the results of the logit equation. Column (3) in Table 3.4 reports the partial derivatives of $\partial Credit_i/\partial X_i$, which are similar to the estimated coefficients in column (1). Wealth, representing the interaction of wealth and income, is negatively associated with credit constraints. College graduates, females, homeowners, and older households are less likely to be credit-constrained. Black, married, saver, and large family households are more likely to be credit constrained. The aim of this paper is to investigate the reasons credit-constrained households save. Section 6.2 provides further details on the methodology and the outcomes of this study.

3.6.2 Why Do Households Save?

We use cross-sectional data from the 2016 SCF from which we obtain information about credit-constrained households [6] to classify saving motives for households and apply the following probit model:

$$S_i = \alpha_0 + \alpha_1 Credit_i + \alpha_2 X_i + \alpha_3 FR_i + \epsilon_i.$$

Where S_i is a dummy variable indicating household saving decisions. $Credit_i$ refers to credit constraints and a dummy variable that indicates either a household's loan request was rejected by a lender, it refers to a credit-constrained household, or a household discouraged to apply for a loan (a discouraged household). FR_i is a

[6] Pfeffera, Schoenia, Kennickell and Andreskic (2016) state that the SCF is a survey focused on an oversample of households that are at a high level of wealth to reflect the small numbers of households that hold a large share of total wealth in the US.

dummy variable indicating financially risk-averse households,X_i represents demographic variables such as gender, age, race, number of children and marital status, and ϵ_i is an error term.

We are interested in estimating the effect of credit constraints on household saving decisions for precautionary, investment, and retirement purposes to address the question of whether and to what extent credit constraints preclude households from accumulating wealth. To estimate the effect of credit constraints on saving decisions, we exclude households whose wealth is less than \$15,000. The motivation to do so is to exclude low-wealth households that cannot accumulate wealth regardless of being credit constrained.

Since the data we utilize in this paper is the 2016 SCF, the data come from an environment in which the interest rate is low. For example, the interest rate on consumer installment loans at commercial banks was about 4.17% [7]. This implies that the opportunity cost of borrowing-saving is small. We also suppose that credit constraints exogenously affect households' saving decisions. Since the interest rate is low, households prefer borrowing to finance consumption rather than reducing consumption to increase savings. However, when credit constraints become tighter, the gap between the target and actual savings level negatively affects the ability of constrained households to accumulate wealth. Therefore, the hypotheses of this paper can be stated: credit constraints move cyclically with saving for liquidity and countercyclically with saving for investment for constrained households, and the credit constraint negatively affects the wealth of constrained households.

Table 3.5 reports the estimated effect of credit constraints on the predicted probability of saving decisions of constrained and discouraged households. Constrained households are less likely to save for retirement and for liquidity, while they are more

[7]See https://fred.stlouisfed.org/series/TERMCBAUTO48NS

likely to save for investment. Constrained Black households are more likely to save for liquidity and investment purposes. College graduates are more likely to save for retirement. Women are less likely to save for investment.

But actual saving is the outcome of both the desire to save on the part of the households and the true constraint they face. Therefore, this gap cannot just be something that prevents them because precluding that implies exogenous barriers, whereas this is a combination of choice and constraints. When households are credit-constrained, they use their savings to smooth their consumption rather than to accumulate wealth over time. Financially, risk-averse households are more likely to save for liquidity, which is consistent with Bommier et al. (2010) evidence that precautionary saving is increasing in risk aversion[8]. They are also more likely to save for investment and less likely to save for retirement. Similar to Christelis et al. (2002), who find that precautionary saving is negatively associated with age, older constrained households are less likely to save for precautionary saving motives. Discouraged households are more likely to save for liquidity and less likely to save for investment purposes. Similarly, discouraged households headed by college graduates are more likely to save for retirement, and women are less likely to save for investment.

3.6.3 Effect of Credit Constraints on Households Wealth

To examine the effect of credit constraints on the wealth of constrained and discouraged households, we utilize the ordinary least squares (OLS) estimator. We

[8]Bommier et al. (2010) develop a formal approach to comparative risk aversion and apply it in two-period models. They show that precautionary savings is increasing in risk aversion.

also utilize quantile regression to examine the effect of credit constraints on the wealth of constrained and discouraged households. OLS regression assumes that the association between the dependent and independent variables are the same at all level. However, quantile regression provides a deeper inference on the relationship between the dependent and independent variables at different levels. Therefore, OLS gets the equation for the mean, while quantile regression can describe the statistical distribution of the variables in more detail, measuring not only the effect of the independent variable in the center of the distribution but also the effect of the upper and lower extremities of the distribution. The OLS regression is directed to the mean (expectation) of the dependent variable. In other words, OLS regression reflects how the mean of the dependent variable is affected by the independent variable, while quantile regression extends the effect of the mean to the quantiles (e.g., .25th, .5th, and .75th). Another difference is that the main goal of OLS regression is to minimize the distances between the predicted value and the observed value, while quantile regression differentially weights these distances and tries to minimize them. Quantile regression provides us with a more detailed picture of how credit constraints affect the wealth of constrained and discouraged households by estimating the effect of credit constraints on the upper and lower levels of wealth. The structural form equation for the quantile regression is as follows:

$$W_i = \delta_0 + \delta_1 Credit_i + \delta_2 X_i + \epsilon_i.$$

W_i refers to wealth, which is the financial assets as mentioned above in the "Data & Sample Description" section, expressed in logarithms in this model, δ_0 is the constant term, $Credit_i$ refers to credit constraints. X_i represents demographic variables, and ϵ_i is the error term.

Following Amemiya (1982), we apply the two-stage least absolute deviations (2SLAD) estimator[9] to address the reverse causality issue that may occur between wealth and credit constraints in which both affect each other. In this model, we utilize the credit score (CS)[10] as an instrumental variable and apply 2SLAD as follows:

$$Credit_i = \pi_0 + \pi_1 CS_i + \pi_2 X_i + \upsilon_i$$

Then, we plug the estimated $\widehat{Credit}_i$ into the structural form to estimate the effect of credit constraints on the wealth of constrained and discouraged households as follows:

$$W_i = \delta_0 + \delta_1 \widehat{Credit}_i + \delta_2 X_i + \epsilon_i$$

Table 3.6 reports the outcomes of the OLS and 2SLS estimators. Credit constraints negatively affect both constrained and discouraged households. For robustness, we applied the Durbin-Wu-Hausman test, with which we fail to reject the hypothesis that the variable is exogenous.

The findings of this paper support the evidence provided by Dogra and Gorbachev (2012) that limited access to credit leads to a significant welfare loss as households cannot smooth and reach the desired level of consumption.

Table 3.7 reports the results of the quantile regression. They indicate that credit constraints negatively affect the wealth of credit-constrained households at the 25th, 50th, and 75th quantiles. Credit constraints negatively affect the wealth of discouraged households at the 25th and at 50th quantiles, but they do not have a significant

[9]Amemiya (1982) applies the two-stage least absolute deviations (2SLAD) estimators to estimate parameters in the simultaneous equations model.

[10]A credit score represents the behavior of the borrower. Wealth and income do not factor into credit scores.

effect on their wealth at the 75th quantile. This indicates that the effect of credit constraints decreases as the level of wealth increases. Table 3.8 reports the outcomes of the two-stage least absolute deviations (2SLAD) estimator, which are similar to those of the quantile regression. These findings show that credit constraints negatively affect the wealth of credit-constrained households at the 25th, 50th, and 75th percentiles. However, credit constraints negatively affect the wealth of discouraged households at the 25th, while positively at the 50th quantile, and have no significant effect at the 75th quantile. This suggests that discouraged households who hold low levels of wealth decumualte their savings to meet their needs. However, discouraged households who hold higher levels of wealth are able to save more and accumulate wealth. One possible explanation is that holding sufficient levels of financial assets allows those households to finance their consumption even if they do not access the credit market. In addition, there could be other factors that affect the wealth of constrained and discouraged households, which are not captured in this estimation.

Figures 3.1 and 3.2 display graphs that visualize the difference in coefficients across the quantiles with the bootstrapped confidence intervals for credit-constrained and discouraged households, respectively. They also display the OLS estimates, which are constant across all quantiles, and their confidence intervals. The green line is the slope coefficient from the quantile regression, and the black lines are the least squares estimates and their confidence intervals. This graph shows that the top and bottom quartiles are well beyond the least squares estimates within the confidence intervals of the quantile regression coefficients, implying that our quantile regression results are significantly different from our OLS results. As mentioned above, the OLS gets the equation for the mean, while quantile regression can describe the statistical distribution of the variables in more detail. For example, OLS regression results show that credit constraints insignificantly affect the wealth of discouraged

households, while quantile regression results show that credit constraints affect the wealth of discouraged households at the .25th and .50th quantiles. Since quantile regression captures the effect of the independent variables at the upper and lower level of the distribution, the magnitude of the coefficients and the signs will, in general, be different from those of the OLS regression.

3.7 Implications of Findings

Approximately 18% of the households in this study are constrained or discouraged households and cannot accumulate wealth. The primary reason that they are credit constrained is their low credit score or no credit rating. Therefore, outreach programs on financial literacy, particularly on how to improve credit scores and build credit histories, would be helpful in reducing the credit constraints of these households. Some nonprofit organizations offer financial literacy education and outreach to help such households improve their credit score and build a credit history to reduce credit constraints and make wise financial decisions in terms of optimal consumption and saving.

Further, the policy implications of our findings may be crucial. For example, a targeted tax cut may significantly increase aggregate consumption. Targeting a particular population classified as credit-constrained and credit-discouraged households would be effective. Those households will benefit from the tax cut not only by financing their consumption but also by increasing their wealth. Further, as Roeger and Veld (2009) point out, a discretionary fiscal policy will result in short-term financial stability for credit-constrained households.

This is also consistent with the findings of Campbell and Hercowitz (2019), who show that the marginal propensity to consume (MPC) out of tax rebates among

middle-income households is higher than predicted by the permanent income hypothesis (PIH). Therefore, credit constraint increases the marginal propensity to consume out of transitory income; and thus, fiscal policy could be an instrument that boosts the financial stability of those households.

The outcomes of this study suggest that improving access to the credit market for constrained and discouraged households could play a substantial role in building household wealth.

3.8 Conclusion

Saving is a behavior to reduce the effect of adverse income shocks, which is evident in a financial emergency and unexpected crises. Several factors affect the ability of the households to save.

One notable factor is being credit constrained. By credit-constrained, we mean households cannot access the credit market and borrow. In this paper, we examine the role that credit constraints play in the savings decisions of households by focusing on a well-defined set of reasons for their saving. The paper is an attempt to understand to what extent credit-constrained households are able to accumulate wealth when the macro environment is characterized by the presence of a liquidity trap.

Here, we utilize a probit model using cross-sectional data from the SCF to examine the effect of credit constraints on constrained and discouraged households' savings behavior. Credit-constrained households are less likely to save for retirement and for liquidity, while they are more likely to save for investment purposes. Constrained Black households are more likely to save for liquidity and investment purposes. Discouraged households are more likely to save for liquidity and less likely

to save for investment purposes. Since discouraged households do not attempt to access the credit market, they mainly save for liquidity purposes. When households are credit-constrained, they use their savings to smooth their consumption rather than to accumulate wealth over time.

Quantile regression is also employed in this paper to estimate how credit constraints affect household wealth at different levels. We find that credit constraints negatively affect the wealth of households. However, they marginally affect the wealth of discouraged households at the 25th quantile and have no statistically significant effect at the 75th quantile. This suggests that the magnitude of the credit constraint effect decreases as household wealth moves from the 25th quantile to the 75th quantile.

3.9 Limitations of the study and Future Research

It may be of interest to track the growth of household savings over time to obtain better insights into whether constrained households are able to accumulate wealth or if they remain stuck in a liquidity trap due to credit constraints. Regarding consumption smoothing, standard models predict an agent borrows if s/he expects an increase in income. However, information on consumption growth is not available in SCF. Unfortunately, SCF data are cross-sectional and do not track the same households across the years of the survey. In addition, it would be more informative if we could exploit household data on unemployment and financial distress to control for additional factors that may contribute to household credit constraints. Therefore, we recommend that future research shed light on the growth in saving for investment and income uncertainty reasons to provide full insight into this topic when such data become available.

Table 3.1: Constrained, Discouraged & Unconstrained Households

Households	(1) Observations	(2) Mean	(3) Standard Deviation
Constrained	2,975	.095	.29
Discouraged	2,741	.088	.28
Unconstrained	25,524	.82	.39
Total	31,240		

Source: the data is downloaded from 2016 survey of Consumer Finance. Total number of respondents is 31,240.

Table 3.2: Reasons for Saving

Group of Households	(1) Constrained	(2) Discouraged	(3) Unconstrained
Cannot Save	.5	.44	.71
Education	10.95	11.64	6.29
Family	7.29	11.27	6.38
Home	7.93	6.09	2.91
Purchase	13.45	13.6	9.53
Retirement	24.74	18.75	36.24
Liquidity/Future	32.3	35.24	35.08
Investment	2.7	2.96	1.82
No Particular Reason	.17	0	1.02
Total	2975	2741	25524

This table reports the motivation of households in 2016 survey of Consumer Finance data to save.

Table 3.3: Reasons Why Households' Applications were Rejected or Discouraged to Apply for a Loan

Reasons	(1) Rejected	(2) Discouraged
Marital Status	0	.18
Age	.168	.18
Race	0	.18
Other Personal Characteristics	.37	.18
No Credit History	14.55	7.7
Credit Score	30.29	29.73
Credit Report	18.76	14.63
Not Enough assets	3.23	2.33
Amount of Debt	.6	9.16
Credit References	20.74	0
Other Credit characteristics	.71	.91
Bad Credit	7.13	10.07
Time in Job	.67	.55
Type of Job	.168	.36
Unemployed	.77	.55
Not Enough Income	12.07	8.43
Source of Income	.168	.73
Financial Characteristics	.50	0
Not A member of Credit Union	0	.36
Previous Experience	0	4.93
Strict Lending Requirements	.77	.36
The Loan is not eligible	0	.18
Discrimination	0	.18
Inconvenient	0	.40
Other	.87	1.28
Not approved for a Loan purpose	.57	0
Low Credit supply	.71	0
Interest rate	0	.36
Error in credit report	.94	.36
Characteristics of Collateral	.73	0
No Reasons	2.89	0
Observations	2975	2741

Note: Households are allowed to give multiple answers.

Table 3.4: Probability of Being Credit Constrained

Variable	(1) Coefficient	(2) Standard Error	(3) Partial Derivative
Income	.12	(.32)	.01
Income^2	.01	(.02)	.001
Wealth	.45***	(.12)	.04***
Wealth^2	-.001	(0.003)	-.00
Wealth*Income	-.06***	(.01)	-.01***
Debt	.11***	(0.015)	.010***
Age	.03	(0.02)	.002
Age^2	-.001***	(.0001)	-.00***
Age*Income	.005**	(.002)	.00**
Age*Wealth	.001	(.001)	.00**
College	-.3***	(.05)	-.03***
Unemployed	.12*	(.06)	.01*
Married	.17**	(.07)	.015**
Black	.31***	(0.06)	.03***
Female	-.32***	(.07)	-.03***
Homeowner	-.51***	(0.06)	-.05***
Family size	.08***	(.02)	.01***
Save dummy	.61***	(0.05)	.054***
Constant	-5.7***	(1.5)	
Observations	22,949		

Note: Standard errors in parentheses in column(2), *** p<0.01, ** p<0.05, * p<0.1. Income and Wealth are expressed in logarithms.

Table 3.5: Effect of Credit Constraint on Constrained & Discouraged Households Saving Decisions

	Constrained			**Discouraged**		
	Retirement	Liquidity	Investment	Retirement	Liquidity	Investment
Credit	-.08**	-.14**	.113	-.12	.115**	-.76**
	(.04)	(.04)	(.09)	(.06)	(.06)	(.33)
Black	-.24***	.09**	.22***	-.24***	.08**	.24***
	(.04)	(.04)	(.07)	(.037)	(.04)	(.07)
Age	.12***	-.04***	-.04***	.04***	.08*	-.04
	(.004)	(.004)	(.01)	(.004)	(.08)	(.008)
Age^2	-.001***	-.00***	0.00***	-.001***	.0003	0.0003***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
College	.078***	- 0.03	0.004	0.08***	-.023	-.002
	(.02)	(.02)	(.02)	(.05)	(.02)	(.05)
# of children	-.103***	-.02**	-0.08***	-.10***	-.025**	-.074***
	(.01)	(.01)	(.03)	(.01)	(.01)	(.027)
Married	-.130***	-.01**	.39***	-.13***	.07**	.4***
	(.03)	(.03)	(.06)	(.03)	(.03)	(.06)
Female	-.001	-.4	-.43***	.001	-.037	-.43***
	(.03)	(.03)	(.08)	(.04)	(.04)	(.08)
Income	-.05***	-.004	.095***	-.047**	-.002	.093***
	(.007)	(.007)	(.014)	(.007)	(.007)	(.014)
Homeowner	.165***	0.03	.36***	.164***	.04	.24***
	(.03)	(.05)	(.07)	(.03)	(.03)	(.08)
Financial Averse	-.202***	.06**	.14**	-.2	.055**	.15***
	(.02)	(.03)	(.06)	(.03)	(.03)	(.057)
Constant	-2.68***	.48***	-2.8***	-2.7***	.44**	-2.77***
	(.15)	(.13)	(.29)	(.15)	(.14)	(.3)
Observations	19406					

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3.6: Effect of Credit Constraint on Constrained and Discouraged Households Wealth Models

	(Constrained) OLS	(Constrained) 2SLS	(Discouraged) OLS	(Discouraged) 2SLS
Credit	-0.0575***	-0.666***	-0.356***	-0.176
	(0.00515)	(0.0931)	(0.0621)	(0.241)
Black	-0.652***	-0.619***	-0.627***	-0.638***
	(0.0419)	(0.0421)	(0.0418)	(0.0449)
Age	0.123***	0.122***	0.122***	0.122***
	(0.00542)	(0.00546)	(0.00541)	(0.00543)
Age^2	-0.000648***	-0.000628***	-0.000623***	-0.000619***
	(4.87e-05)	(4.91e-05)	(4.87e-05)	(4.89e-05)
# of children	-0.0179	-0.0127	-0.0173	-0.0183
	(0.0127)	(0.0128)	(0.0128)	(0.0129)
College	1.370***	1.346***	1.363***	1.365***
	(0.0246)	(0.0249)	(0.0247)	(0.0248)
Married	-0.475***	-0.448***	-0.451***	-0.454***
	(0.0395)	(0.0395)	(0.0396)	(0.0397)
Homeowner	0.653***	0.594***	0.618***	0.626***
	(0.0331)	(0.0333)	(0.0329)	(0.0346)
Female	-0.434***	-0.457***	-0.441***	-0.443***
	(0.0443)	(0.0444)	(0.0443)	(0.0444)
Financial Risk averse	-1.033***	-1.025***	-1.018***	-1.022***
	(0.0307)	(0.0303)	(0.0305)	(0.0305)
Constant	7.902***	7.803***	7.740***	7.740***
	(0.156)	(0.157)	(0.155)	(0.155)
Observations	19,623	19,623	19,623	19,623
R-squared	0.393	0.392	0.390	0.390

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.7: Effect of Credit Constraint on Constrained & Discouraged Households Wealth-Quantile Model

	Constrained			**Discouraged**		
	Q.25	Q.50	Q.75	Q.25	Q.50	Q.75
Credit	-.446***	-.3975***	-.440***	-.271***	-.289**	-.095
	(.046)	(.041)	(.079)	(.060)	(.113)	(.084)
Black	-.505***	-.447***	-.615***	-.509***	-.460***	-.622***
	(.033)	(.053)	(.047)	(.053)	(.054)	(.057)
Age	.0978***	.1188***	.138***	.093***	.117***	.1446***
	(.005)	(.006)	(.008)	(.006)	(.005)	(.009)
Age^2	-.0005	-.0006***	-.0007***	-.0005***	-.0006***	-.0007***
	(.00004)	(.00005)	(.00007)	(.00005)	(.00005)	(.0008)
College	1.073***	.1.286***	1.489***	1.083***	1.299***	1.506***
	(.018)	(.024)	(.041)	(.018)	(.0269)	(.032)
# of Children	-.041***	.0007	.00028	-.047**	-.0102	-.003
	(.015)	(.009)	(.017)	(.019)	(.013)	(.025)
Married	-.311***	-.521***	-.561***	-.358***	-.487***	-.542***
	(.033)	(.044)	(.047)	(.045)	(.044)	(.045)
Homeowner	.433***	.475***	.678***	.463***	.504***	.715***
	(.026)	(.042)	(.075)	(.044)	(.042)	(.044)
Female	-.429***	-.4223***	-.501***	-.358***	-.461	-.519
	(.039)	(.049)	(.058)	(.0497)	(.049)	(.058)
Financial Averse	-.872***	-.9759***	-1.018***	-.855***	-.942***	-.994***
	(.030)	(.030)	(.051)	(.034)	(.027)	(.033)
Constant	7.657***	7.84***	8.085	7.81***	7.81***	7.788***
	(.163)	(.189)	(.252)	(.179)	(.155)	(.230)
Observations	19623					

Standard error in parenthesis *** p<0.01, ** p<0.05, * p<0.1

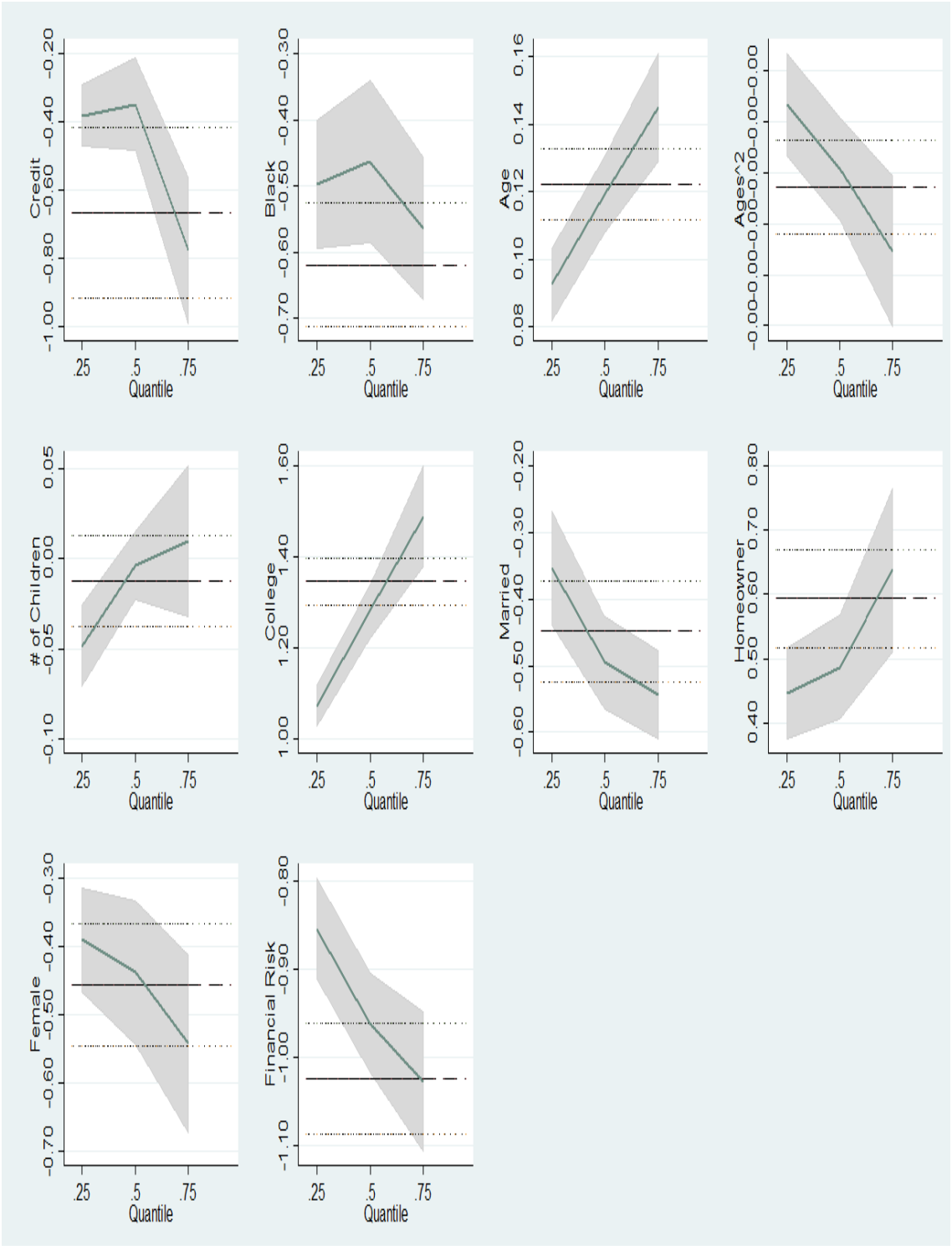

Figure 3.1: Effect of Credit Constraint on Credit-Constrained Households.

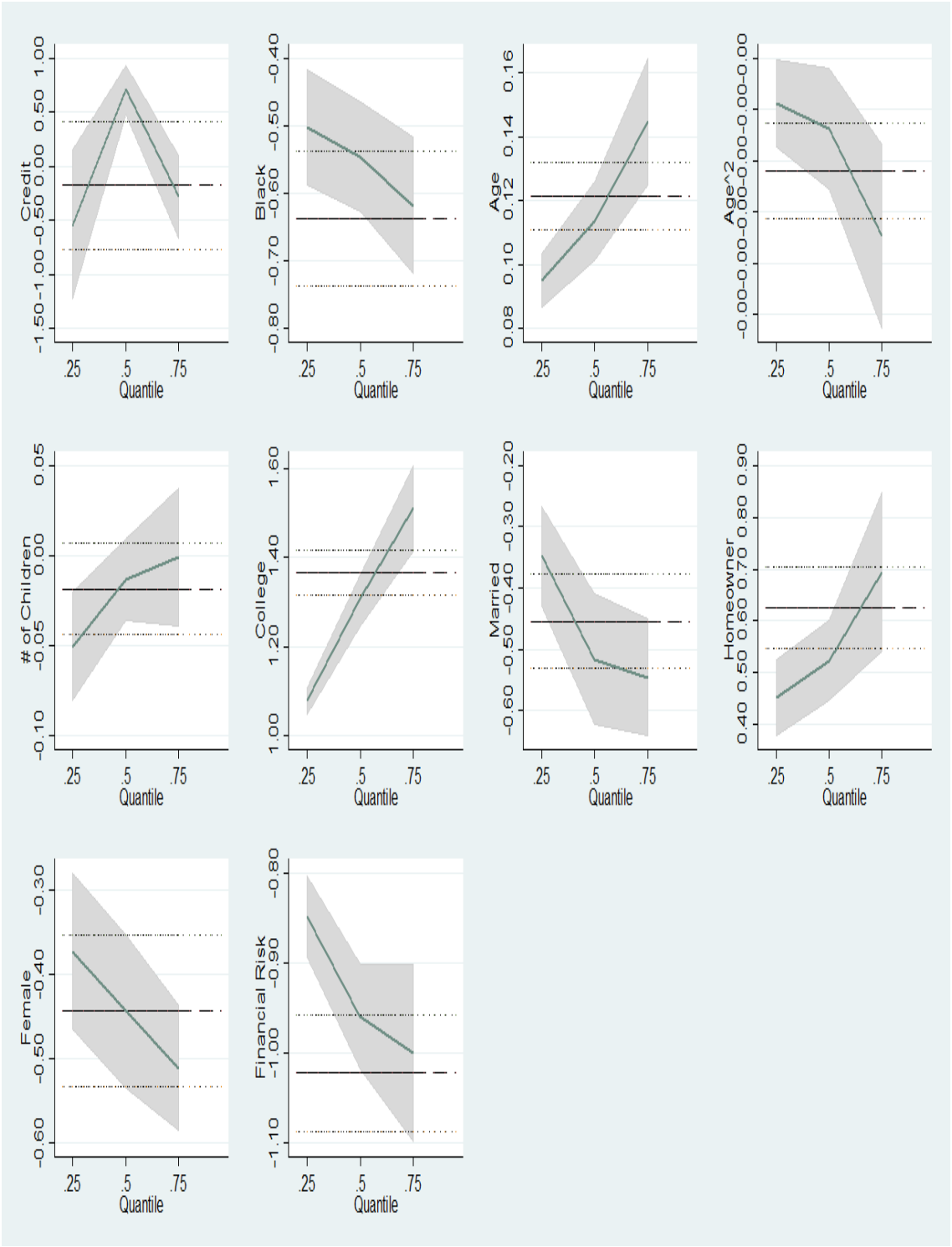

Figure 3.2: Effect of Credit Constraint on Discouraged Households.

Table 3.8: Effect of Credit Constraint on Constrained & Discouraged Households Wealth-2SLAD

	Constrained			**Discouraged**		
	Q.25	Q.50	Q.75	Q.25	Q.50	Q.75
Credit	-.382***	-.349***	-.775***	-.541*	.709***	-.277
	(.07)	(.073)	(.139)	(.297)	(.163)	(.246)
Black	-.49***	-.463***	-.564***	-.502***	-.546***	-.618***
	(.046)	(.053)	(.047)	(.05)	(.051)	(.032)
Age	0925***	.119***	.145***	.095***	.113***	.145***
	(.005)	(.005)	(.009)	(.005)	(.006)	(.009)
Age^2	-.0005***	-.0006***	-0.0008***	0.00049***	-.0005***	-0.0007***
	(.00005)	(.00004)	(.00001)	(.00005)	(.00006)	(.00008)
College	1.073***	1.28***	1.488***	1.08***	1.30***	.41***
	(.021)	(.040)	(.036)	(.022)	(.031)	(.03)
# of Children	-.048***	-.004	.0095	-.050***	-.013	-.0005
	(.011)	(.012)	(.027)	(.012)	(.008)	(.022)
Married	-.354***	-.495***	-.442***	-.348***	-.516***	-.546***
	(.052)	(.066)	(.045)	(.045)	(.042)	(.066)
Homeowner	.446***	.487***	.6377***	.451***	.523***	.693***
	(.042)	(.049)	(.058)	(.027)	(.038)	(.069)
Female	-.390***	-.438***	-.452***	-.373***	-.444***	-.511***
	(.055)	(.076)	(.068)	(.051)	(.052)	(.034)
Financial Averse	-.8545***	-.962***	-1.03***	-.848***	-.959***	-.999***
	(.030)	(.032)	(.051)	(.034)	(.024)	(.043)
Constant	7.85***	7.79***	7.91***	7.75***	7.87***	7.8***
	(.174)	(.159)	(.276)	(.152)	(.190)	(.267)
Observations	19623					

Standard error in parenthesis *** p<0.01, ** p<0.05, * p<0.1

CHAPTER 4

The Role of Health Expenditures, Household Composition, Education and Bequest Motives in Determining Retiree Wealth

4.1 Introduction

When retirees save enough prior to retirement, they can continue to maintain consumption levels similar to those enjoyed during working life. However, Blundell et al. (1998) find a significant decline in consumption around retirement age. This indicates a lack of sufficient level of assets at the age of retirement. Scholz et al. (2006) examine whether Americans are saving optimally for retirement and find that a significant number of households have a gap between the targeted wealth and actual wealth. Several factors affect retirees saving and investment decisions, including most importantly a lack of financial education. Lusardi and Mitchell (2007) conclude that many households are not sufficiently financially educated to make wise saving and investment decisions to prepare for their retirement. Another important factor that is found to affect retirees' wealth is health expenditure. Scholz and Seshadri (2010 WP) find that consumption and health capital explain the decline in wealth in older age. Palumbo (1999) documents that uncertain out-of-pocket medical expenses play an important role in precautionary savings with negative consequences for the levels of consumption of elderly Americans. Finally, bequest motives also play an essential role in determining the wealth of retirees. Modigliani (1998) argues that private wealth held at any time reflects both life cycle considerations and the assets transferred as bequests and major gifts. However, Nardi et al. (2010) find that bequest motives do not play an important role in retirees' saving behavior.

In this paper, we evaluate the role of education, household composition, health expenditures, and bequest motives in determining the assets holdings of retirees.

Our first hypothesis is the desire to bequest to the next generations positively affects the wealth of retirees.

As a corollary, we hypothesize that married retiree accumulates more wealth than single ones. Our second hypothesis, based on the literature mentioned above, is that education increases retirees' wealth. Further, the literature that suggests that the risk of medical spending explains the slow decumulation of retiree wealth and public health insurance may mitigate the effect of medical spending uncertainty (Nardi et al. 2016), we hypothesize thirdly that public health insurance, and thus, public health expenditures reduce the need to save, and thus positively affect retirees' wealth. To evaluate the role of these three factors on retiree wealth, we utilize the Health and Retirement Study (HRS) data covering the period 1992-2016 and 5000 households. We restrict the data to retired households, and employ the System Generalized Method of Moments (GMM) estimator to estimate the effects of these variables on retiree's wealth and address the potential endogeneity issue, pointed out by Meer et al. (2003 WP), who find that there is an endogeneity that the causal connection between wealth and health goes both ways. Our data reveals that on average 76.5% of retirees have bequest motives, their average wealth is $353,871.80, while their average financial assets is $150212, and 46.8% are married. While we find evidence that bequest motives positively affect retiree wealth, we do not find evidence for the role of education, medical expenditures, or household composition in determining retiree wealth.

This paper is organized as follows. Section 4.2 presents the literature review. Section 4.3 describes the data and the methodology that are used in this paper. Section 4.4 describes the empirical approach. Section 4.5 presents the conclusion.

4.2 Literature Review

The motivation for bequeathing wealth to the next generation affects the saving decisions of households. Bernheim (1987 WP) examines several aspects of saving behavior after retirement, focusing on the roles of bequeathable wealth, the age of the owner, and annuities.

According to the Consumer Expenditure Survey (CEX) shows that health expenditure is the fourth-largest expenditure category for those who are between ages 65 to 74 and the second -largest expenditure category for those who are 75 years old and older[1]. Thus, healthcare expenditures constitute a significant part of the total retiree spending. Clarka and Mitchell(2014) find that public health insurance reduces saving for retirees. Here following Nardi et al. (2010), who document that out-of-pocket medical expenses (OOP) significantly affect retiree saving behavior, we utilize the out-of-pocket medical expenditures to analyze the role of the health expenditures in determining the wealth of retirees. In the same vein, Banks et al. (2019) compare nondurable expenditures of older households in the US and the UK and document that while the income trends are similar, there is a dramatic decline in nondurable expenditures at older ages in the UK compared with the US. This considerable difference is attributed to larger healthcare and medical expenses in the US than in the UK. Thus, in what follows, a key variable we analyze is out-of-pocket medical expenses[2].

As pointed out above, when agents retire, their income falls and lowers their ability to accumulate wealth after retirement. Bernheim et al. (2001) document that

[1]See
https://www.bls.gov/opub/btn/volume-5/spending-patterns-of-older-americans.htm

[2]Excluding the out-of-pocket medical expenses from the comparison between USA and UK in the Banks et al. (2019) paper, reduces the gap in nondurable expenditure.

consumption is not smooth at the retirement age, at which point there is a negative relationship between retirement savings and income replacement rates. This observation makes them skeptical of previous studies that find that home production, work-related expenses, or differences in relative tastes for leisure explain the differences in wealth at retirement.

Making financially wise consumption, saving, and investment choices at an early age provides financial stability at retirement. For example, Venti and Wise (1998) conclude that at all levels of lifetime earnings, there is considerable dispersion in the accumulated wealth of households near retirement. This dispersion is attributable to the saving and consumption choices made while young. Lusardi and Mitchell (2011 WP) utilize Health and Retirement Study (HRS) data to identify how people make financial decisions. They find that older Americans, especially women who are underrepresented and less educated, are financially illiterate and thus do not plan effectively for retirement.

Households with different educational levels make different consumption, saving, and investment choices either before or after retirement, which affect the retirees' wealth accumulation and decumulation. Education and financial literacy have been shown to promote wise saving and investment decisions. For example, Poterba et al. (2013) provide evidence that education substantially affects these choices, and this effect occurs at the pre-retirement age. Lusardi and Mitchell (2007) find that financial literacy plays an important role in the lack of household retirement savings.

Numerous studies have focused on how the bequest motivation affects the wealth of retirees. Modigliani (1998) finds that bequests play an important role for assets accumulation in wealthy and high-income households, while they serve a precautionary motive in low-income households. Kopczuk and Lupton (2007) find that elderly households with children have more significant bequest motives than childless elderly

households. Hurd (1987), who utilizes the longitudinal Retirement History Survey (RHS) data to examine the effect of bequest motives on wealth of the elderly people, however, finds no evidence to support the hypothesis that bequest motives increase the wealth among the elderly people.

Indeed, there is evidence that life expectancy and longevity determine how retirees accumulate and decumulate their wealth; certainly, if medical expenditures increase with age as those retirees need more healthcare. Retirees retire with relatively small financial assets in which they face longevity risk, unexpected and uninsured medical expenses, and undesirable returns on their assets (Poterba et al., 2011). Love et al. (2008) utilize the Health and Retirement Study (HRS) and conduct the "annualized comprehensive wealth" measurement to measure the wealth trajectories for retirees taking into account life expectancy, medical expenses, and bequest motives. They find that retirees' wealth substantially increases with age. In contrast, Blundell et al. (2016) employ two data sets to provide a detailed comparison of wealth trajectories for American and English retirees households utilizing the HRS and English Longitudinal Study of Ageing (ELSA) panel data. They find that English retirees accumulate wealth, while US retirees' wealth declines slowly with age.

Household composition, including marital status and number of children, plays an essential role in determining the wealth of retirees. Bearden and Wilder (2007), who utilize the HRS panel data, find that having children is associated with lower household wealth at the retirement age, and the effect increases with the number of children. They also show that single retirees report lower wealth than married retirees.

In this paper, we attempt to bridge a gap in the previous studies and evaluate the effects of education, household composition, health expenditures, and the be-

quest motive on the retiree wealth. We do so by employing the System Generalized Method of Moments (GMM) estimator to address the reverse causality that may occur between wealth and health expenditures.

4.3 Data and Methodology

To evaluate the role of education, household composition, health expenditures, and bequest motives on the wealth of retirees, we utilize the HRS panel data covering the period 1992-2016 with 5000 households and restrict the data to retired households.[3] We collect information on wealth, financial assets, health expenditures, household composition, and bequest motives. The wealth variable is constructed as the sum of the value of the primary house, the net value of other real estates, the net value of the business, the net value of vehicles, the net value of stocks, the net value of checking accounts, the net value of certificate deposits, the net value of bonds, the net value of other savings minus sum of debt such as the value of all mortgages and home loans and all other debt. The financial assets variable is the net value of non-housing financial wealth and is calculated as the sum of the financial assets components, which are the sum of the value of stocks, checking accounts, certificate deposits, bonds, and other financial assets minus debt. The health expenditures variable represents total out-of-pocket medical expenditures for the households. The HRS data is collected by asking the respondents a direct question about the bequest motives:"What are the chances that you (and your (spouse/partner)) will leave any inheritance?". Table 4.1 reports the descriptive statistics for retirees, which shows

[3]The Health and Retirement Study (HRS) is a longitudinal panel data conducted by the Institute for Social Research at the University of Michigan.

that on average 76.5% of retirees have bequest motives, have three children average wealth of $353,871.80, average financial assets of $150212, with 46.8% married. In addition, figure 4.1 displays that the chance of leaving a bequest is correlated with the mean of wealth. Figure 4.2 displays that the average wealth of college graduate retirees is larger than that of non-college graduates. Figure 4.3 shows that the average wealth of married retirees is larger than that of single retirees. Here, one possible explanation is that the decline of the household's Social Security benefits for single-retirees as compared to married-retirees ((Bearden and Wilder 2007).

4.4 Empirical Approach

To begin evaluating the roles of education, household composition, health expenditures, and bequest motives on the wealth of retirees, we employ ordinary least squares (OLS) regression as follows:

$$W_{it} = \gamma_0 + \gamma_1 H_{it} + \gamma_2 BM_{it} + \gamma_3 Education_{it} + \gamma_4 X_{it} + \epsilon_{it}$$

Where W_{it} represents retiree wealth, H_{it} represents health expenditures, BM_{it} represents the bequest motive, $Education_{it}$ is a dummy variable indicating whether the retiree is a college graduate, X_{it} represents marital status and number of children, and ϵ_{it} is an error term[4]. In this model, we consider married retirees to focus on the role of marital status on retiree's wealth.

Meer et al. (2003 WP) point out that wealth and health status may be endogenous. To address this potential endogeneity issue in this model, we use system generalized method of moments (GMM) estimators. The system GMM is a form

[4]Note: wealth and health expenditures variables are expressed in logarithms.

of instrumental variable approach (IV) that is efficient because it uses a rich set of instruments. It is thus a method alternative two-stage least squares (2SLS), and distinguishes between the independent variables and the instrumental variables, overlapping these variables in the second stage. The system GMM estimator includes both the level and the first difference equations. In dynamic panel data models, system GMM includes lagged levels of the dependent variable as an independent variable. The first difference of the regression eliminates the fixed effects. Further, in system GMM, the deeper lags of the endogenous variables and the dependent variable are used as instrumental variables[5]. Since the current level of wealth is determined by its past level, we include W_{it-1} as an independent variable in the system GMM model to deal with omitted variable bias. These omitted variables are not observed in the data, such as negative shocks in W_{it-1}, which carry the effects to W_{it}. Therefore, the model is as follows:

$$W_{it} = \alpha_2 W_{it-1} + \alpha_1 H_{it} + \alpha_2 BM_{it} + \alpha_3 Education_{it} + \alpha_4 X_{it} + \upsilon_{it}$$

To test the validity of our Systems GMM estimates, we run two main robustness tests. First, we run Arellano-Bond AR (1) AR (2) test (Arellano and Bond, 1991) to test the first and second-order serial correlation in the first-differenced errors. The output presents an auto-correlation in the first-order, which is required for the validity of the system GMM. Second, we test the validity of the exclusion restriction by performing the Hansen and Saragan tests for over-identifications restrictions. The test indicates that the instrumental variables in the system GMM are not over-identified. In addition, we perform Hansen test for the exogeneity of the instruments,

[5]See Roodman (2009).

which reveals that the system GMM estimator is valid in this study[6]. We also use the two-step estimator with robust standard errors in this model.

Table 4.2 reports the findings of the OLS and system GMM estimators for the effect of health expenditures, education, household composition, and bequest motives on wealth. The results indicate that the bequest motives significantly increase retiree wealth. Since we believe that there is a non-linear relationship between age and wealth, we include age^2 in the regression, and the results are reported in column 1 and column 3 in table 4.2. We expect that age positively affects wealth, but at some point, this effect decrease. While OLS outputs show that age significantly increases wealth, we do not find evidence that when applying the system GMM estimator, age affects retirees' wealth. The results show that bequest motives, college degree, and being married positively affect the wealth of retirees. While Bearden and Wilder (2007) find that having children is associated with the lower wealth of households at retirement age, we find that the number of children only affects retirees' wealth in the OLS regression. With system GMM, which addresses the endogeneity issue, our results only indicate that the bequest motive significantly increases retirees' wealth, while there is no evidence that other factors play a significant role in determining the wealth.

Table 4.3 reports the findings of the OLS and system GMM estimators for the effect of health expenditures, education, household composition, and bequest motives on the financial assets. Column 1 reports the results for OLS estimator excluding age^2 variable, while column 2 includes age^2 to examine the non-linear relationship between age and wealth. As in table 4.2, the regression results indicate that the bequest motive, college degree, and being married positively affect the wealth of retirees. In contrast with table 4.2, the number of children negatively affects the

[6]See Roodman (2009) and Arellano and Bond (1991)

financial assets of retirees. However, performing system GMM in which addresses the potential endogeneity issue in the OLS estimator, the results show that there is only a marginal effect of the bequest motive on wealth, and we find no evidence that other factors play a significant role in determining wealth.

4.5 Conclusion

In this paper, we evaluate the role of education, household composition, health expenditures, and bequest motives in determining retiree wealth. To do so, we utilize HRS data covering 5000 households in the period 1992-2016. We restrict the data to retired households and employ the System Generalized Method of Moments (GMM) estimator to estimate the effects of these variables on retiree wealth and address potential endogeneity issues. The data shows that on average, 76.5% of retirees have bequest motives, have three children, on average wealth of $353,871.80, and average financial assets of $150212, while 46.8% of them are married. We find evidence that while bequest motives positively affect retiree wealth, our results indicate that education, medical expenditures, and household composition have no significant effect on wealth. As Poterba et al. (2013) point out, education indirectly affects retiree wealth after retirement through its effect on health and financial capital accumulated before retirement, which would explain the insignificant relationship between education and retiree wealth. Unlike Love et al. (2008), who find that retiree wealth substantially increases with age, we find the effect of age on wealth is not statistically significant when applying system GMM.

While previous studies, (Poterba et al., 2013), find that education positively affects financial capital accumulation, here, we find no evidence to support this finding. The literature shows that education positively affects wealth through in-

come. Here, we restrict the data to retired households who are no longer working. As such, the effect of income decreases after retirement. Another possible explanation is that education affects wealth as it increases financial literacy. On the other hand, educational costs constitute a large financial liability even after retirement, which offsets the positive effect of education on wealth.

We find no significant relationship between health expenditures and wealth. This could be attributed to government health insurance programs, such as Medicare. Another possible explanation is that retirees allocate their consumption in such a way to finance their high health expenditures[7].

The bequest motive positively affects the wealth of retirees as they save more and accumulate wealth to ensure that their offspring inherit part of their wealth.

[7]See Bank et al. (2019)

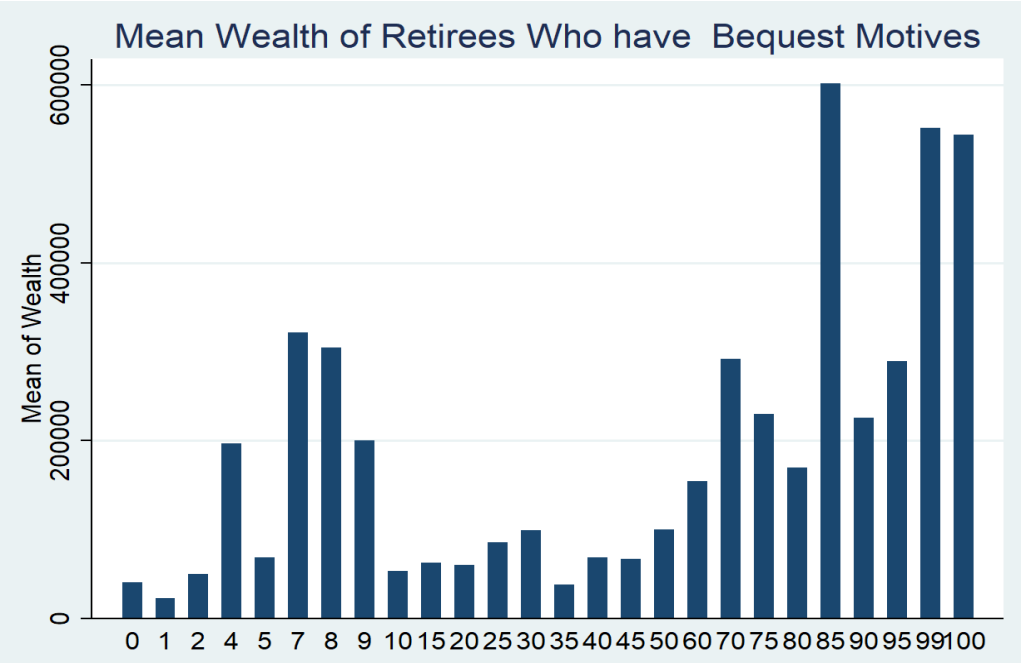

Figure 4.1: Wealth of Retirees who have Bequest Motives.

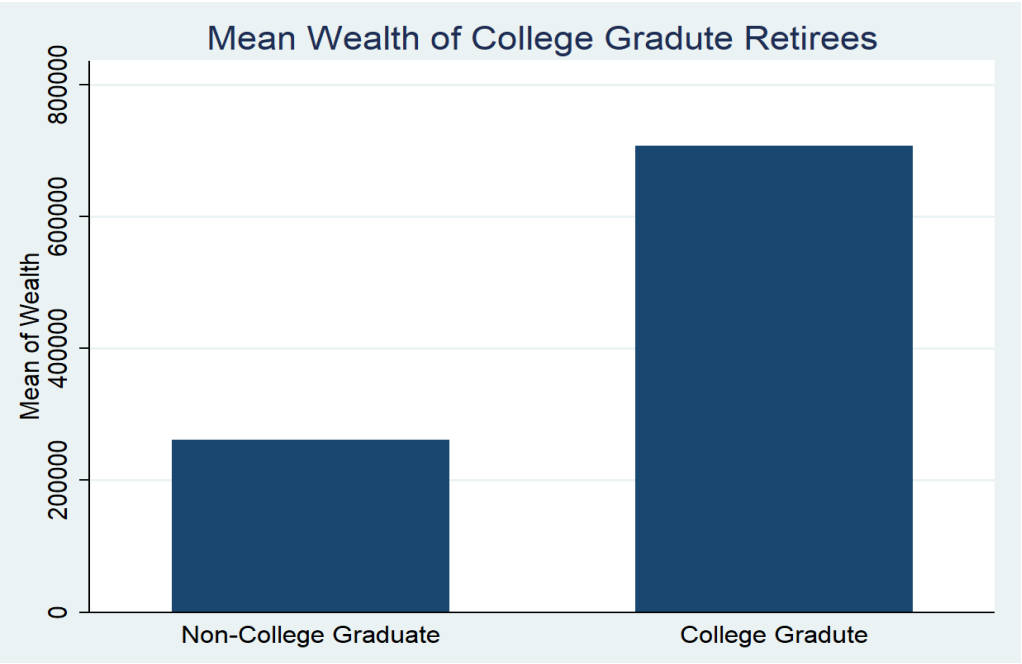

Figure 4.2: Wealth of College Graduate Vs. Non-College Graduate Retirees.

Table 4.1: Descriptive statistics of Retirees

VARIABLES	(1) Mean	(2) Median	(3) Standard Deviation
College	3.168111	3	1.383604
Bequest Motive	76.50245	100	40.74818
Medical Expenditure	6581.282	3600	13337.02
lg-Medical Expenditure	7.935856	8.188967	1.7259188
Wealth	353871.8	151000	829957
lg-Wealth	11.33009	11.98293	2.824848
Financial Wealth	150212	20000	571578.6
Lg-Financial Wealth	9.158153	10.27509	3.923427
Married	.4683072	0	.4990062
# of children	3.109278	3	2.057816
Observations	21456		

All data are taken from HRS

Table 4.2: Effect of Education, Health Expenditures, Household Composition, and Bequest Motives on Wealth

VARIABLES	(1) OLS	(2) OLS	(3) GMM	(4) GMM
College	0.413***	0.415***	0.0777	0.0855
	(0.0322)	(0.0322)	(0.0702)	(0.0703)
Bequest Motive	0.0132***	0.0132***	0.0145**	0.0136**
	(0.00121)	(0.00121)	(0.00676)	(0.00640)
Medical Expenditures	0.0492***	0.0491***	-0.0633	-0.0672
	(0.0157)	(0.0156)	(0.0690)	(0.0737)
Age	0.00951***	0.110***	-0.00285	0.0610*
	(0.00337)	(0.0321)	(0.00369)	(0.0331)
Married	0.640***	0.628***	0.0622	0.0690
	(0.162)	(0.162)	(0.119)	(0.119)
# of Children	0.00869	0.00609	0.0270*	0.0242
	(0.0204)	(0.0204)	(0.0164)	(0.0159)
Age^2	-	-0.000693***	-	-0.000433*
		(0.000226)		(0.000232)
L.Wealth	-	-	0.743***	0.737***
			(0.126)	(0.125)
Constant	7.900***	4.339***	2.205*	0.0250
	(0.321)	(1.168)	(1.252)	(2.148)
Observations	5,502	5,502	3,646	3,646

Medical expenditures and wealth are expressed in logarithm.

Robust standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Table 4.3: Effect of Education, Health Expenditures, Household Composition, and Bequest Motives on Financial Assets

VARIABLES	(1) OLS	(2) OLS	(3) GMM	(4) GMM
College	0.794***	0.794***	0.141	0.137
	(0.0548)	(0.0548)	(0.108)	(0.0997)
Bequest Motive	0.0252***	0.0253***	0.0215	0.0211
	(0.00227)	(0.00227)	(0.0177)	(0.0175)
Medical Expenditures	0.103***	0.103***	-0.00834	-0.000240
	(0.0297)	(0.0297)	(0.119)	(0.113)
Age	0.0169***	0.0578	0.00270	-0.0808
	(0.00559)	(0.0709)	(0.00980)	(0.0677)
Married	0.403*	0.397*	0.146	0.160
	(0.236)	(0.236)	(0.217)	(0.214)
# of Children	-0.166***	-0.167***	0.0386	0.0414
	(0.0357)	(0.0358)	(0.0323)	(0.0309)
	-	-0.000282	-	0.000559
		(0.000487)		(0.000479)
L.Financial assets	-	-	0.783***	0.790***
			(0.137)	(0.133)
Constant	3.189***	1.731	-0.540	2.439
	(0.552)	(2.573)	(1.244)	(3.042)
Observations	5,162	5,162	3,319	3,319

Medical expenditures and wealth are expressed in logarithm.

Robust standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Figure 4.3: Wealth of Married Vs. Single Retirees.

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