

HOW EDUCATION CONTRIBUTED TO U.S. HOUSEHOLD WEALTH CHANGES
DURING THE 2008 ECONOMIC SHOCK?

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By

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ABSTRACT

The Great Recession in 2008 cost American households trillions of dollars, and years after the shock, some families are still feeling the crush. However, the amount of losses or gains during the crisis vary across the population. This paper examines the role of education in these dynamic changes, asking whether more education helped people weather economic crisis better. Using data from the Federal Reserve's Survey of Consumer Finances in year 2007 and year 2009, this paper examines the relationship between education and changes in family wealth, measured by total household assets. I use OLS regressions and Inverse Hyperbolic Sine (IHS) technique to examine these changes, and then determine whether the general pattern holds in each income quantile, and how the pattern changes as income increases, controlling for household demographic characteristics, and attitudes towards borrowing and saving, and other factors. My results indicate that during the shock, higher educational attainment was associated with larger changes in total assets, and wealthy households with more education experienced gains rather than loss.

The research and writing of this thesis is dedicated to everyone who has supported me. I want to express my sincere gratitude to my advisory Dr. Thompson, for his guidance, patience, and encouragement along the way.

Many thanks,
Yijun Yin

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Introduction

Classic economic theory holds that “the sole end and object of all economic activity is consumption” (Keynes, 1936), and consumption largely depends on households’ disposable income and wealth. The 2008 Financial Crisis, or the Great Recession, which was considered by many economists as the worst recession since the Great Depression in the 1930s, was an economic tsunami to many American households. The nation’s unemployment rate rose from 5.0 percent in December 2007 to a peak of 10.0 percent in October 2009 (U.S. Bureau of Labor Statistics, Current Population Survey); the stock market and housing market tumbled; and the S&P 500 index dropped from 1479 in December 2007 to a low of 757 in March 2009, a fall of 48 percent.¹ Corresponding to these shocks, changes in spending behaviors were observed across the population (Devlin-Foltz and Sabelhaus, 2016). About 40 percent of American households experienced financial distress, defined as “(the head of household) being unemployed, being more than two months behind on mortgage payments, or owning a home valued at less than the mortgage”, at least sometime during that period. (National Bureau of Economic Research working paper).²

In the face of economic volatility, due to their diverse financial portfolios and their ability to weather the crisis, households have different experiences. The amount of loss for the majority of households who lost in the shock vary substantially, according to data from Federal Reserve’s Survey on Consumer Finances, a small proportion of households

¹ S&P 500 Historical Prices. Retrieved from <http://www.multpl.com/s-p-500-historical-prices/table/by-month>

² The National Bureau of Economic Research. The Effects of Economic Crisis on American Households. Retrieved from <http://www.nber.org/bah/2010no3/w16407.html>

actually experienced gains rather than losses. Previous studies have examined the role of education in income and wealth building, but these studies mainly use data from before the Great Recession, but the role of education in stabilizing family wealth in the face of economic shock is less discussed.

This paper contributes to relevant literature by comparing changes in family wealth, specifically total household assets, in the context of the 2008 Financial Crisis. The results provide additional insight into what kinds of household weather economic shocks better, who lost and who gained, and how policy can contribute to an economy with less economic volatility and greater financial stability.

Literature Review

Household as a unit of analysis

Families are the foundation of all economies, and they have been widely used as units of analysis by academia and government entities to measure the well-being of an economy, including economic inequality, economic recovery, and social progress. Although the 2008 financial crisis led to an aggregate economic shock, distinct disparity was observed among households in different segments of wealth distribution, and studies showed that wealth inequality can significantly amplify the impact of particular shocks (Krueger, Mitman and Perri, 2016). While the entire distribution of wealth shifted down during the 2007-2009 period, a sizable fraction of households experienced gains in wealth. Bricker et al. (2011) found that the changes in asset values played a key role in the changes in household wealth, and changes in portfolios and debt. Furthermore, these authors found greater variation in wealth changes, measured in percents, was observed for lower-income families. In this paper, I use the terms of household, family, and head of households interchangeable.

Education and wealth accumulation

Education is a major contributor to wealth accumulation. Boshara et al. (2015) confirmed the well known pattern that more education is associated with more wealth. They also found that households with more education have stronger balance sheets, a better mix of investments in their portfolios, more liquidity, and less debt. Cooper and Zhu (2016) examined how education contributes to better household financial outcomes and found that increased average income is the primary channel through which education affects

household finances. Although more education does not necessarily result in better financial knowledge, data from the FINRA National Financial Capability Study (2016)³ show that households without a head with a college degree face more financial difficulty, are less likely to answer financial literacy questions correctly and are less likely to have non-retirement investment. Campbell (2006) finds that, compared to their more educated counterparts, households with less education invest less effectively and make more significant mistakes. In addition, Cole et al. (2014) find that education increases financial market participation and reduces the possibility of declaring bankruptcy or being denied by a loan. And Calvet et al. (2007) find that financially sophisticated households, measured by education and wealth, tend to invest more efficiently, but also more aggressively. They also achieve higher returns.

Other demographic factors and wealth

Inheritance and attitudes towards risk, borrowing, saving and investing vary across population and contribute to the wealth gap. Thompson and Suarez (2015), using SCF data explored the racial wealth gap and found that inheritance is closely related to wealth accumulation, and white households benefit from more inheritance than black and Hispanic families. These authors also found that respondents with longer investment horizons, who were “risk tolerant”, and generally not induced to borrow to pay for luxury items, tended to have greater wealth.

³ FINRA (2016). Financial Capability in the United States 2016. Retrieved from http://www.usfinancialcapability.org/downloads/NFCS_2015_Report_Natl_Findings.pdf

Another important factor contributing to wealth and asset ownership is the age of the head of household. Census data show that households' net worth increases with age up to the point of retirement, and the increase is greater for households whose heads have better education (Vornovitsky et al. 2014). Age could also contribute to more stable wealth because older people may have learned from investment failures in their younger years, have more responsibilities, and become more risk averse. Agarwal et al. (2007) find that compared to younger and older adults, middle-aged adults borrow at lower interest rates, and pay fewer fees. The difference is explained mainly by age-related cognitive effects, selection effects, and cohort effects, rather than age-related risk preferences.

Other factors also affect household financial decisions and wealth, including background risk, labor income, race. Heaton and Lucas (2000), for example, find that background risks, including labor income and real estate values impact household portfolio decisions and asset holdings. Krueger and Perri (2010), using Italian household data to investigate the relationship among labor income, consumption, and wealth, find that labor income changes are associated with modest consumption changes and larger wealth changes, and that wealth shocks affect consumption. In addition, Agarwal and Mazumder (2013) find that individuals with higher cognitive ability, especially high math scores, are less likely to make financial mistakes. And Grinstein-Weiss et al. (2014) find that during the 2008 crisis, American homeowners were less likely than renters to lose a large proportion of their wealth.

The Present Study

The studies described above show that educational attainment is associated with high income, less possibility of unemployment and the ability to save more and build wealth. But the role of education in stabilizing household wealth in the event of economic shocks has not been fully explored. This paper contributes to the existing literature by comparing the typical experience of groups with different educational attainments within and across income quantiles, and estimating how education contributes to losses and gains during the 2008 crisis. I hypothesize that households whose head have higher educational attainments see their assets fluctuate in a different pattern compared to less educated households, controlling for observable demographic characteristics including age, race and marital status.

Conceptual Framework

Base on the findings of previous research, I hypothesize that household with better education weathered the financial crisis better, that in, they may have experienced smaller loss or actual gains during the economic shock in 2008, and the experience may have become more positive as income grew. My model accounts for household demographic characteristics and characteristics about family financial planning, how they manage their wealth, their educational attainment, and the sources of their income. These factors are illustrated in Figure 1 below, my conceptual framework.

Households in different income quantiles may have different strategies for managing their wealth, in order to better capture these characteristics, I will divide my sample into five normal income quantiles and compare the impact of education within and across each quantile. I further hypothesis that households in higher income quantile with more education, are more likely to experience gains during the crisis.

Determinants of household wealth and its changes

Household wealth varies depending on a family's educational attainment, income, and wealth management. Higher education is associated with higher labor income, but many other factors contribute to wealth accumulation. For example, households with more income have more resources to accumulate but could also have more to lose if an investment isn't working. Conversely, even if they have less income to begin with, households that are better at managing their finances can end up accumulating more wealth through good investments and savings. Households led by an older head are more

likely to have more wealth, because people's salary increases as they advance in their career, and people become smarter about wealth management. Moreover, because economic shocks happen periodically in history, older people who went through a previous crisis might be more cautious about managing their asset portfolios than younger people.

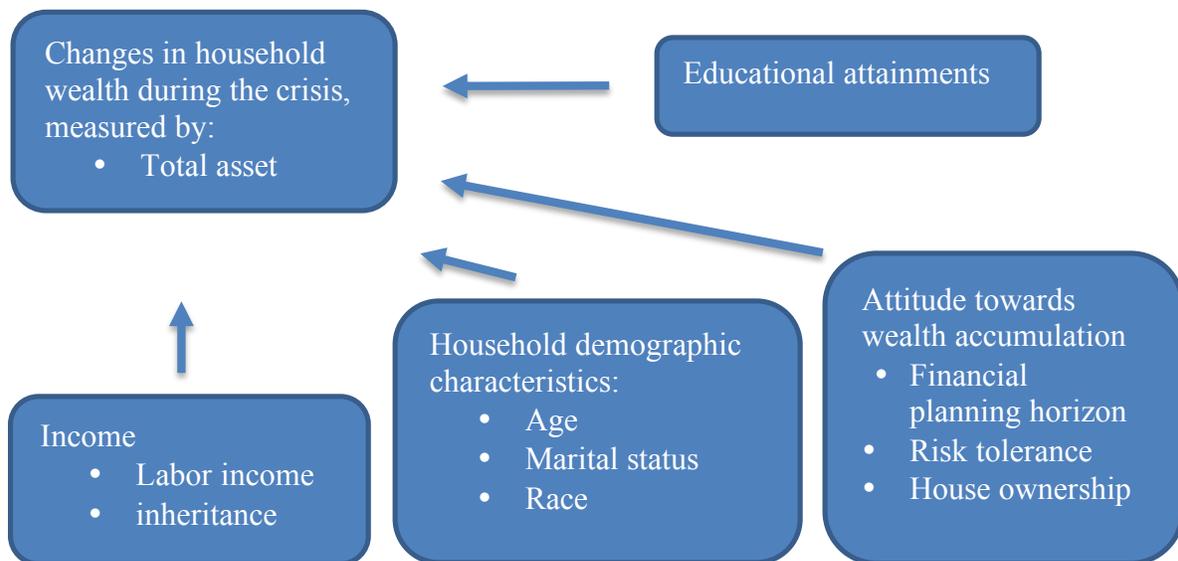


Figure 1. Conceptual Framework

Data and Method

This study merged publicly available 2007-2009 panel data with some variables indicating family attitudes towards financial planning from the 2007 full survey data, both from the Federal Reserve's Survey of Consumer Finances (SCF). The SCF is normally a triennial cross-sectional survey designed primarily to collect asset and liability information about American households. It documents, among other things, households' demographic characteristics, use of financial services, and employment history. In 2009, the Federal Reserve sponsored a re-interview with households participated in the 2007 survey to get a better understanding of the effects of the financial crisis on U.S households. The re-interview was not expected when the 2007 survey was conducted, and was mostly completed between July and December 2009, after the National Bureau of Economic Research had declared great recession officially ended. Out of the 2007 survey's 4,422 participants, about 89 percent (3,862) participated the 2009 survey. The public version of the panel data excluded 4 very wealth observations, and another outlier observation. In total, the 2007 – 2009 publicly available panel data included data from 3,857 U.S. households, and my merged dataset with more variables from 2007 survey matched the 3,857 households. This new panel data over sampled wealthy households and households with a college degree, but the weighted sample is statistically representative of the 2007 U.S. population (Bricker, Bucks, Kennickell, Mach & Moore, 2011).

Because some respondents did not know the values of their specific holdings, found the subject conceptually difficult to understand, or were reluctant to share the information,

when the survey was conducted, some values for total assets are missing. However, major characteristics of the data was broadly consistent with the characteristics of other SCF data and general data that measure net assets, and the overall proportion of missing information is small. The missing data for both waves were jointly imputed. The public version of the 2007-2009 panel data has five complete-information implicates for each respondent, and the merged variables from the 2007 survey do not have missing data. Thus there was no missing value in my merged panel data set. (Kennickell, 2011). My SCF data confirms the general known pattern that household wealth varied across the society, even before the crisis. In my data set total household assets vary from negative \$4,138,455 to positive \$1.45 billion.

Previous literature finds that changes in family wealth during the 2008 crisis were primarily a result of changes in asset values, rather than portfolio and debt changes (Bricker et al. 2011); so I chose my primary dependent variable the total value of assets held by households. Also, since households who lost more in dollar value during the 2008 crisis may have had more wealth to start with, a proportionate specification rather than absolute values better displays the pattern of wealth changes and how that pattern differs among education groups. During the crisis, 6,644 out of 19,150 observations, about one-third of the households in my dataset, experienced gains in total household assets, or positive changes, while the rest (12,506) experienced losses, or negative changes.

The large number of negative values in my data make it impossible to evaluate the relationship using a normal log function, so I chose the following approach. I estimate an

OLS model with inverse hyperbolic sine (IHS) technique to compare changes in household wealth, measured by total assets, over the two years, 2007-2009. The benefit of IHS technique is that besides comparing percentage changes of positive values, which a log function can do, IHS is able to compare percentage changes in total assets of households that experienced negative or zero wealth changes. IHS technique was introduced by Pence (2006), as a solution to estimate percentage changes of variables with large numbers of negative values, and to address the “difference in initial wealth” problem. I generated a new variable, `assetdif_asinh`, as my dependent variable, which measures the changes in the IHS assets of each household between years 2009 and 2007. Total asset changes differ by education group. On average, households without a high school degree experienced a loss of 1.5 percentage points; those with a high school degree but no college education experienced a loss of 26 percentage point; college dropout experienced a loss of 16.2 percentage point, and college graduate experienced a loss of 21.3 percentage points. (See Table 1).

The IHS function is linear at the origin and as wealth increases, the function approximates the logarithm in its right tail (Pence, 2006). Pence pointed out that the shape of the IHS curve effectively reflects the relationship between wealth, contribution received and investment returns: he assumed that changes in wealth for less wealthy families are more likely to result from contribution from others, and if this is true, a linear relationship fits it better than a nonlinear one. Changes in wealth for wealthy families are more likely to result from investment returns, which are better reflected in a logarithmic relationship.

This paper examines the role of education in wealth changes across the population and then investigates whether the pattern of changes differs between the poor and the wealthy. Next, I estimate the effect of one additional year of education on family wealth within each income quantile. To do that, I divide the sample into 5 income quantiles, using normal income of households in 2017. The normal income measures the value of income that a household would expect to receive in a normal year. I hypothesize that, in general, compared to less educated households, households with higher educational attainments saw the value of their asset fluctuate in a different pattern, controlling for observable demographic characteristics and characteristics that capture how households choose to manage their wealth. Specifically, I control for age, marital status, house ownership, attitudes towards borrowing, saving and financial planning, income, and race. Since families that get more inheritance are more likely to accumulate more wealth, I also include variables for inheritance and other gifts households have received.

My first regression model is:

$$\begin{aligned} \text{IHS(Changes in Total Asset)} = & \beta_0 + \beta_1 \text{Education} + \beta_2 \text{Wage Income} + \beta_3 \text{Net Worth} + \beta_4 \\ & \text{Dummy for Inheritance} + \beta_5 \text{Number of Inheritance} + \beta_6 \text{Number of Inheritance} + \beta_7 \\ & \text{Value of Inheritance} + \beta_8 \text{Tolerance of Financial Risk} + \beta_9 \text{Financial Planning Horizon} + \\ & \beta_{10} \text{Dummy for house ownership} + \beta_{11} \text{Age of Head of Household} + \beta_{12} \text{Marital Status} + \\ & \beta_{13} \text{Dummy for race} \end{aligned}$$

My second regression model is as below. I run the model five times, one for each income quantile:

$$\text{IHS(Changes in Total Asset)} = \beta_0 + \beta_1 \text{Education} + \beta_2 \text{ Dummy for Inheritance} + \beta_3 \text{Number of Inheritance} + \beta_4 \text{ Number of Inheritance} + \beta_5 \text{ Value of Inheritance} + \beta_6 \text{Tolerance of Financial Risk} + \beta_7 \text{ Financial Planning Horizon} + \beta_8 \text{Dummy for house ownership} + \beta_9 \text{Age of Head of Household} + \beta_{10} \text{Marital Status} + \beta_{11} \text{Dummy for race}$$

My third regression model, which includes the interaction variables is:

$$\text{IHS(Changes in Total Asset)} = \beta_0 + \beta_1 \text{IncomeQuantile} * \text{Education} + \beta_2 \text{ Dummy for Inheritance} + \beta_3 \text{Number of Inheritance} + \beta_4 \text{ Number of Inheritance} + \beta_5 \text{ Value of Inheritance} + \beta_6 \text{Tolerance of Financial Risk} + \beta_7 \text{ Financial Planning Horizon} + \beta_8 \text{Dummy for house ownership} + \beta_9 \text{Age of Head of Household} + \beta_{10} \text{Marital Status} + \beta_{11} \text{Dummy for race}$$

Table 2 shows that my panel data over sampled better educated households, with the number of respondent household heads who have a college degree being 4 time greater than the number of their counterparts who lack a high school diploma. I use a weight variable provided by the Federal Reserve to reach a representative estimate (Bricker, Bucks, Kennickell, Mach & Moore, 2011).

Table 1. Number of Observations in Each Education Category

Education	Changes in total Asset (%)
no high school diploma/GED	-1.40
high school diploma or GED	-26.07
some college	-16.19
college degree	-21.37

Table 2. Sample Size by Education Category

EDCL07	Freq.	Percent	Cum.
no high school diploma/GED	1,762	9.14	9.14
high school diploma or GED	4,943	25.63	34.77
some college	3,042	15.77	50.54
college degree	9,538	49.46	100
Total	19,285	100	

Table 3. Definition of Variables

Variable Name	Definition
ASSETS	A continuous variable indicating total value of assets held by a household
NETWORTH	A continuous variable indicating total value of net worth held by a household
Assetdif_asinh	Inverse Hyperbolic Sine of asset changes, created by: gen assetdif_asinh = asinh(ASSET09)-asinh(ASSET07)
EDCL07	A categorical variable indicating total net worth of household
No High School Diploma/GED	EDCL07 = 1
High School Diploma/GED	EDCL07 = 2
Some College	EDCL07 = 3
College Degree	EDCL07 = 4
WAGEINC07	Wage and salary income, in 2007
AGECL07	A categorical variable indicating age of head of household as of 2007
<35	AGECL = 1
35 - 44	AGECL = 2
45 - 54	AGECL = 3
55 - 64	AGECL = 4
65 - 74	AGECL = 5
>75	AGECL = 6
INHERITANCE	A dichotomous variable indicating whether the household ever received an inheritance as of 2007
Yes	INHERITANCE = 1
No	INHERITANCE = 0
NumINHERITANCE	A categorical variable indicating the number of inheritance ever received as of 2007
1 inheritance ever received	NumINHERITANCE = 1
2 inheritance ever received	NumINHERITANCE = 2
3 inheritance ever received	NumINHERITANCE = 3
4 inheritance ever received	NumINHERITANCE = 4
No less than 5 inheritance ever received	NumINHERITANCE = 5
VALUEINHERIANCE	Approximate value at the time the inheritance was received
VALOtherGifts	Total value of other gifts received as of 2007
FinRisk	A categorical variable indicating the amount of financial risk that household heads are willing to take when they save or make investments

Table 3. (cont.)

Variable Name	Definition
Take substantial financial risks expecting to earn substantial returns	RinRisk = 1
Take above average financial risks expecting to earn above average returns	RinRisk = 2
Take average financial risks expecting to earn average returns	RinRisk = 3
Not willing to take any financial risks	RinRisk = 4
FPLANHorizon	A categorical variable indicating the time period most important to household heads when they plan saving and spending
Next few month	FPLANHorizon = 1
Next year	FPLANHorizon = 2
Next few years	FPLANHorizon = 3
Next 5 - 10 years	FPLANHorizon = 4
longer than 10 years	FPLANHorizon = 5
HOUSECL07	A dichotomous variable indicating whether the household own a house as of 2007
owns ranch/farm/mobile home/house/condo/coop/etc	HOUSECL07 = 1
otherwise	HOUSECL07 = 0
MARRIED07	A dichotomous variable indicating marital status of head of household as of 2007
Married or living with a partner	MARRIED07 = 1
Neither married nor living with a partner	MARRIED07 = 0
race	race of ethnicity of respondents
White non-hispanic	race = 1
Black/African American	race = 2
Hispanic	race = 3
Other	race = 5

Descriptive Statistics

Table 4 provides weighted descriptive statistics for my dependent variables and for my independent variables, including household total assets, and IHS of changes in total assets, in years 2007 and 2009, demographic variables and variables indicating attitudes towards wealth management. Over the period of the study, households' average total assets declined from \$696,209 to \$583,664, representing a 16% loss.

Changes in family wealth during the 2007-2009 period were diverse, varying by educational attainment, race, age and other factors. Compared to households whose heads are of the same age, households with at least a college degree had significantly more wealth than other households, while households without a high school degree had the least wealth. The wealth accumulation pattern also differed between households without a high school degree and those who have one. Table 5 shows that total assets of households lead by someone without a high school degree increases as people get older and hits the first peak when the household head is 45 years old, then their total assets decline and reach to a low point when the head is 55. Total assets rise again after 55 and start declining again at the age 65. For households with education levels beyond a high school degree, the total assets variable displays a single peak pattern – total assets increase until the age of 65 and then start to decline, as shown in figure 2.

In terms of dollar value, on average, households with a college degree, lead by a head who is about 65 years old, lost roughly 1 million in total asset, representing the biggest

loss among the different education groups. Younger households and households with less education lost less in absolute dollar terms.

Table 6 shows the wealth gap among households by race. Within each race category, higher educational attainment is associated with greater total assets. White families lead by a head who possess a college degree had the most total asset in both years. African American families had the least total asset in both years across all four education categories. (See Figure 3).

Figure 4 shows total assets and changes in total assets during the crisis for households in different normal income quantiles. Households in the richest income quantile, the 5th quantile, have four times more total asset than the second richest quantile, which confirms the generally know pattern that wealth in a society is highly concentrated in a relatively few households.

Table 4. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ASSET in 2007 (thousand dollars)	19,285	696.209	3587.662	-4138.455	1,450,000
ASSET in 2009 (thousand dollars)	19,285	583.664	2956.396	-553.000	954,000
Assetdif_asinh	19,285	-0.16	1.64	-32.60	31
Education group					
High School graduate	19,285	0.32	0.47	0.00	1
College Drop Out	19,285	0.19	0.39	0.00	1
College Graduate	19,285	0.36	0.48	0.00	1
Wage Income (thousand dollars)	19,285	55.511	127.333	0.00	31,900
Age Group					
35-44	19,285	0.20	0.40	0.00	1
45-54	19,285	0.21	0.41	0.00	1
55-64	19,285	0.17	0.38	0.00	1
65-74	19,285	0.10	0.31	0.00	1
>75	19,285	0.09	0.29	0.00	1
Inheritance dummy	19,285	0.21	0.41	0.00	1
number of inheritance					
1 inheritance	19,285	0.16	0.37	0.00	1
2 inheritances	19,285	0.04	0.19	0.00	1
3 inheritances	19,285	0.01	0.08	0.00	1
4 inheritances	19,285	0.00	0.05	0.00	1
5 inheritances	19,285	0.00	0.05	0.00	1
Value of inheritance (thousand dollars)	19,285	26.795	259.330	-1.00	50,000
Value of other gifts (thousand dollars)	19,285	0.500	20.955	0.00	4,600

Table 4. (cont.)

Variable	Obs	Mean	Std. Dev.	Min	Max
Financial Risk					
Above average risk and expect above average return	19,285	0.17	0.38	0.00	1
Average risk and expect average return	19,285	0.38	0.49	0.00	1
Not any risk	19,285	0.41	0.49	0.00	1
financial planning horizon					
next year	19,285	0.12	0.33	0.00	1
next few year	19,285	0.27	0.45	0.00	1
next 5-10 years	19,285	0.25	0.43	0.00	1
longer than 10 years	19,285	0.14	0.35	0.00	1
house ownership	19,285	0.69	0.46	0.00	1
marital status	19,285	0.60	0.49	0.00	1
Race					
Black	19,285	0.13	0.34	0.00	1
Hispanic	19,285	0.09	0.29	0.00	1
Other	19,285	0.04	0.20	0.00	1

Table 5. Average Total Assets by Education by Age in 2007 and 2009

Year	Age Class	no high school diploma/GED	high school diploma or GED	some college	college degree
2007	<35	72817.49	122335.2	118038.6	347190.8
2007	35 - 44	132339.9	292815.8	360641.8	753614.4
2007	45 - 54	200101.8	332884.6	539961.4	1512045
2007	55 - 64	167737.5	405556.7	697747.3	2018153
2007	65 - 74	251765.9	426212.3	1041284	2690582
2007	>75	241027.3	447315.5	627919.7	2083867
2009	<35	71838.03	94374.58	112391.3	399992.2
2009	35 - 44	86114.58	261318.9	294886.2	728785.1
2009	45 - 54	201052	278769.5	441838.7	1254685
2009	55 - 64	147302.2	340989.2	567838.1	1629318
2009	65 - 74	187098.8	378351	795448	2168207
2009	>75	174046.4	302093.5	685946.9	1496471

Table 6. Average Total Assets by Race

	2007				2009			
	White-non Hispanic	Black/African American	Hispanic	Other	White-non Hispanic	Black/African American	Hispanic	Other
no high school diploma/GED	210866	74986.19	153167.3	258846.2	175273.3	66418.54	110401.1	258846.2
high school diploma or GED	362128.4	143318.4	215881.3	347173.7	300653.4	115976.8	162675.9	257388.1
some college	521197.7	177125.7	357145.1	630646.3	444325.3	126890.8	270329.8	475294.6
college degree	1516761	393373.3	679144.7	1029954	1286564	320895.5	521542.6	842221.5

Table 7. Normal Income Quantiles

group	Freq.	Percent	Cum.
1 st Quantile	2,718	14.09	14.09
2 nd Quantile	2,763	14.33	28.42
3 rd Quantile	2,939	15.24	43.66
4 th Quantile	2,938	15.23	58.90
5 th Quantile	7,927	41.10	100.00
Total	19,285	100.00	

Note: Normal Income measures the value of income the household would expect to receive in a "normal" year

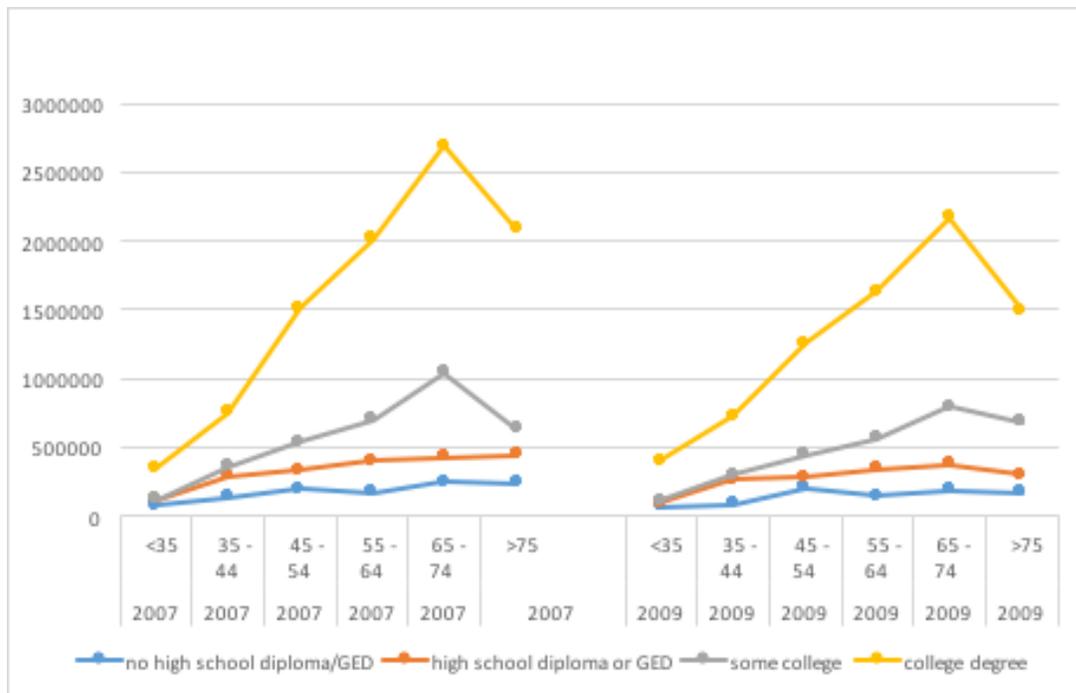


Figure 2. Average Total Assets by Education by Age in 2007 and 2009

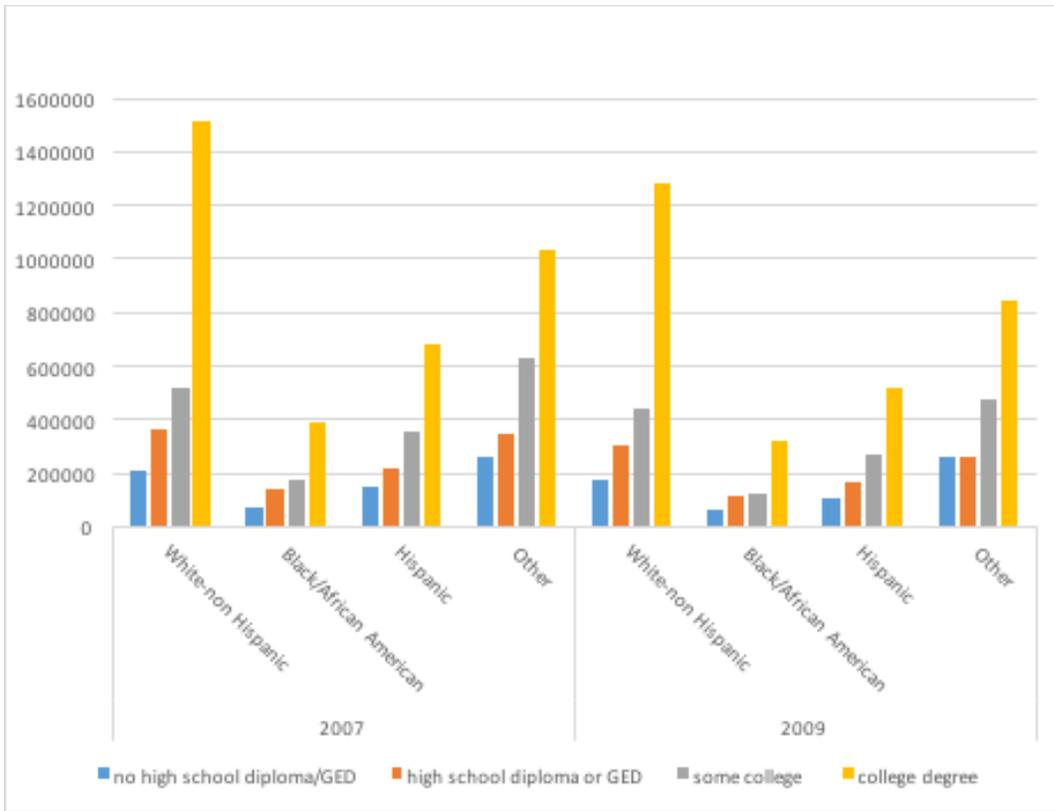


Figure 3. Average Total Assets by Education by Race.

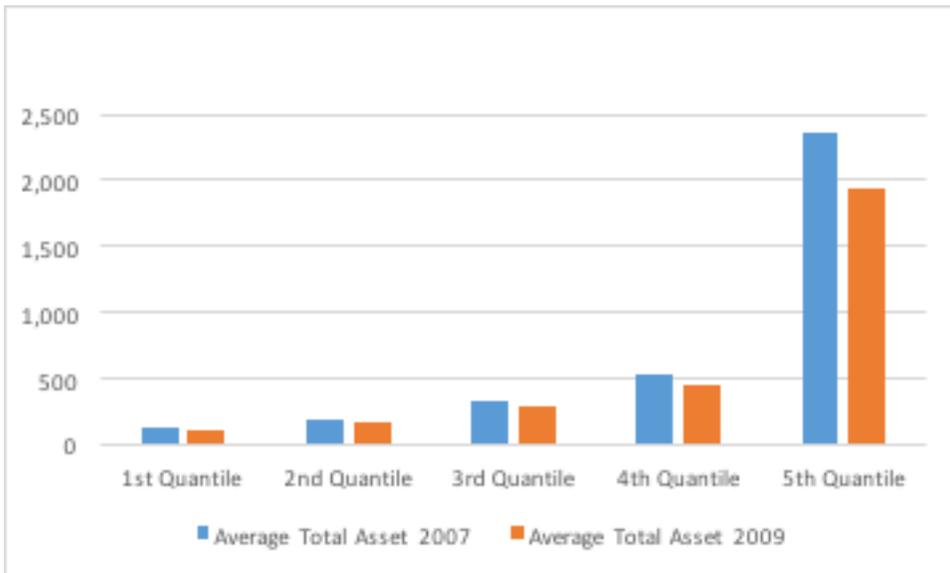


Figure 4. Changes in Total Assets by Normal Income Quantiles (thousands)

Regression Results

Table 8 summarizes the results from my OLS regressions. The dependent variable is the inverse hyperbolic sine (IHS) of family total assets. The category of household head without a high school degree is the omitted category in all regressions.

In table 8, column (2) adds wage income and family net worth to the variables in column (1). Column (3) adds information about inheritance, including a dummy variable on ever received an inheritance; dummy variables for numbers of inheritance ever received, with never received as omitted category; a continuous variable for the value of the inheritance, and a continuous variable for value of other gifts ever received. Column (4) adds information about attitudes towards family financial planning, including dummy variables for financial risks households are willing to take, with “take substantial financial risks expecting to earn substantial returns” as omitted category; dummy variables for financial planning horizons, with “next few month” as the omitted category, and a dummy variable for house ownership. Column (5) adds dummy variables for age groups, with head of household younger than 35 years old as the omitted category; a dummy variable for marital status; and dummy variables for race, with white as the omitted category.

In column (1), compared to household heads who dropped out of high school, households led by someone who has a high school diploma loss 22.2 percentage points more during 2007-2009, and the coefficient is statistically significant at a conventional level. The coefficients are also negative for college dropout and college graduates, indicating that

households with more education lost more during the crisis, but these two coefficients are not statistically significant. Many household characteristics besides education also affect how much wealth a family owns and how they manage it. With more control variables added to capture these characteristics, in column (2)(3)(4) and (5), both the magnitude and significance of the education coefficients change. In column (5), the strongest model, where family net worth, labor income, demographic characteristics, and observable attitudes towards saving and investing are controlled, all three educational coefficients become statistically significant at conventional levels. In this model, compared to household that lack a high school diploma, household who graduated from high school but did not go to college lost 27.1 percentage points more during the crisis; household with a head who got some college education lost 19.4 percentage more than those whose head dropped out of high school, and households with more than college education lost 17.6 percentage more than households whose head dropped out of high school, holding the control variables constant.

My results show that as education levels increase, households lose more as a result of having more wealth to lose. I also found an opposite trend - households with more education lose less because as education helps people better manage their wealth and weather economic crisis. One may wonder how this dynamic works and at what point the positive effect of education on wealth building overwhelms the negative effect and actually results in gains during economic shocks, which did happen to some households in the 2008 crisis.

I also estimated the following two regression models using the base model in column (5) to further explore the relationship between education and family wealth. However, instead of controlling for net worth and labor income, I divided the population into five different quantiles using normal income in 2007 and examined the effect of education for households within the same quantile group. The results are displayed in Table 9. In the first income quantile, compared to households without a high school degree, households with high school degree lost 56 percentage points more, households with some college education lost 64.7 percentage points more and household with at least a college degree lost 81.1 percentage points more, during the crisis, holding control variables constant. And all three coefficients are significant at conventional level. The table shows that in the poorest group, people with more education lost more during the crisis, that education didn't provide much help when people have a little wealth.

Moving up in the income quantiles, the coefficients change from negative to positive, and from insignificant to significant. In the richest group, the 5th quantile, the coefficients tell a story that is the opposite of the story for the poorest group. Within the 5th quantile, compared to households without a high school diploma, households with a high school degree lost 56.4 percentage points less, households with some college education lost 48.2 percentage points less, and household with at least a college degree lost 51.0 percentage point less, holding control variables constant. Also depending on how much households in the 5th quantile without a high school degree lost, the more educated group in this quantile may actually experience gains. i.e., if households without a high school degree lost 30 percentage points, and households with a high school degree lost 56.4 percentage

point less than households without a high school degree, households led by high school graduates experienced a $(56.4 - 30) = 26.4$ percentage points gains during the crisis.

One may also wonder how much one more year of education affects total assets. To answer this question, I generated an interaction variable using EDUC07, a continuous variable measuring the total years of education received, and the five net income quintiles. The result is show in Table 10. Compared to households within the 1st income quintile, for households within the 2nd normal income quintile, one more year of education is associated with $(-0.0744 + 0.0764) = 0.002$, a 0.2 percentage points smaller loss in total assets; one more year of education is associated with $(-0.0744 + 0.123) = 0.0486$, a 4.86 percentage points smaller loss for household within the 3rd normal income quintile; and one more year of education is associated with $(-0.0744 + 0.101) = 0.0266$, a 2.6 percentage point smaller loss for household in the 4th normal income quintile; and one more year of education is associated with $(-0.0744 + 0.103) = 0.0386$, a 3.86 percentage point smaller loss for the richest households, holding inheritance, other gifts, attitudes towards financial risk, financial planning and observable demographic characteristics constant. All the coefficients are significant at conventional levels, indicating that I can reject the hypothesis that there is no relationship between changes in total household assets and education in the U.S. population. The pattern indicates that compared to the poorest group, more education in more richer groups is associated with smaller losses during the financial crisis.

Table 8. Total Asset Regression

VARIABLES	(1)	(2)	(3)	(4)	(5)
High School Graduate	-0.222 *** (0.0608)	-0.222 *** (0.0608)	-0.219 *** (0.0607)	-0.195 *** (0.0601)	-0.271 *** (0.0590)
College Drop Out	-0.0985 (0.0650)	-0.0975 (0.0650)	-0.0932 (0.0650)	-0.0976 (0.0666)	-0.194 *** (0.0655)
College Graduate	-0.111 * (0.0577)	-0.103 * (0.0580)	-0.0924 (0.0578)	-0.0954 (0.0597)	-0.176 *** (0.0586)
Wage income 2007		5.97e-08 (3.69e-08)	5.25e-08 (3.74e-08)	8.85e-08 *** (3.35e-08)	1.12e-07 *** (3.37e-08)
Net worth 2007		-1.20e-08 *** (7.34e-10)	-1.07e-08 *** (6.97e-10)	-9.47e-09 *** (6.51e-10)	-8.27e-09 *** (7.39e-10)
Information on inheritance					
Dummy for ever received inheritance			0.125 *** (0.0462)	0.178 *** (0.0500)	0.178 *** (0.0442)
1 inheritance ever received			-0.176 *** (0.0507)	-0.199 *** (0.0546)	-0.210 *** (0.0487)
2 inheritance ever received			-0.181 *** (0.0583)	-0.192 *** (0.0622)	-0.192 *** (0.0577)
3 inheritance ever received			-0.140 ** (0.0579)	-0.124 ** (0.0625)	-0.0688 (0.0587)
4 inheritance ever received			-0.464 *** (0.149)	-0.494 *** (0.152)	-0.471 *** (0.145)
5 or more inheritance ever received			-	-	-
Value of inheritance			-7.76e-08 *** (1.83e-08)	-8.81e-08 *** (2.09e-08)	-9.01e-08 *** (2.133e-08)
Value of other gifts received			3.92e-07 *** (1.32e-07)	3.66e-07 *** (1.32e-07)	3.47e-07 *** (1.18e-07)

Table 8. (cont.)

VARIABLES	(1)	(2)	(3)	(4)	(5)
Financial risks household is willing to take					
Above average risk and expect above average return				0.156 **	0.157 **
				(0.0677)	(0.0681)
Average risk and expect average return				0.118 *	0.132 **
				(0.0649)	(0.0652)
Not any risk				0.135 *	0.165 **
				(0.0700)	(0.0695)
Finance planning horizon					
Dummy for next year				0.193 ***	0.198 ***
				(0.0655)	(0.0661)
Dummy for next few years				0.272 ***	0.272 ***
				(0.0464)	(0.0474)
Dummy for next 5-10 years				0.284 ***	0.284 ***
				(0.0457)	(0.0461)
Dummy for longer than 10 years				0.317 ***	0.290 ***
				(0.0483)	(0.0487)
Dummy for house ownership					
				-0.298 ***	-0.250 ***
				(0.0394)	(0.0404)
Age of household head					
35-44					-0.0922 *
					(0.0552)
45-54					-0.122 ***
					(0.0441)
55-64					-0.170 ***
					(0.0453)
65-74					-0.0264
					(0.0444)

Table 8. (cont.)

VARIABLES	(1)	(2)	(3)	(4)	(5)
>75					-0.327 *** (0.0689)
Dummy for married					-0.0774 ** (0.0312)
Race of household head					
Dummy for black					-0.0195 (0.0596)
Dummy for Hispanic					-0.312 *** (0.0608)
Dummy for other race					-0.114 * (0.0640)
Constant	-0.0287 (0.0553)	-0.0281 (0.0554)	-0.0208 (0.0562)	-0.173* (0.0944)	0.0394 (0.101)
Observations	19,285	19,285	19,285	19,285	19,285
R-squared	0.002	0.003	0.003	0.013	0.018

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

Table 9. Total Asset Regression with Five Income Quantiles

VARIABLES	(1) 1 st Quantile	(2) 2 nd Quantile	(3) 3 rd Quantile	(4) 4 th Quantile	(5) 5 th Quantile
High School Graduate	-0.560 *** (0.113)	-0.0477 (0.107)	0.000581 (0.106)	-0.102 (0.0823)	0.564 *** (0.158)
College Drop Out	-0.647 *** (0.162)	0.00160 (0.144)	0.159 (0.107)	0.0844 (0.0858)	0.482 *** (0.154)
College Graduate	-0.811 *** (0.172)	0.101 (0.129)	0.345 *** (0.104)	0.154 ** (0.0747)	0.510 *** (0.155)
Age					
35-44	-0.278 (0.205)	0.0425 (0.147)	0.165 * (0.0884)	-0.200 *** (0.0706)	-0.217 *** (0.0812)
45-54	-0.274 * (0.161)	-0.215 * (0.119)	0.0951 (0.0833)	-0.0806 (0.0603)	-0.160 *** (0.0522)
55-64	-0.825 *** (0.157)	-0.128 (0.107)	0.124 (0.0828)	-0.107 * (0.0587)	-0.228 *** (0.0564)
65-74	-0.169 (0.137)	-0.113 (0.0926)	0.189 *** (0.0654)	0.0536 (0.0597)	-0.346 *** (0.0649)
>75	-0.637 *** (0.163)	-0.469 *** (0.131)	-0.0559 (0.191)	-0.490 *** (0.116)	-0.391 *** (0.0843)
Inheritance					
Ever received inheritance	-0.238 ** (0.0966)	0.0796 (0.138)	-4.532 *** (0.228)	0.268 *** (0.0718)	0.148 *** (0.0516)
1 inheritance ever received	0.272 ** (0.126)	0.0308 (0.144)	4.537 *** (0.230)	-0.260 *** (0.0794)	-0.226 *** (0.0553)
2 inheritance ever received	0.500 *** (0.177)	-0.386 * (0.199)	4.652 *** (0.247)	-0.198 ** (0.0772)	-0.197 *** (0.0717)
3 inheritance ever received	1.752 *** (0.281)	0.407 * (0.207)	4.498 *** (0.229)	-0.0321 (0.221)	-0.188 ** (0.0940)
4 inheritance ever received	-1.446 ** (0.626)		2.652 *** (0.195)	0.0142 (0.172)	-0.189 *** (0.0689)

Table 9. (cont.)

VARIABLES	(1) 1 st Quantile	(2) 2 nd Quantile	(3) 3 rd Quantile	(4) 4 th Quantile	(5) 5 th Quantile
5 or more inheritance ever received	-		-	-	-
Value of inheritance	-7.95e-07 (7.76e-07)	-1.20e-06 ** (4.69e-07)	-1.90e-07 *** (4.92e-08)	-3.94e-07 *** (1.05e-07)	-5.71e-08 *** (1.70e-08)
Value of other gifts received	7.32e-05 (6.22e-05)		0.000107 *** (5.54e-06)	9.48e-07 *** (1.90e-07)	1.21e-07 ** (5.33e-08)
Financial Risk					
Above average risk and expect above average return	1.300 *** (0.274)	0.191 (0.158)	-0.272 ** (0.109)	0.392 (0.239)	-0.0393 (0.0654)
Average risk and expect average return	0.737 *** (0.219)	-0.154 (0.141)	-0.0513 (0.104)	0.336 (0.244)	0.156 *** (0.0497)
Not any risk	0.795 *** (0.216)	0.0469 (0.140)	-0.0757 (0.105)	0.300 (0.251)	0.154 ** (0.0609)
Financial Planning					
Dummy for next year	0.132 (0.153)	0.655 *** (0.148)	-0.105 (0.128)	0.111 (0.132)	-0.120 (0.128)
Dummy for next few years	0.608 *** (0.128)	0.317 *** (0.0975)	0.293 *** (0.0900)	0.0451 (0.0660)	-0.123 (0.108)
Dummy for next 5-10 years	0.316 ** (0.156)	0.347 *** (0.101)	0.277 *** (0.0845)	0.219 *** (0.0587)	0.0191 (0.111)
Dummy for longer than 10 years	0.437 *** (0.168)	0.366 *** (0.124)	0.202 ** (0.0943)	0.130 * (0.0668)	0.0677 (0.112)
Dummy for house ownership	-0.314 *** (0.108)	-0.158 ** (0.0741)	-0.0756 (0.0730)	-0.376 *** (0.0819)	0.0492 (0.178)
Dummy for married	-0.296 *** (0.109)	0.0500 (0.0753)	0.0784 (0.0636)	0.250 *** (0.0527)	-0.123 * (0.0640)

Table 9. (cont.)

VARIABLES	(1) 1 st Quantile	(2) 2 nd Quantile	(3) 3 rd Quantile	(4) 4 th Quantile	(5) 5 th Quantile
Race					
Dummy for black	0.245 *	0.0759	-0.279 ***	-0.254 ***	-0.657 ***
	(0.128)	(0.135)	(0.101)	(0.0879)	(0.167)
Dummy for Hispanic	-0.236	-0.503 ***	-0.242 ***	-0.124 *	-0.333 ***
	(0.208)	(0.121)	(0.0920)	(0.0702)	(0.0744)
Dummy for other race	-0.904 **	-0.0376	0.213 **	-0.0137	-0.0175
	(0.402)	(0.147)	(0.103)	(0.0771)	(0.0723)
Constant	-0.0895	-0.156	-0.529 ***	-0.451	-0.435 *
	(0.285)	(0.206)	(0.161)	(0.274)	(0.232)
Observations	2,718	2,763	2,939	2,938	7,927
R-squared	0.054	0.036	0.038	0.062	0.065

Robust standard errors in parentheses

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

Table 10. Regression with Continuous Education Variables

VARIABLES	(1) assetdif asinh
Income Quantiles	
2 nd Quantile	-1.008 *** (0.307)
3 rd Quantile	-1.782 *** (0.256)
4 th Quantile	-1.442 *** (0.241)
5 th Quantile	-1.639 *** (0.316)
Years of education	-0.0744 *** (0.0162)
Education by quantile	
2 nd Quantile*Education	0.0764 *** (0.0243)
3 rd Quantile*Education	0.123 *** (0.0195)
4 th Quantile*Education	0.101 *** (0.0184)
5 th Quantile*Education	0.113 *** (0.0228)
Age	
35-44	-0.0800 (0.0548)
45-54	-0.120 *** (0.0444)
55-64	-0.191 *** (0.0454)
65-74	-0.0636 (0.0440)

Table 10. (cont.)

VARIABLES	(1) assetdif asinh
>75	-0.421 *** (0.0686)
Inheritance	
Dummy for ever received inheritance	-0.317 ** (0.148)
1 inheritance ever received	0.285 * (0.149)
2 inheritance ever received	0.301 ** (0.153)
3 inheritance ever received	0.417 *** (0.153)
4 inheritance ever received	-
5 or more inheritance ever received	0.452 *** (0.152)
Value of inheritance	-1.10e-07 *** (2.09e-08)
Value of other gifts received	3.08e-07 ** (1.20e-07)
Risk	
Above average risk and expect above average return	0.174 ** (0.0690)
Average risk and expect average return	0.152 ** (0.0659)
Not any risk	0.174 ** (0.0689)
Financial Planning	
Dummy for next year	0.183 *** (0.0665)

Table 10. (cont.)

VARIABLES	(1) assetdif_ asinh
Dummy for next few years	0.283 *** (0.0474)
Dummy for next 5-10 years	0.293 *** (0.0470)
Dummy for longer than 10 years	0.293 *** (0.0496)
Dummy for house ownership	-0.221 *** (0.0405)
Dummy for married	-0.0196 (0.0334)
Race	
Dummy for black	-0.0387 (0.0594)
Dummy for Hispanic	-0.312 *** (0.0620)
Dummy for other race	-0.115 * (0.0641)
Constant	0.815 *** (0.220)
Observations	19,285
R-squared	0.023

Robust standard errors in parentheses

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

Discussion and Conclusion

During economic shocks, the economy as a whole experiences losses in wealth, jobs, consumption, and confidence, but experience varies from household to household. This paper tried to determine who lost and who gained during the 2008 Financial Crisis, and if the patterns differ by households' educational attainments. The results indicate that education helps to stabilize wealth in the face of economic shock, but the magnitude of education's effect varies between the rich and the poor. In the poorest income group, more education is associated with more loss; but moving up on the income scale, the pattern starts to change; more education is associated with less income loss, and, for the richest families, actually resulted in gains. Among the richest group, during 2007-2009, households with at least a college degree lost 51 percentage points less than households without a high school degree; each additional year of education is associated with a 11 percentage points smaller loss in households' total assets.

My findings are consistent with the previous literature, as past research suggests that better education is associated with more income and thus contributes to more wealth. But my results add to this conclusion, an indication that in the face of economic shocks, education brings an additional benefit. It helps stabilize wealth and reduces the magnitude of financial volatility.

However, my model controls for some household demographic characteristics and attitudes on how households manage their wealth, my results may suffer from omitted variable bias. Due to the nature of household wealth, a sensitive topic that people may not

willing to openly discuss, and the limitations of the data, I was not able to include many other factors that affect how households manage their asset. Critics may be concerned about my inability to control for other factors that are correlated with education, income and total assets, and this may also result in bias. In order to better address this concern, I divided observations into five income quantiles, assuming households within each quantile have some shared characteristics on their wealth management, and compared the effect of education within each quantile. However, stratification and matching methods might better control for these unobserved characteristics.

Additional, my results may not be generalizable to different population or settings. My paper studies the role of general education, instead of financial education and financial literacy, in the U.S. society during the 2008 economic shock. A society with high financial literacy and relative low general educational attainments may have a different pattern on how family wealth changes in the event of an economic shock.

A strong economy is always a top priority in every administration, and in all countries. And it is important to consider how to reduce financial volatility and avoid economic crisis. My results suggest that increasing the level of education in the population may have a positive impact on financial stability and should be taken into consideration in policy decisions on education and financial regulations.

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