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REVIEW

September/October 2013 Volume 95, Number 5

Restoring Household Financial Stability after the Great Recession: Why Household Balance Sheets Matter

Selected articles from a symposium sponsored by the Federal Reserve Bank of St. Louis and Washington University in St. Louis, February 5-7, 2013

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Introduction

Ray Boshara

In its most recent Financial Accounts of the United States, the Federal Reserve reported that the typical household has more than recovered the wealth it lost during the Great Recession; and that same report states that household deleveraging has ended. So, we can finally look past the recovery, correct?

Unfortunately, not yet. Yes, we have made steady progress over the past several quarters on both fronts. However, adjusting for inflation (about 1.7 percent per year) and population growth (nearly 4 million new households) since the peak in 2007, the typical household has recovered only three-quarters of the wealth lost in the recession, and total household debt levels and debt-to-income ratios remain high.

Moreover, about 84 percent of the wealth recovered since the economy bottomed out in 2009 has been through higher values of stocks and other financial assets, which overwhelmingly benefit the wealthiest 10 percent of Americans. Meanwhile, housing—where the wealth of the vast majority of families is concentrated—is still recovering. Despite recent progress, housing wealth has contributed only 11 percent to the recovery.

Clearly, American families have some way to go before they—and, thus, the broader economy—fully recover. Yet the role of family balance sheets—as distinct from income and jobs—in that recovery has not been, in our view, adequately examined. Accordingly, we chose this theme for our inaugural research symposium, held February 7-9, 2013, at the Federal Reserve Bank of St. Louis. We were pleased to organize this event in partnership with the St. Louis Fed's Research Department and the Center for Social Development at Washington University in St. Louis.

While several original papers from leading economists and academics nationwide were presented at the symposium, space and other factors allow the publication of only five in this special issue of *Review*. A complete list of the papers and presentations is available at the Center for Household Financial Stability website (http://www.stlouisfed.org/household-financial-stability/events/20130205/agenda.cfm). A wide range of forward-looking balance-sheet topics were explored, including the impact of student loans on overall balance-sheet health; how savings

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are allocated before and after job losses; the role of financial innovation in driving booms and busts in U.S. consumption; the sustainability of household wealth after exiting from poverty; the forces driving deleveraging; and several others.

The symposium was sponsored by the St. Louis Fed's Center for Household Financial Stability, which was announced by Bank President James Bullard at the symposium and formally launched in May 2013. The Center aims to address three questions: What is the state of American family balance sheets? Why do they matter for strengthening families and the economy? And what can researchers, policymakers, and others do to improve them? More information on the Center may be found at http://www.stlouisfed.org/hfs. This site includes a subscription link to our periodic newsletter highlighting new research, upcoming events, and coverage of the Center by major media.

Finally, we encourage readers to participate in our second annual symposium, scheduled for May 8-9, 2014, in St. Louis. The balance sheets of younger Americans (younger than 40 years of age)—and how their balance sheets matter for realizing the American Dream and growing the economy—will be the focus of the next symposium. As with the first symposium, the presented papers will be a mix of commissioned papers and those from a competitive call for papers (with abstracts due by December 4, 2013). For more information about the symposium (which is open to the general public) and to respond to the call for papers, see http://www.stlouisfed.org/household-financial-stability/events/?id=507.

We hope you find these papers thought-provoking and that we have piqued your interest in our new Center's focus on family balance sheets.

The Current State of U.S. Household Balance Sheets

Jacob Krimmel, Kevin B. Moore, John Sabelhaus, and Paul Smith

The Board of Governors of the Federal Reserve System is responsible for two of the most widely used datasets containing information about U.S. household balance sheets: the quarterly macro-level Financial Accounts of the United States (FA, formerly known as the Flow of Funds Accounts) and the triennial micro-level Survey of Consumer Finances (SCF). The FA is very timely, but the data can be used only to describe the household sector as a whole. The SCF provides the micro-level detail needed to capture heterogeneity in household finances, but the data are available only with a long lag. The authors' key contribution in this article is their use of the FA dataset and other macro data sources to "age" the micro-level SCF data forward through time to generate a representative sample for current-quarter policy analysis. They use this aging approach to compare and contrast pre- and post-recession trends in key indicators, such as net worth, debt-to-income ratios, debt service-to-income ratios, and housing loan-to-value ratios across families grouped by characteristics including income, age, and geography.
(JEL E21, D31, D91)

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Household sector balance sheets both contributed to and were dramatically affected by the Great Recession. The run-up in housing and stock prices in the years preceding the recession contributed to the strong growth in consumer spending and the rapid pace of debt accumulation during that period and thus helped to create a situation in which more households were more vulnerable to financial shocks.[1] The steep declines in house values and stock prices at the onset of the recession (combined with rising unemployment and declining incomes) contributed to the substantial drop and subsequent anemic growth in consumer spending that has dominated macroeconomic activity for the past five years. One of the usual explanations for continuing spending restraint by consumers is the desire by at least some

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households to avoid reverting to the vulnerable balance-sheet situations they faced as the recession started.[2]

Clearly, understanding the most recent business cycle and the slow pace of the ongoing recovery requires an understanding of the evolution of household balance sheets. Unfortunately, the datasets available for studying household balance sheets all have significant limitations across one or more dimensions—such as representativeness, timeliness, level of aggregation, degree of longitudinal information, and level of detail. These limitations impair our ability to track the evolution of household balance sheets over time in sufficient detail to identify important changes as they occur. In this article, we circumvent this problem by combining existing data sources to track the evolution of household balance sheets in a manner that is timely yet still captures important heterogeneity.

We focus on two widely used data sources on household balance sheets, both of which are produced by the Board of Governors of the Federal Reserve System—the Financial Accounts of the United States (FA),[3] which provide quarterly estimates of the aggregate assets and liabilities held by the household sector, and the Survey of Consumer Finances (SCF), which provides a detailed triennial snapshot of the finances and balance sheets of a representative sample of U.S. households.[4]

These two data sources were developed for different purposes. The FA provides a timely measure of the aggregate state of U.S. households, which is a key indicator for the macroeconomic outlook. The SCF provides a detailed look at the rich heterogeneity in household finances, which is critical for understanding the microeconomic underpinnings of macroeconomic activity. We used FA data through the third quarter of 2013, but the dataset lacks micro data on household balances sheets. The SCF provides rich micro data for a point in time, but because it is costly and labor intensive to produce, the SCF is available only every three years and has a two-year production lag (for example, the most recent survey is from 2010, which became available in 2012). The primary goal of our study described here is to combine the two datasets in an effort to create a timely dataset of detailed household-level balance-sheet information.

More generally, our goal is to explore a methodology to answer the following question: How can we use a combination of the SCF, the FA, and other available macro data to more comprehensively describe the *current* state of household finances? As later described, the central concept developed here can be described as "aging" the most recent SCF sample forward using the information available in the FA and other macro data sources. At the most basic level, each household record in the SCF can be updated each quarter by applying estimated changes in asset values using a local house price index for house values and an equity price index for corporate equity values. As we show below, this simple first step alone accounts for most of the change in household net worth since 2010, as measured in the FA.

An important first step when integrating micro and macro data sources in such a simulation exercise is reconciling the economic concepts and measurement used in the two datasets. As described later (and in Appendix A), we make several adjustments to both the SCF and the FA to put them on the same footing.

Once these adjustments are made, the evolution of household balance sheets is generally similar in both the SCF and the FA. For example, both datasets show nearly identical levels and

trends in the overall household debt-to-income (D/I) ratio. An interesting feature that merits further analysis is that asset values do not track quite as closely between the two datasets. In particular, the SCF and FA show different rates of change in house prices in the period leading up to the Great Recession,[5] but even for these statistics the overall patterns of change for this period are very similar.

The projections generate some intriguing results. Between 2010 and 2011, house prices and stock prices were both still falling in the aggregate, causing household wealth to fall. At the end of 2011, stock prices began to rise fairly robustly, while house price growth was much more moderate. This pattern led to gains in household net worth concentrated at the top of the wealth distribution. As house prices continued to grow through 2012, household balance sheets began to improve across the distribution and the share of households with key financial ratios (such as the loan-to-value [LTV] ratio) showing high degrees of distress began to fall. Thus, the projection suggests that important improvements in the balance-sheet positions of many households are currently underway, though elevated debt levels associated with the housing boom are still widespread.

MEASURING HOUSEHOLD WEALTH IN THE FA AND THE SCF

As noted, the FA and the SCF were developed for different purposes and do not measure household balance sheets in the same manner. As a result, we need to standardize the concepts of household assets and liabilities across the datasets before combining the information. Because our general approach is to start with the 2010 SCF and age it forward, we adjust the FA data to make them more conceptually similar to the SCF data.[6]

The first step is to align the concept of "household." In the FA, the household sector is estimated residually—that is, household holdings of each asset category are estimated as the total outstanding less holdings of the other sectors (businesses, governments, financial institutions, and foreign holders). This strategy is required because there are no comprehensive administrative data sources on aggregate household assets and liabilities. Because we also lack comprehensive administrative data sources on other parts of the economy—in particular, nonprofit organizations, hedge funds, and other private pools of assets—these other factors are also included in the FA's household sector by default. However, we are able to measure certain components, such as the real estate holdings of nonprofit organizations. So, we first remove these holdings from the FA's household sector.

A second standardization adjustment is related to institutional holdings of assets on behalf of households. The two most important examples are assets held by defined benefit pension funds and life insurance companies to back promises of future payments to households. These assets (or more precisely, the promises they back) can thus reasonably be considered part of household net worth and are included in the FA concept of household wealth.[7] However, it is difficult to measure the value of these promises accurately in the SCF. The SCF includes some questions about pension coverage and defined benefit income expectations, but a comprehensive calculation of the value of these pension claims is beyond the scope of this article.[8] Thus, we exclude

this source of wealth from the FA measure of net worth to standardize the data sources. On net, these adjustments lower FA net worth by about 21 percent in 2012.

We make similar types of conceptual adjustments to another macro data source we use to measure changes in aggregate income—the National Income and Product Accounts (NIPA). NIPA personal income is based on a very broad concept that includes "in-kind" payments that many households typically do not consider as income and are not collected in the SCF. Examples include fringe benefits (e.g., employer-provided health insurance and employer pension contributions) and government-provided health care (Medicare and Medicaid). Removing these payments from NIPA income reduces the aggregate income estimate by about 8 percent in 2012.[9]

Measurement differences still remain even after these conceptual adjustments to the macro and micro data sources. For example, aggregated total net worth in the SCF is approximately 125 percent of the adjusted FA net worth measure in 2010, primarily because reported house values rose faster in the SCF than in the FA during the housing boom leading up the Great Recession.

TRENDS IN AGGREGATE MEASURES OF HOUSEHOLD BALANCE SHEETS

The conceptual adjustments made to FA wealth and NIPA income concepts do not affect some now very well-known stories about trends in household sector net worth over the past few decades. Household sector net worth has experienced two distinct boom and bust periods since 1995 (Figure 1). The first boom and bust was largely associated with the 1990s' stock market bubble, while the second involved run-ups and steep drops in both the stock market and housing values in the 2000s. Because the second period involved housing, it affected a much broader swath of families, and the unprecedented widespread drop in housing values was a key contributor to the Great Recession. Household sector net worth has rebounded somewhat since the trough reached in early 2009, as both stock prices and housing prices have (at least partially) recovered.

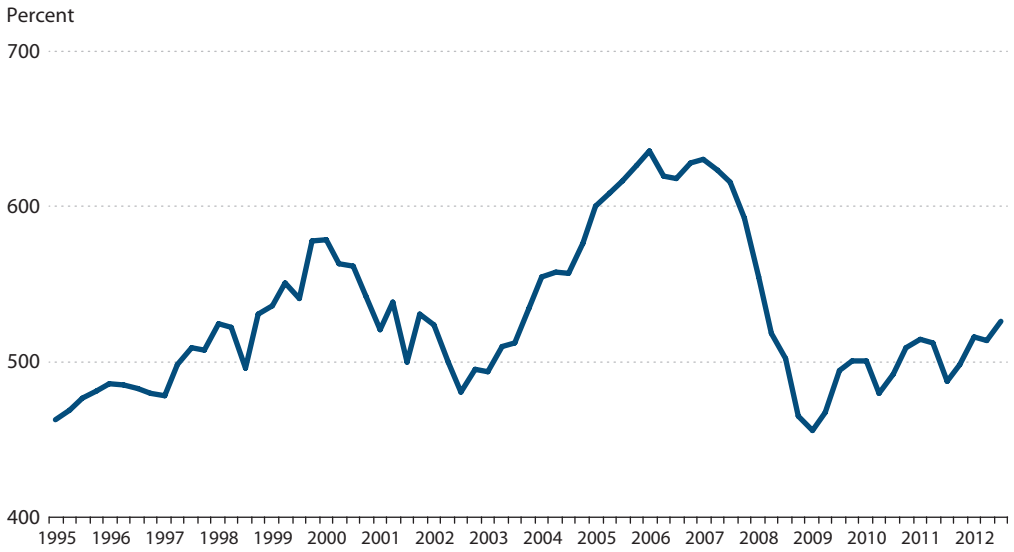
One legacy of the housing boom is an elevated level of household debt. In the aggregate data, the overall ratio of household debt to disposable income was steady at just under 100 percent between 1995 through 2001 before surging to nearly 150 percent by 2010 (Figure 2). Although mortgage debt and other types of consumer debt (vehicle loans, credit cards, education debt, other consumer loans) all increased in the years preceding the Great Recession, mortgage debt accounted for about 90 percent of the total household debt increase between 2001 and 2010. The levels of mortgage debt have since fallen (and incomes have since risen), but the large run-up in the aggregate D/I ratio is far from gone. As of 2012:Q3, aggregate household sector debt remained at about 125 percent of aggregate household sector disposable income.[10]

Figure 2 shows relatively high aggregate D/I ratios, but Figure 3 shows that the ratio of debt service to income (also termed the debt service ratio) has fallen as interest rates have fallen.[11]

Trends in housing debt and housing values together generate one of the most widely discussed statistics used to characterize the current state of U.S. household aggregate balance sheets, the total LTV ratio. As shown in Figure 4, the aggregate housing LTV ratio changed little during the decade preceding the Great Recession; the ratio hovered around 40 percent as the year-after-

Figure 1

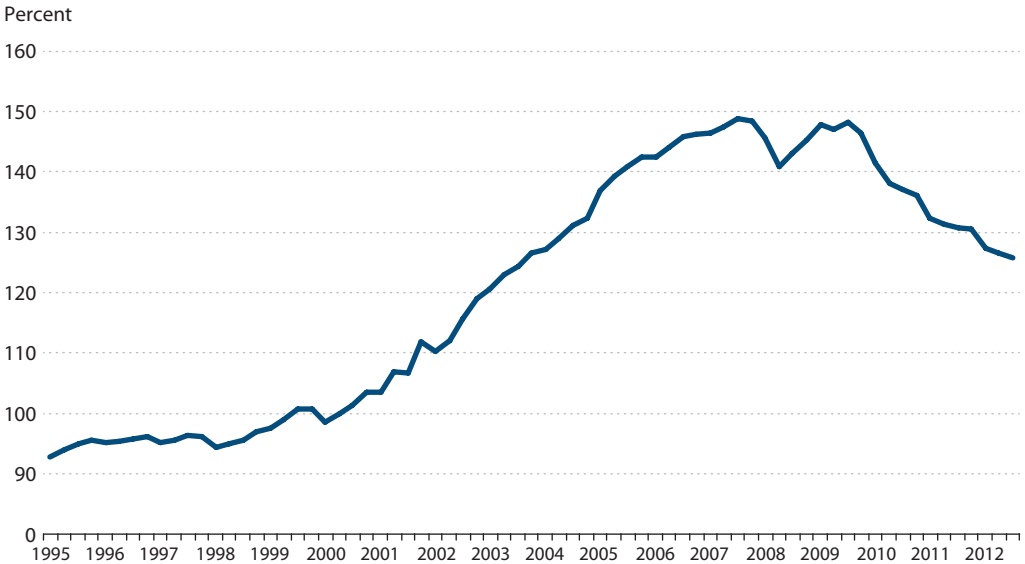
Household Net Worth-to-Household Disposable Income Ratio



SOURCE: FA and NIPA.

Figure 2

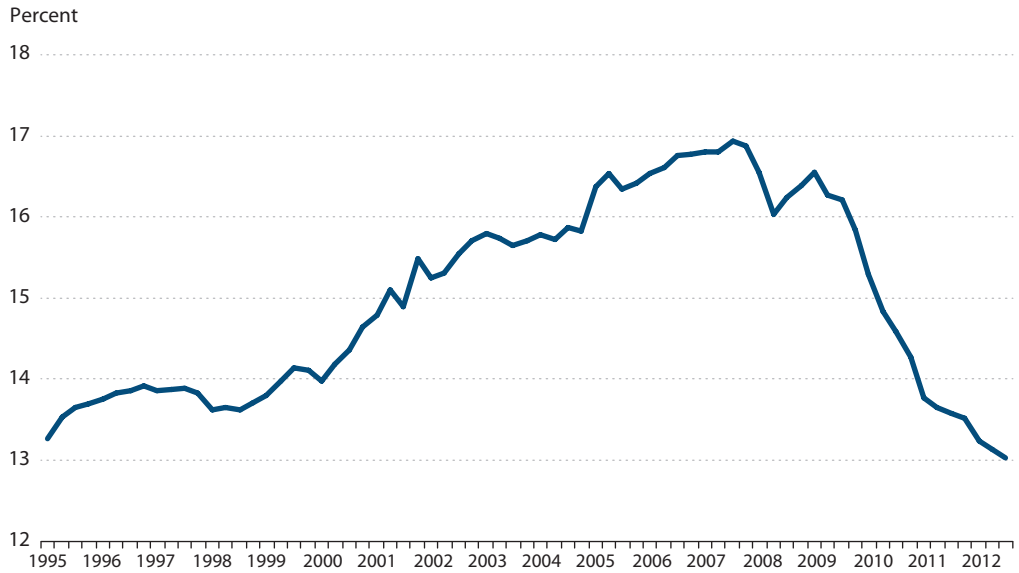
Aggregate Household Debt-to-Household Disposable Income Ratio



SOURCE: FA and NIPA.

Figure 3

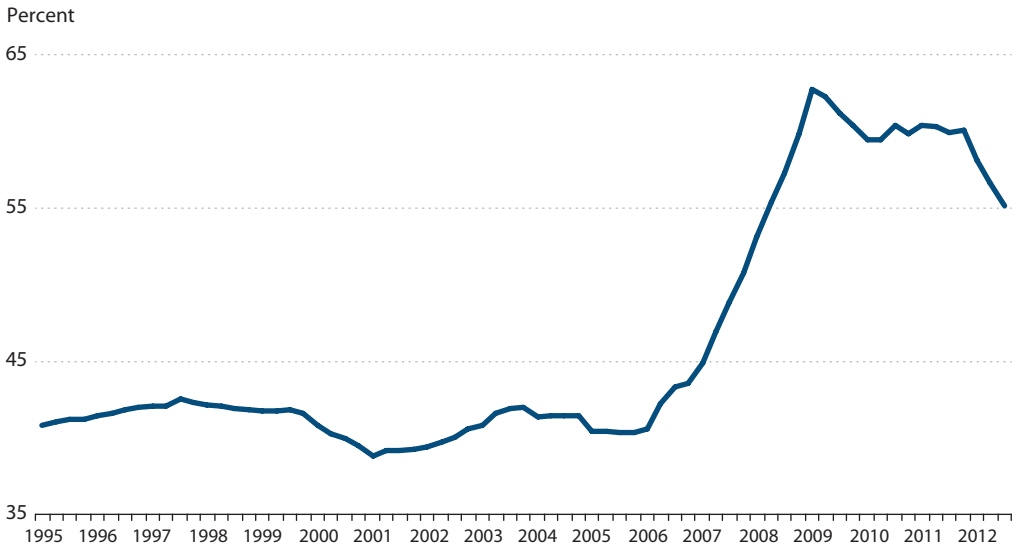
Aggregate Household Debt Service-to-Household Disposable Income Ratio



SOURCE: Federal Reserve Board and NIPA.

Figure 4

Aggregate Housing Debt-to-Housing Assets (LTV) Ratio



SOURCE: FA.

year surge in house values was matched by a surge in mortgage borrowing. When the collapse in house values began in 2006, the aggregate LTV jumped to over 60 percent, even as net mortgage borrowing ground to a virtual halt.

Aggregate mortgage debt outstanding has fallen since 2007 as the result of a steep decline in purchase originations, tighter credit standards, falling prices, and charge-offs. This decrease has had a meaningful effect on aggregate LTV ratios, but the sharp drop in the ratio in 2012 as house prices began to rise illustrates the importance of house values in determining the high-frequency movements in the overall LTV ratio. While an aggregate LTV of 55 percent may not appear particularly alarming—that is, the average homeowner may not be in a precarious position—we are also interested in the distribution of LTVs, especially the incidence of very high LTVs. For this, we need micro data such as provided by the SCF.

AGING HOUSEHOLD BALANCE SHEETS FORWARD THROUGH TIME

Household-level data are critical for understanding heterogeneity in household balance sheets and tracking metrics such as the share of households with high LTV or debt service-to-income ratios. But as noted previously, the painstaking process of collecting reliable micro data means that the SCF is available only every three years with a two-year lag between fielding the survey and releasing the data. In other words, the SCF is a critical tool but not a particularly timely one. The goal of our project is to estimate a current sample of household balance sheets by aging the most recent SCF micro data forward to the current quarter, household by household. The aging process involves updating prices for equity holdings and house values, growing incomes, and using two alternative trajectories for household debt. There are no adjustments for other new saving or borrowing.

The first step in our aging approach is updating each household's asset valuations using indexes for house prices and stock prices. Real estate values are adjusted proportionally using CoreLogic Home Price indexes at the level of the Census Bureau's Core Based Statistical Area (CBSA) that matches each household's geographic location (see Appendix B). The geographic detail available in the CBSA is quite extensive, with close to 1,000 distinct geographic areas represented across the United States. Real estate values for unincorporated businesses are adjusted proportionally using the percent change in noncorporate equity asset revaluations in the FA. Finally, the values of corporate equities (both inside and outside retirement accounts) are grown proportionally with corporate equity values from the Dow Jones Total Stock Market Index.[12] These adjustments to asset values are only estimates—in reality, each household will experience its own unique change in asset values. However, the price indexes we apply should capture the average movement of asset values since the most recent SCF.

These asset price changes alone are sufficient to capture most of the movement in aggregate net worth since 2010. Overall FA net worth (adjusted for SCF consistency as described) rose by 13.9 percent between 2010 and 2012. Applying the housing, corporate equity, and noncorporate equity revaluations as described to the 2010 SCF raises the sample's aggregate net worth by 11.0 percent.

The second step in aging the 2010 SCF records is updating household incomes. We grow each household's income proportionally with the growth in aggregate NIPA income, component by component. For example, a 10 percent increase in aggregate wage income would be applied to the wages of each SCF household with wage income in 2010. We grow each component of income separately—for example, Social Security and pension income are grown separately from wages—to preserve the heterogeneity in income growth for households with different compositions of income. For example, younger households and those with more-moderate incomes are more likely to receive most of their income from wages, while older families are more likely to receive less-volatile Social Security and pension income. Again, this simple approach of assigning the aggregate growth rate to each household produces only a rough estimate of each household's actual income growth and could miss key correlations affecting particular population subgroups. For example, if the households that accrued the highest amounts of debt leading up to the Great Recession were also the ones that experienced the slowest income growth since 2010, our aging procedure might overstate the improvement in the financial situations of these households.[13]

The third step in aging each SCF record is updating household debt. At this stage, we have modeled two alternative assumptions governing the evolution of household debt since 2010. Neither scenario is meant to be a realistic prediction of the actual evolution of household debt, but together they help frame the role of debt on household balance sheets.

The first debt scenario we apply assumes that families offset any principal paydown since 2010 with new borrowing, so that overall (nominal) debt is held constant. In this scenario, the changes in balance-sheet measures (e.g., the D/I ratio and the debt service-to-income ratio after 2010) reflect only improvements in income, driven by the proportional growth using NIPA aggregates. Similarly, the evolution of ratios involving asset prices—in particular, housing LTVs—is determined only by the house value itself. Although very simplistic, this constant debt scenario does help illustrate how factors other than debt growth itself can generate improvement in key measures of household finances. In particular, the threshold-type statistics will show disproportionate improvement if many families are just above the threshold in 2010, and thus even modest income or house price growth is enough to bring them below the cutoff.

The second debt scenario uses the 2010 SCF's very detailed information about the loan terms and payment behavior of each household to model the effect of principal paydown at the rates observed in 2010. That is, we project forward each household's principal balances, assuming the household continues to make the observed loan payments on schedule.[14] An important feature of this scenario is that it assumes that households take on no new debt, which is of course not realistic: Since 2010, many households have originated new mortgages, refinanced existing ones, or added new credit card, student loan, or auto debt. Nonetheless, this scenario offers a useful interpretation by measuring what would have happened to each household's balance sheet if all the new debt acquisition had occurred among other households.

If every SCF household had paid down its debt according to the 2010 terms and no new debt was assumed, aggregate debt in the SCF would have fallen about 8 percent between 2010 and 2012. In the FA, aggregate household sector debt fell about 2 percent over this period. Thus, the assumption of principal paydown with no new debt clearly overstates debt paydown in the aggregate. Interestingly, however, this "miss" appears to be entirely concentrated in consumer

(that is, non-mortgage) debt. Mortgage debt, which is the lion's share of household debt, fell about 6.1 percent in the FA over this period, while consumer debt rose substantially. The FA does not decompose consumer debt into its components, but other sources, such as credit bureau data, suggest that education debt rose more than 30 percent, vehicle debt rose about 17 percent, and other consumer installment debt rose about 2 percent.[15]

Applying the principal paydown scenario to mortgage debt in the SCF results in a 5.9 percent aggregate reduction in SCF mortgage debt—quite close to the 6.1 percent reduction observed in the FA. This finding suggests that unmodeled mortgage-related transactions such as cash-in refinancing, charge-offs, and net new mortgage debt acquisition cancel out in the aggregate over this period. Indeed, since many households did not engage in these unmodeled transactions, the principal paydown scenario is likely a reasonably accurate forecast for many of the households that stayed in their 2010 homes. On the other hand, this scenario clearly misses the rapid growth in consumer debt—especially education debt and auto lending—seen in the aggregate data since 2010.

THE CURRENT STATE OF U.S. HOUSEHOLD BALANCE SHEETS

In this section, we analyze the balance sheets of the aged SCF sample as of 2012:Q3, the most recent quarter of FA and NIPA data at the time of our analysis. It is well known that the Great Recession had a dramatic impact on household balance sheets, with direct effects from relative price shocks on homeowners and households that owned corporate equities and indirect effects for many households from unemployment and other income shocks (Bricker et al., 2012, and Mian, Rao, and Sufi, 2011).[16] The 2010 SCF provides a snapshot of household finances in the period immediately following the recession. The goal of creating an aged SCF is to gain some sense of balance-sheet evolution since 2010 so we can derive a more timely estimate of the types of disaggregated statistics calculated from the SCF data.

The advantage of a very rich micro dataset such as the SCF is that it provides many interesting ways to tabulate the data and gain additional perspective on trends in household finances. The focus of the micro analysis in this section is on the distribution of the same four measures of household balance-sheet positions previously considered using the aggregate statistics: net worth-to-income, overall D/I, debt service-to-income, and housing LTV ratios. Different approaches can be used to tabulate these measures with micro data. For example, means can be reported by group and thus can be used to compare and contrast outcomes for various population subsets against the aggregate or other groups. Alternatively, the fraction of families for whom the statistic of interest exceeds some critical threshold can be reported (e.g., LTV > 95 percent). Both means and threshold-type statistics might be important for predicting changes in economic behavior over time.

The amount of data that can be generated by this sort of micro analysis quickly expands with the introduction of a third dimension for tabulating outcomes, such as decomposition by household type. In this analysis, we tabulate various outcomes by permanent (or "normal") income, by age (<45, 45-64, and ≥65 years of age), and by geography (the four so-called sand states versus all others).[17] With these parsimonious choices, we have (i) four measures of household financial

Table 1

Mean Net Worth by Normal Income

	Actual ($)		
Normal income percentile	**2007:Q3**	**2010:Q3**	**Percent change**
All	598,814	510,530	–15
1-20	99,171	74,592	–25
21-40	142,155	130,895	–8
41-60	228,258	171,224	–25
61-80	399,545	303,305	–24
81-90	641,844	627,810	–2
91-100	3,592,344	3,119,507	–13

NOTE: Mean net worth is expressed in 2012 dollars.

position, (ii) two possible outcome variables for each (means and share exceeding a threshold value), and (iii) three ways of grouping households (by normal income, age, and geography) for each of six historical SCF samples (triennially from 1995 to 2010) plus eight projection quarters representing 2010:Q4 through 2012:Q3. In addition, we have the two alternative scenarios for projecting debt balances. Because all these choices result in so much potential data output, we restrict our presentation to a few tables and figures that highlight some noteworthy aspects of pre- and post-recession trends in household finances.

A natural starting point for analyzing household finances for the past few years is the dramatic collapse in wealth between 2007 and 2010. As shown in Table 1, the overall decline in mean net worth was 15 percent and the decline was widespread across households grouped by normal income. Every group experienced some decline, but proportionally the first, third, and fourth quintiles were somewhat harder hit. Note, however, that the top decile of households in terms of normal income experienced a 13 percent real wealth decline between 2007 and 2010, which was roughly in line with the overall average decline.

What does the rudimentary aging experiment suggest about changes in mean wealth across income groups since 2010? In the simplest case—in which debt is held constant and only asset prices evolve—the projection suggests continued widespread wealth declines in 2011 but then net gains (relative to the 2010:Q3 starting point) in 2012 (Table 2). The reason is straightforward: Stock prices were volatile and house prices generally fell a bit in 2011, while both stock and house prices rose after 2011:Q3.

One goal of aging the SCF sample is to evaluate the distribution of wealth change across groups since 2010. Note that wealth losses were relatively larger for the lower-normal income groups through 2011, which reflects how the various assets and relative price changes are distributed across these groups. The gains in wealth resulting from price changes were concentrated at the top of the normal income distribution because these groups own a disproportionate share of all assets, especially corporate and noncorporate equities, which increased the most in value. However, it is important to consider the limitations of these projections: In addition to showing

Table 2

Effect of Relative Prices on Mean Net Worth by Normal Income

	Actual ($)	Projected ($)		Percent change from 2010:Q3 to	
Normal income percentile	2010:Q3	2011:Q3	2012:Q3	2011:Q3	2012:Q3
All	510,530	491,717	537,214	–4	5
1-20	74,592	71,421	75,394	–4	1
21-40	130,895	124,830	131,423	–5	0
41-60	171,224	163,052	174,688	–5	2
61-80	303,305	289,244	311,997	–5	3
81-90	627,810	600,420	655,394	–4	4
91-100	3,119,507	3,021,629	3,331,984	–3	7

NOTE: Mean net worth is expressed in 2012 dollars.

Table 3

Effect of Relative Prices and Debt Paydown on Mean Net Worth by Normal Income

	Actual ($)	Projected ($)		Percent change from 2010:Q3 to	
Normal income percentile	2010:Q3	2011:Q3	2012:Q3	2011:Q3	2012:Q3
All	510,530	495,831	544,897	–3	7
1-20	74,592	72,343	77,039	–3	3
21-40	130,895	126,570	134,550	–3	3
41-60	171,224	166,034	180,171	–3	5
61-80	303,305	294,290	321,394	–3	6
81-90	627,810	607,847	669,237	–3	7
91-100	3,119,507	3,033,951	3,355,620	–3	8

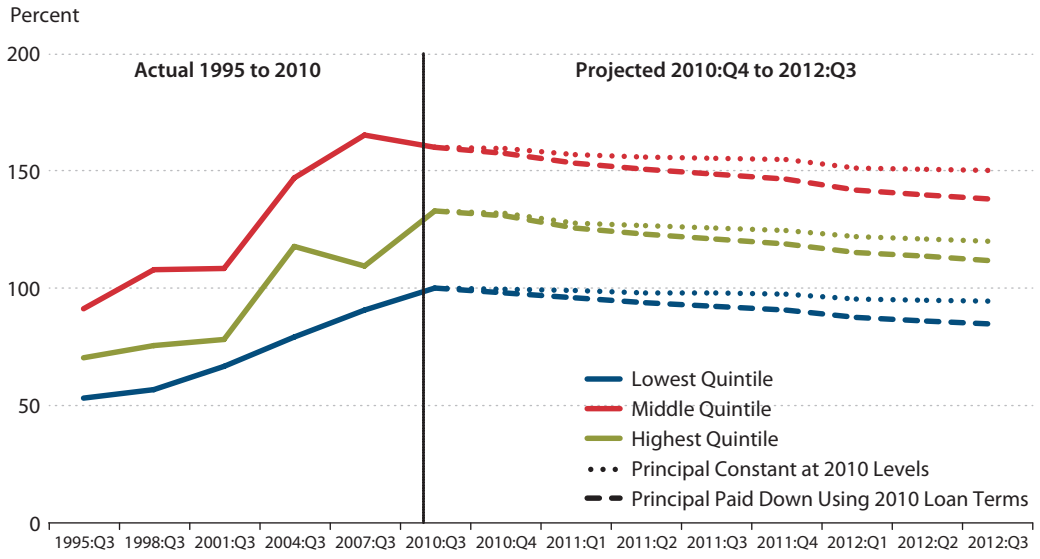
NOTE: Mean net worth is expressed in 2012 dollars.

only the effects of price changes for these selected assets, there are real changes in other types of assets and debt (for example, new saving and debt reduction) that are not captured in these calculations.

How different would these conclusions be under the principal paydown assumption scenario described previously? As noted, if every household in the SCF paid down principal using their 2010 loan terms without assuming any new debt, total household debt would have fallen about 8 percent (in the FA, household sector debt fell 2 percent over this period). However, even the 8 percent reduction in debt resulting from this thought experiment would have only a small effect on household net worth, pushing up the net increase in real net worth from 5 percent to 6 percent for the 2010:Q3–2012:Q3 period (Table 3). Thus, even this sort of debt paydown scenario would

Figure 5

Average Debt-to-Average Disposable Income Ratio (by Normal Income)



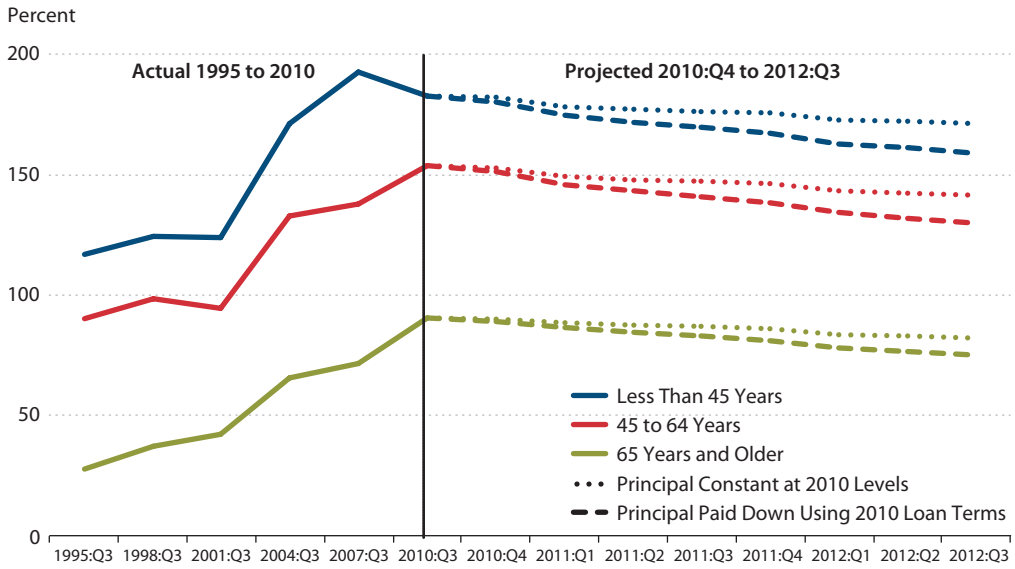
not fundamentally alter the distribution of wealth change across income groups. Lower-income groups would realize slightly more of the net gains in wealth since 2010 because debt is relatively more important on their balance sheets. But the fundamental story from Table 2—that the improvements since 2010 driven by asset price changes are concentrated at the top of the income distribution—would be unchanged even in the debt paydown scenario.

For the D/I ratio by age, income, or geographic group in the SCF, we calculate the ratio as the average debt of the group relative to the average income of the group, rather than the average of the group's ratios.[18] Figure 5 illustrates the trends in the D/I ratio by the normal-income group in both the historical (triennial) SCF surveys (to the left of the vertical line) and in each projected quarter (to the right of the line). The quarterly projection is shown for both the constant debt scenario and the principal paydown scenario. As Figure 5 shows, the run-up of the D/I ratio between 1995 and 2010 was widespread across normal-income groups; this ratio remains elevated for all groups through 2012:Q3 even under the principal paydown scenario. We find that the D/I ratio is highest for the middle normal-income group. Homeownership rates and thus mortgage debt rise with income; nonetheless, households at the top of the income distribution tend to have less debt relative to income than do middle-income households. These differences by income hold at all points in time and the relative D/I ratios have changed little, which suggests that the growth of debt (relative to income) over the past decade was not concentrated in any one part of the income distribution.

The same basic story about trends in debt relative to income holds across age groups. As Figure 6 shows, D/I ratios are lower among older age brackets at every point in time. This is not

Figure 6

Average Debt-to-Average Disposable Income Ratio (by Age)



especially surprising because the typical life cycle pattern of borrowing for housing and other investments exhibits higher borrowing at younger ages. However, as with income, the growth in the D/I ratio from 1995 to 2010 can be seen across age groups and, in fact, is steepest in relative terms for the 65-and-older age group. Even under the principal paydown scenario with no new debt after 2010, there is no substantial reversal of the run-up in the D/I ratio from 1995 to 2010 for any of the three age groups.

Next we examine the evolution of the debt service-to-income ratio, which is arguably even more important for measuring households' financial stress from leverage. For this analysis, rather than focusing on the ratio itself, we measure the share of households with regular monthly payments in excess of 40 percent of their disposable income. This threshold is arbitrary, but it is intended to indicate potentially risky levels of leverage.[19] We find that this indicator of household financial stress is highest in the middle of the normal-income distribution, at nearly 15 percent of households in 2010 (Figure 7). During the boom, this indicator spiked among the highest normal-income households, while it fell back a bit among the lowest normal-income households. Unlike the previous figure, for this indicator we do find a significant decline after 2010 under the principal paydown scenario, especially for middle-income households. Under the constant debt scenario, however, we see little change after 2010.

Figure 8, which shows the debt service-to-income ratio by age, indicates that the share of households with high debt service ratios is roughly similar for households younger than 45 years of age and those 45 to 64 years of age and significantly lower for those older than 65 years of age. Again, a significant decline in this indicator occurs after 2010 under the principal paydown sce-

Figure 7

Families for Whom Debt Service-to-Disposable Income Ratio Exceeds 40 Percent (by Normal Income)

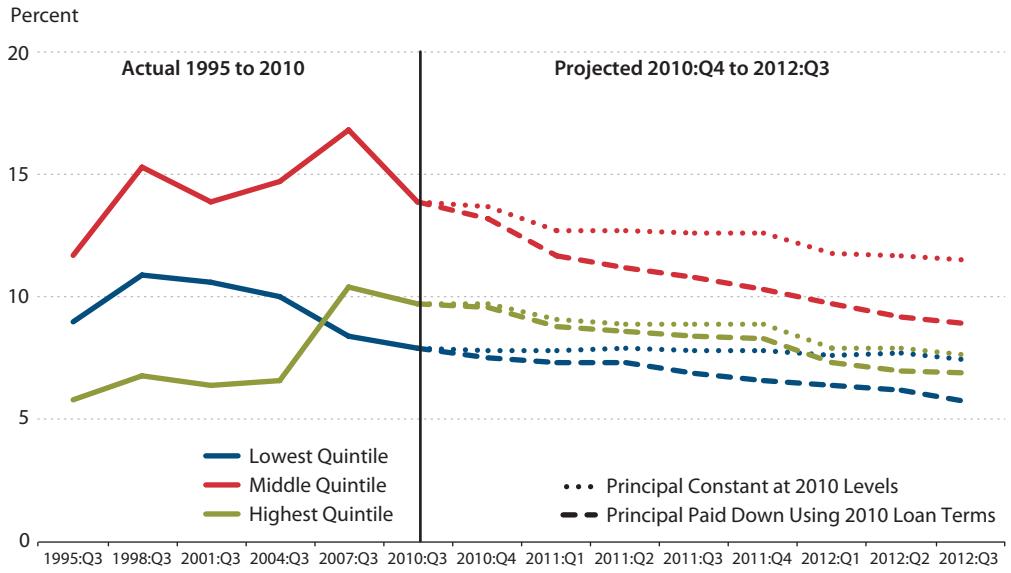


Figure 8

Families for Whom Debt Service-to-Disposable Income Ratio Exceeds 40 Percent (by Age)

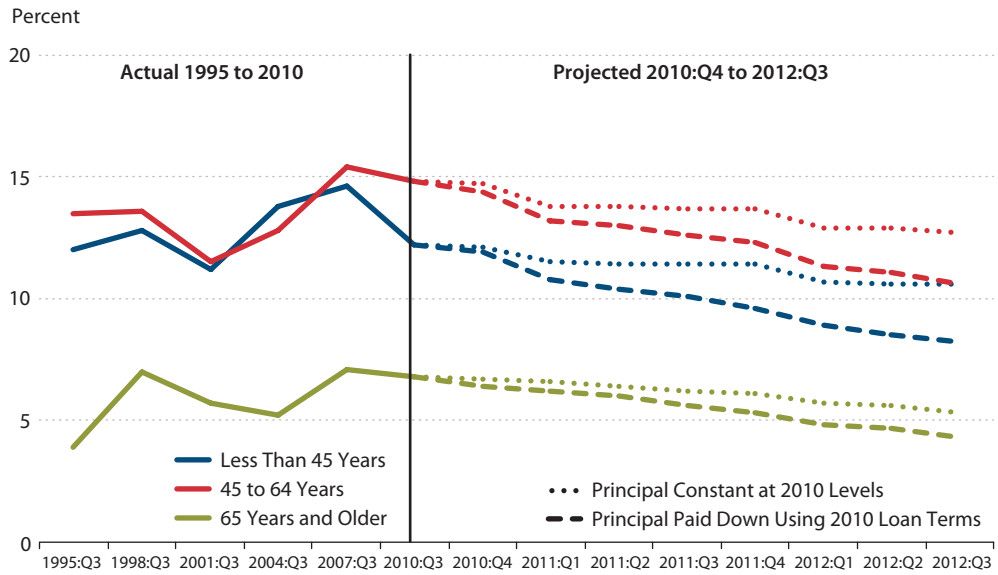
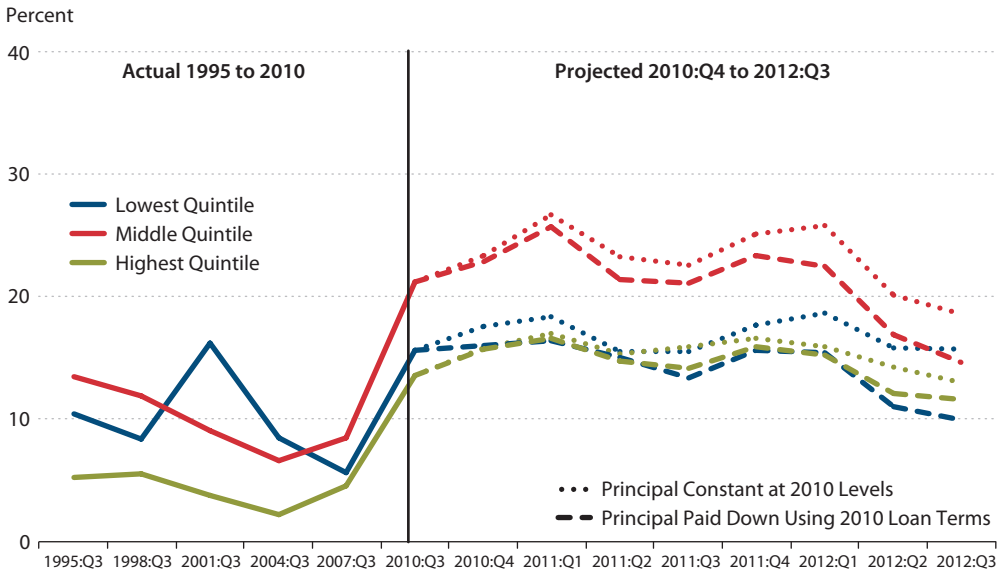


Figure 9

Families with Mortgages for Whom Housing LTV Exceeds 95 Percent (by Normal Income)



nario and there is little change under the constant debt scenario. This difference could be due in part to the role of shorter-amortization loans such as car payments. Under the principal paydown scenario, such loans are being retired at a high rate, resulting in a dramatic drop in the share of households with high debt service-to-income ratios.

Figures 9 through 11 provide several perspectives on housing debt relative to housing values, or LTV. Again, we focus on an indicator of high LTV rather than the LTV itself since homeowners with high LTVs are often of particular interest with regard to financial stability (for example, they are most likely to default on their mortgages). In this analysis, we define "high-LTV" as a mortgage balance in excess of 95 percent of the household's reported market value of their home.[20]

As Figure 9 shows, the fraction of mortgage-holding households with high LTVs jumped dramatically in 2010 for all normal-income groups but especially for the middle-income group, for whom it surpassed 20 percent. Since then, this indicator has trended down for all groups in 2012 as house prices have risen. Comparing the two debt paydown scenarios after 2010, there is little change under the constant debt scenario and a more significant decline under the principal paydown scenario—especially for the lower-income households—though the indicator remains elevated relative to 2007. Recall that, in contrast to consumer debt, mortgage debt under our principal paydown scenario tracks observed changes in aggregate mortgage debt in the FA quite closely, so in this case we believe that the patterns shown here for the principal paydown scenario may be a reasonable estimate of actual developments after 2010.

Figure 10 shows the trends in the high-LTV indicator by age, with an even sharper pattern than the pattern for normal income. Again, there was a spike in the high-LTV indicator between

Figure 10

Families with Mortgages for Whom Housing LTV Exceeds 95 Percent (by Age)

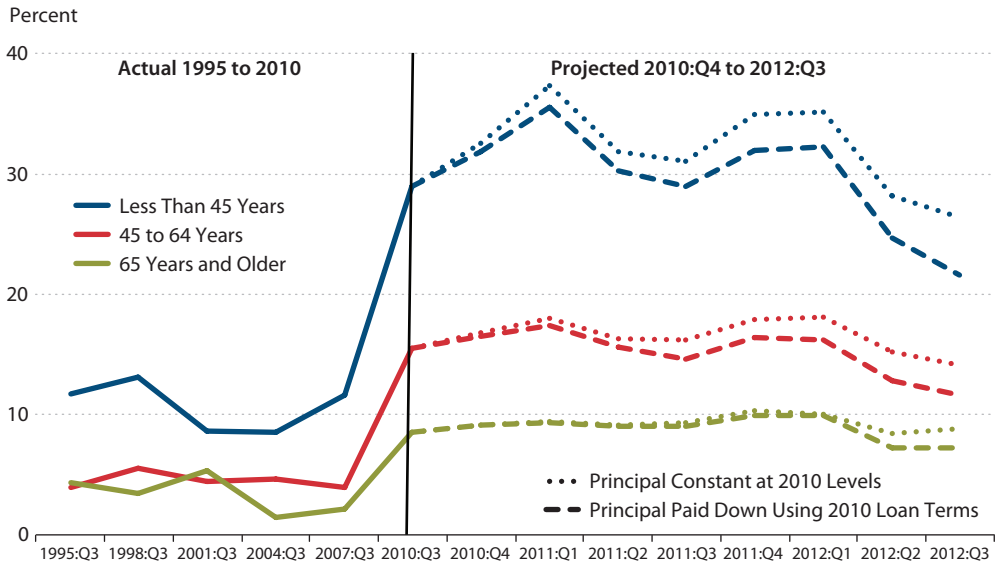
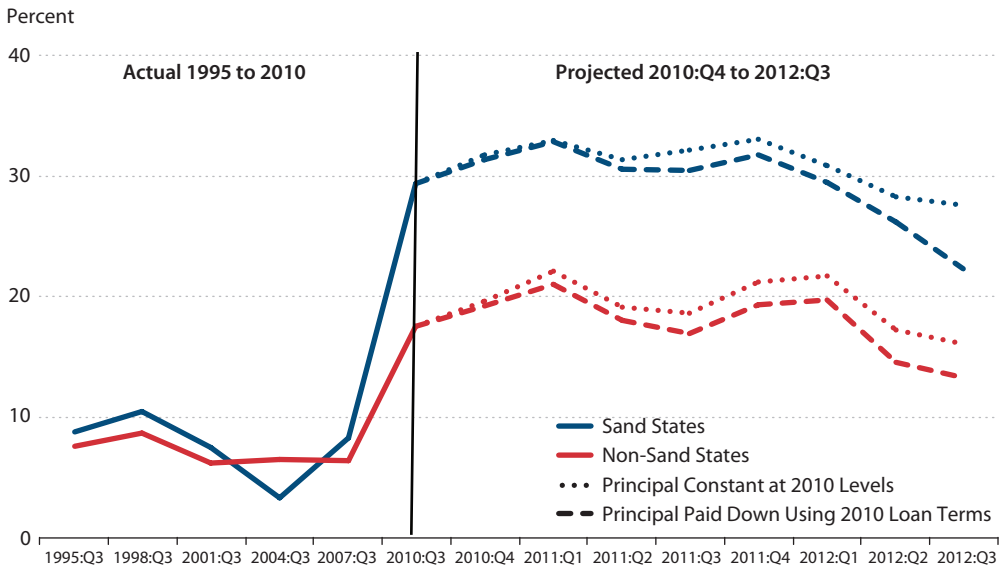


Figure 11

Families with Mortgages for Whom Housing LTV Exceeds 95 Percent (by Geography)



2007 and 2010 for all three groups, but by far the largest spike occurred in the youngest age group, which includes many first-time homebuyers who were more likely to buy near the peak of the housing market. For this age group, the high-LTV indicator reached nearly 30 percent in 2010, while among households over 65 years of age, it never exceeded 10 percent. Again, there was a downward trend for all ages in 2012 as house prices rose and a more significant reduction under the principal paydown scenario, especially for the youngest age group.

Finally, we show the evolution of the high-LTV indicator by geography, splitting the sample into the "sand states"—Florida, Arizona, Nevada, and California—versus the other states to illustrate the larger boom-and-bust cycle in the sand states. As Figure 11 shows, households in the sand states experienced a much larger spike in the high-LTV indicator in 2010 than did households in other states, although the spike was by no means limited to only the sand states. Sand-state households also experienced a much larger decline in this indicator in 2012, especially under the principal paydown scenario.

CONCLUSION

In this exercise, we used aggregate information from the FA and other macro data sources to attempt to estimate a "current SCF" by projecting forward each household in the 2010 SCF survey. Our simple exercise produced some key insights about the extent to which changes in household finances after 2010 reversed some of the trends both before and throughout the Great Recession. For example, real wealth losses between 2007 and 2010 were widespread across age and income groups and continued through 2011 before asset prices began to recover. Equity prices began to rise in late 2011 and real estate prices began to follow in early 2012. However, the gains were not equal across groups, particularly by income, because the real wealth gains attributable to house and equity prices after 2010 were concentrated at the top of the distribution.

In addition to rising asset prices, steadily rising incomes have improved key household financial ratios such as the D/I ratio since 2010, though the effect has not been large enough to reverse the sharp run-up in these ratios over the past decade. We find that (i) the increase in debt was widespread across all the age and income groups considered and (ii) D/I ratios remain high through 2012 even under the assumption that households continued to pay down debt on terms observed in 2010 and have assumed no new debt since then. For the share of households with debt service-to-income ratios above 40 percent, however, we find a fairly significant drop-off would occur in the fraction of households above this threshold under the assumption of continued debt paydown since 2010 with no new debt. However, other sources indicate that consumer debt—especially education and auto loans—has grown sharply after 2010.

One oft-cited statistic on household finances is the dramatic increase in housing LTVs that occurred in the post-2006 housing market collapse. The share of households with self-reported LTVs over 95 percent rose from about just under 7 percent in 2007 to nearly 20 percent in 2010. This spike in the incidence of high LTVs was widespread across age and income groups and was observed in both the so-called sand states and other states (though the spike was much larger in the sand states). Again, we find there would be a fairly significant reduction in the share of households with high LTVs under the assumption of continued debt paydown since 2010 with no new

debt. Unlike the case for consumer debt, for housing debt this assumption might be closer to the truth as originations of mortgages for purchases remain very low by historical standards. Despite the possible drop-off since 2010, however, we find that even under the principal paydown scenario, the share of households with high LTVs remains elevated relative to 2007.

APPENDIXES

Appendix A: Reconciling SCF Data with Aggregate Published Income and Wealth Measures

The concept of personal income in the National Income and Product Accounts (NIPA) includes imputed incomes for which no comparable cash flow measure exists, as well as unmeasured or poorly measured (at the household level) income sources, such as fringe benefits and in-kind transfers. The concept of net worth in the FA includes assets and liabilities of nonprofit organizations, as well as holdings through institutional arrangements such as defined benefit pensions, that are not adequately measured at the household level. This appendix describes the adjustments to aggregate income and wealth measures aimed at achieving improved conceptual consistency with the SCF.

The NIPA concept of personal income is decomposed into source components in its Table 2.1. Personal income is the broadest measure of income received by the household sector. To better compare the NIPA income measure with the SCF income measure, we exclude supplements to wages and salaries (line 6), Medicare and Medicaid transfers (lines 19 and 20), and other current transfers from business (net) (line 24). These exclusions reduce personal income by about 8 percent in 2012. On the SCF side, we begin with the standard *Federal Reserve Bulletin* income variable, which is the family's reported total income for the year preceding the survey. However, we replace that measure with the sum of the reported income *components* (wages and salaries, business income, interest, dividends, capital gains, transfers, retirement income) in cases where the sum of the components exceeds the reported total. Several conceptual issues remain to be addressed to completely reconcile incomes: The NIPA measure includes items not reported in the SCF, such as imputed rent on owner-occupied housing and interest and dividends paid indirectly to households (mostly pensions), while the SCF income measure includes items not in the NIPA concept, such as withdrawals from pension plans. On net, the discrepancies roughly cancel out and the SCF measure is close to 90 percent of the adjusted NIPA measure.

The FA net worth measure reported in its Table B.100 diverges conceptually from the SCF measure in two broad ways. First, the FA household sector includes nonprofit institutions. The most prominent impact of nonprofits occurs through their holdings of real estate (line 5) and plant and equipment (line 6). Removing these assets lowers FA household sector net worth by about 4 percent in 2012. The second (and larger) set of adjustments to FA household sector net worth relates to assets held on behalf of households by other institutions, particularly defined benefit pension funds and life insurance companies. The combined holdings of private sector defined benefit pensions (Table L.116.b), federal employee pension assets (other than the Thrift Savings Plan) (Table L.118, line 7), and state and local employee pension assets (Table L.117)

account for about two-thirds of pension assets on Table B.100 (line 28), but these are not measured at the household level in the SCF and excluding them lowers net worth by almost 15 percent. Similarly, holdings of life insurance companies are excluded because these assets are mostly policy reserves (that is, not whole life). Excluding life insurance (Table B.100, line 27) reduces net worth by approximately 2 percent. Finally, a number of asset and liability categories (Table B.100, lines 26, 30, and 35-41) are either associated with nonprofits or are not well measured at the household level; these basically net out and reduce reported net worth by less than 1 percent. Together, all adjustments for SCF consistency reduce FA net worth by just over 21 percent in 2012.

Appendix B: Geographic Locators for Assigning House Price Changes

One of the crucial building blocks for aging the SCF micro sample forward through time is assigning local area house price changes to individual observations. This appendix explains how specific price indexes were used to project changes in house prices.

Each observation in the SCF includes a numeric geographic locator variable derived from that household's CBSA. If the CBSA could not be identified or matched to a corresponding local housing price index, we use the household's state of residence as a geographic identifier. According to the Census Bureau, "the term Core Based Statistical Area (CBSA) is a collective term for both metro and micro areas. A metro area contains a core urban area of 50,000 or more population, and a micro area contains an urban core of at least 10,000 (but less than 50,000) population. Each metro or micro area consists of one or more counties and includes the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core."[21] Current CBSA delineations were last revised in September 2010; new delineations based on the 2010 Office of Management and Budget (OMB) standards[22] will be released by the OMB in 2013. There are 960 distinct CBSAs under current definitions.

The process of mapping households to unique geographic locators unfolded over several steps. We first assigned SCF households to their corresponding CBSA by using the Department of Housing and Urban Development's zip code-to-CBSA crosswalk.[23] Of the 142,460 observations between the 1995 and 2010 surveys, 134,800 (94.6 percent) mapped to a CBSA that could be matched to a location represented in CoreLogic's CBSA-level home price index (HPI). Over two-thirds (5,270) of the 7,660 observations that could not be matched to CoreLogic's HPI were located in zip codes not located within a CBSA (i.e., rural). The remaining 2,390 observations (less than 1.7 percent of the SCF sample between 1995 and 2010) were located within a CBSA not sampled by CoreLogic. Such a proportion is consistent with the coverage of CoreLogic's HPI, which represents about 98.5 percent of U.S. zip codes. The 7,660 observations that could not be matched to CoreLogic's CBSA data were therefore assigned their corresponding state-level CoreLogic HPI.

Appendix C: Details about Loans, Loan Terms, and Debt Service in the SCF

The SCF collects data on 13 categories of loans that, in principle, can be used to measure household debt service. These categories include loans on cars and trucks for personal use, other owned vehicle loans, education loans, other consumer loans, home improvement loans, primary

mortgages, other residential real estate loans, loans against land contracts given by the respondent household, margin loans, loans against life insurance policies, pension loans, credit cards, and lines of credit. In this article, we map the various types of loans into the five household debt categories that are reconciled with the FA and other aggregate data sources and tracked as part of household net worth. These categories are mortgages, education loans, credit cards, vehicle loans, and other consumer loans. To maintain consistency between loans and (gross versus net) debt balances, we exclude loans on land contracts, margin loans, life insurance loans, and pension loans from the following discussion.

Each loan in the SCF is identified in two ways: by type and by purpose. Loan type describes where the loan is recorded in the SCF and differentiates, for example, a household's first consumer loan from its second consumer loan. The 42 loan types can be assigned to up to one of eight purposes: vehicle, education, other consumer loans, home improvement, other residential, principal residence, credit card, and other lines of credit. Loan type and loan purpose are then used to place a loan into one of the five debt classifications. This dual identification strategy helps identify (i) how the household thinks about the loan in terms of type and (ii) the underlying good or service financed by the loan. In short, recording the loan type allows us to map it back to the SCF itself. Categorizing loans by their purpose allows proper aggregation of debt on the balance sheet.

The SCF has up to 17 distinct pieces of information on any given loan: the loan type and loan purpose as mentioned above plus payment amount, whether the loan is currently in pay status (not deferred), whether the loan is on schedule, origination month, origination year, term of the loan, expected month of payoff, expected year of payoff, month when payments will begin, year when payments will begin, original amount, reported amount still owed, interest rate, credit limit, and whether the loan is secured by home equity. Different loans have different combinations of the 17 variables under various circumstances, but together they make it possible to estimate the amount of principal currently being paid on any given type of loan, which is the key input to the debt paydown scenario.

Our analysis accounts for 431,892 loans across the 142,460 families in the 1995-2010 SCF samples. Each family has a (weighted) average of 2.85 loans (3.03 unweighted); some 19,308 (15,437 unweighted) households have no loans. Among the households with at least one loan, the average number of loans per household is 3.29 (3.40 unweighted). In terms of mapping loans into debt categories, 22 percent are mortgages, 6 percent are for education, 54 percent are credit cards, 12 percent are vehicle loans, and 6 percent are other consumer loans.

NOTES

1 See, for example, Moore and Palumbo (2010).

2 See, for example, De Nardi, French, and Benson (2012) and Petev, Pistaferri, and Eksten (2011).

3 Before 2013, this dataset was known as the Flow of Funds Accounts.

4 The FA data are available for download at http://www.federalreserve.gov/releases/z1. Results of the most recent SCF are discussed in Bricker et al. (2012). SCF micro data are available for download or online tabulation and analysis at http://www.federalreserve.gov/econresdata/scf/scfindex.htm.

5 See Henriques and Hsu (2013) for a more comprehensive discussion of reconciling SCF and FA net worth measures.

6 See Appendix A for more details.

7 The same logic can be applied to other promises of future payment to households, such as Social Security benefits or Medicare. These promises are not included in the FA concept of household wealth, in part because they are not backed by marketable financial assets.

8 See Love, Smith, and McNair (2008) for a calculation of the value of households' claims on pension and life insurance providers using the Health and Retirement Survey sponsored by the National Institute on Aging.

9 One important area for future work is further reconciliation of SCF and NIPA incomes, especially with respect to imputed income on owner-occupied housing and pension flows. See Appendix A for details.

10 For a more comprehensive discussion of recent trends and current levels of household debt, see Brown et al. (2011).

11 These debt service ratios are available on the website of the Board of Governors of the Federal Reserve System (http://www.federalreserve.gov/releases/housedebt/); see Dynan, Johnson, and Pence (2003) for details. In computing this ratio, we adjust the definition of income in the denominator to be consistent with the SCF definition, as described previously. Note that this ratio can also fall because of lengthening average amortization periods—for example, if there is a compositional shift toward longer-term loans.

12 As noted, at this stage we are not accounting for any new saving flows.

13 A more realistic simulation methodology could bring to bear the insights and data used in studies of permanent and transitory income changes over time. See, in particular, Carroll (1992); DeBacker et al. (2011); Guvenen, Ozkan, and Song (2012); and Sabelhaus and Song (2009, 2010). Ackerman and Sabelhaus (2012) show how the difference between the actual and "normal" income measures in the SCF relates to the traditional distinction between transitory and permanent income shocks.

14 The SCF has information on up to 42 distinct loans across several different types of debt, of which most are installment-type loans, for which typical or scheduled payments, interest rate, term, and origination are known. Some loans—most notably education loans—have additional information about payment behavior, in particular, whether the loan is currently in deferral. See Appendix C for details.

15 Authors' calculations, using Equifax aggregates calibrated so total non-mortgage consumer debt matches the non-mortgage consumer debt totals in the FA.

16 For a more dynamic perspective on the effects of the Great Recession on household finances, see Bricker et al. (2011). Also, Moore and Palumbo (2010) compare and contrast the distribution of household finances across the three economic downturns since the current version of the SCF was initiated in 1989.

17 The concept of "normal" income in the SCF is conceptually and empirically close to the concept of "permanent" income that economists generally consider when they describe consumer behavior. The label "normal" stems from a question posed to SCF respondents; after they report their actual income, they are asked whether they consider the current year a "normal" year. If respondents state it is not a normal year, they are asked to report a value for "normal" income. Actual and normal income are the same for most respondents. However, Ackerman and Sabelhaus (2012) show that the deviations from normal for the subset who report such deviations provide a relationship between actual and permanent income consistent with estimates of transitory shocks using panel income data.

18 This approach is used to minimize the influence of households with special circumstances that result in unusually large or small ratios.

[19] Recent regulations promulgated by the Consumer Financial Protection Bureau use a similarly defined threshold of 43 percent in the context of regulating "qualified mortgages" (see http://files.consumerfinance.gov/f/201308_cfpb_atr-qm-implementation-guide_final.pdf).

[20] Because this measure of LTV relies on homeowners' self-reports on the market value of their home, it may differ somewhat from other measures of LTV. For example, the 2010 SCF shows a spike in the share of homeowners reporting their home is worth exactly what they owe on it. Because our indicator is intended to identify a group of people who have no real equity to lose by walking away, we include these homeowners in the high-LTV indicator.

[21] See "Metropolitan and Micropolitan Statistical Areas Main" at http://www.census.gov/population/metro/.

[22] See "Part IV: Office of Management and Budget 2010 Standards for Delineating Metropolitan and Micropolitan Statistical Areas; Notice." *Federal Register*, June 28, 2010, *75*(123); http://www.whitehouse.gov/sites/default/files/omb/assets/fedreg_2010/06282010_metro_standards-Complete.pdf.

[23] See "HUD USPS ZIP Code Crosswalk Files" at http://www.huduser.org/portal/datasets/usps_crosswalk.html.

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Economic Vulnerability and Financial Fragility

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Unfortunately, many families with the greatest exposure to the economic dislocations of the recent recession also had very risky balance sheets beforehand that were characterized by low levels of liquid assets, high portfolio concentrations in housing, and relatively high balance-sheet leverage. The authors argue that economic vulnerability and risky balance sheets are correlated because they derive from common factors. These factors include a low stock of human capital, inexperience (relative youth), and, in some cases, the legacy of discrimination in housing, education, and employment. Innate cognitive ability interacts with formal education and on-the-job experience to build human capital, while the legacy of discrimination may attenuate the translation of cognitive ability and education into human capital. Acquiring financial knowledge of risk management also requires time and experience and is more valuable to those with high levels of human capital and savings available to invest. Given the combination of these factors, individuals and families who are young, less cognitively able, and/or members of historically disadvantaged minorities are more likely to be economically vulnerable and to hold risky balance sheets because they lack financial knowledge and experience. Moreover, balance sheets of economically vulnerable families before the recent recession were especially risky after a decade of financial liberalization and innovation that increased the access of such families to homeownership and historically high leverage. Economically vulnerable families should avoid "doubling down" with risky balance sheets to enhance their future household financial stability. (JEL D14, D11, D12)

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The recent financial crisis and recession inflicted substantial economic and financial harm on millions of families, but the effects were not uniform across the population. The hardest-hit groups included individuals or families who were the young, the less educated, and members of a minority group. Unemployment rates among all these groups increased sharply and remain elevated more than four years into the recovery (Bureau of Labor Statistics, various years; Figure 1).[1]

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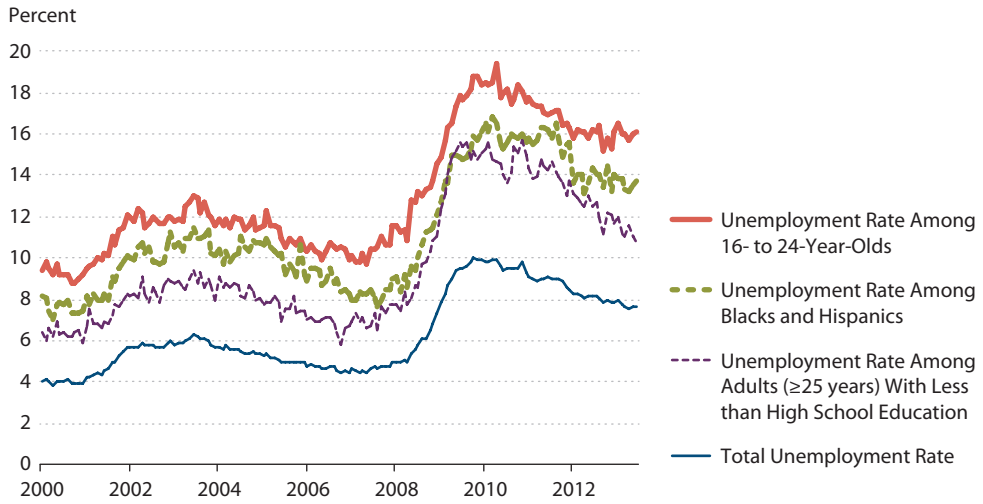
Figure 1

Unemployment Rates



SOURCE: Bureau of Labor Statistics/Haver.

These economically vulnerable groups also suffered greatly in financial terms. For example, the 2010 average wealth of households younger than 40 years of age, with a two- or four-year college degree, and within an historically disadvantaged minority group (black or Hispanic) was $33,154. This is 66 percent lower than their 2007 average.[2] The 2010 average wealth of households younger than 40 years of age, but with less than a high school education and not a part of an historically disadvantaged minority group (primarily white or Asian) was $22,008. This is 74 percent lower than their 2007 average. Most other subgroups with one or more of these demographic characteristics also suffered above-average wealth losses.[3]

Why did the demographic groups hardest hit by the recession also suffer enormous financial losses? The answer is not as obvious as it might at first appear. Economic and financial cross-currents—including rising unemployment, falling asset prices, and different wealth accumulation patterns—affected various households in different ways. Households at greater ex ante risk of job loss and other economic setbacks—the economically vulnerable—indeed suffered more unemployment spells and other income interruption than other groups.[4] On the other hand, these same households presumably knew they were at greater risk of job loss than other families. They might have had higher precautionary savings and chosen relatively safe balance sheets to compensate for their elevated economic risk.[5] Such circumstances would imply relatively high saving propensities; large stocks of safe and liquid assets relative to income to respond to emergencies; a broadly diversified asset portfolio to hedge against the collapse of any asset class; and low balance-sheet leverage (i.e., debt-to-assets ratio) to minimize both the amplification of asset price declines on net worth and the risk of defaulting on a debt.

Moreover, economically vulnerable families generally have relatively low permanent incomes and low wealth-to-income ratios.[6] Because such families had comparatively little wealth before the crisis, their total lifetime resources presumably were less affected by asset price declines. In contrast, older, more highly educated, and nonminority families typically had much greater wealth and larger shares of their lifetime resources at risk in financial and housing markets. After the trauma of 2007-09, large declines in asset prices presented an unusually favorable opportunity for families with relatively low pre-crisis exposure to these markets to accumulate assets at bargain prices. Extremely low interest rates in the aftermath of the crisis likewise could be especially valuable to struggling families who wanted to refinance existing debt or assume new debt to buy a house, pay for education or training, or start a new business.

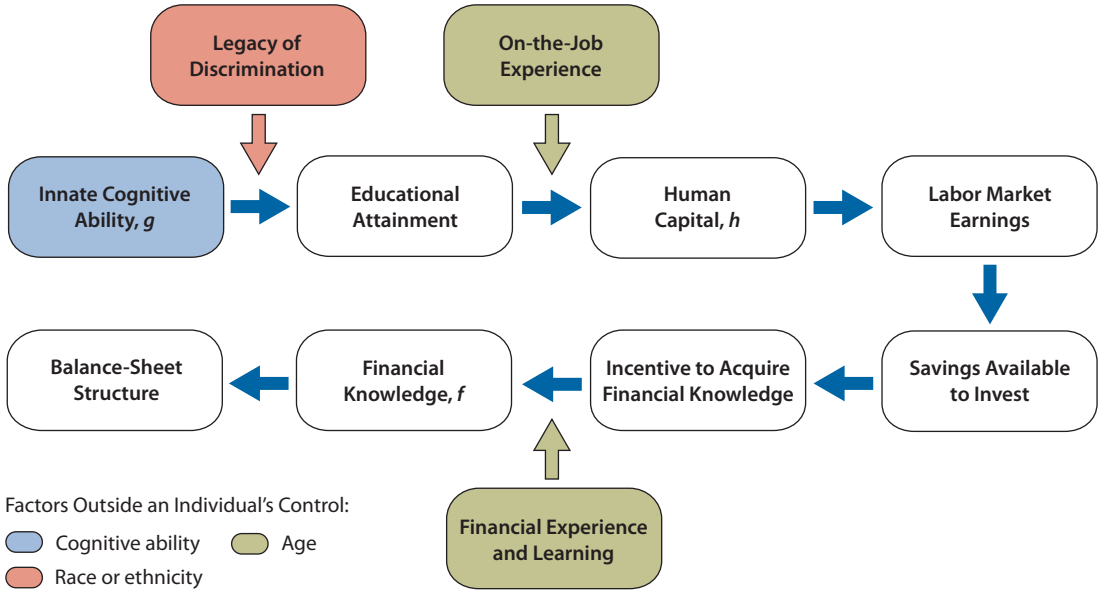
It is therefore not obvious why economically vulnerable groups of families experienced such large percentage wealth losses. As it turns out, economically vulnerable families also typically exhibited risky financial behavior and had risky balance sheets before the crisis. In particular, young, less-educated, and minority families had saving propensities significantly lower than their older, better-educated, and nonminority counterparts.[7] Their homeownership rates increased by above-average amounts in the decade preceding the crisis and their share of housing in total assets was higher than for economically less vulnerable families (see Emmons and Noeth, 2013). Balance-sheet leverage and debt-to-income ratios were higher and increased more in the years leading up to the Great Recession (see Emmons and Noeth, 2013).

The huge wealth declines of these families during the crisis, as well as their apparently limited ability to take advantage of low asset prices and interest rates in 2009 and 2010, followed directly from their pre-crisis balance sheets. Rather than providing a bulwark against the economic storm, the balance sheets of many economically vulnerable families collapsed just as their earnings from work declined or vanished.

Our article is organized as follows. In the next section, we provide a framework based on the work of Lusardi, Michaud, and Mitchell (2013) to better understand why so many economically vulnerable families entered the recession with very risky balance sheets. This approach does not rely on differing rates of time preference or risk aversion to generate differences in behavior toward financial risk. Instead, the key insights are that financial knowledge (i) is costly, (ii) takes time to acquire, and (iii) is of greater value to families with greater anticipated earning power during the middle years of their life spans that they would like to shift forward into retirement. We then document the heterogeneity of balance sheets in 2007 across the demographic dimensions of age, educational attainment, and race or ethnicity, emphasizing the riskiness of the average balance sheet among economically vulnerable groups. Next, we show the financial results of holding risky balance sheets during the Great Recession. A separate section provides regression evidence that helps us determine the relative importance of demographic factors in driving risky portfolio choice. We find that relative youth, perhaps more than any other factor, explains risky financial behavior before the crisis and the ensuing large wealth losses. The final section concludes with a discussion of commonly proposed intervention strategies that attempt to break the link between economic vulnerability and financial fragility.

Figure 2

Earnings Determination and Balance-Sheet Choice



A FRAMEWORK FOR UNDERSTANDING THE LINK BETWEEN ECONOMIC VULNERABILITY AND RISKY BALANCE SHEETS

Figure 2 sketches our framework connecting a family's endowments (cognitive, social, chronological) and its economic and financial outcomes. To motivate our subsequent examination of balance sheets and net worth changes during the Great Recession, we describe in turn how educational attainment, race and/or ethnicity, and age combine to help determine earnings and influence balance-sheet choice.

Variables in Explaining Financial Vulnerability

The Role of Cognitive Ability and Educational Attainment. An individual or family head (henceforth, family) is born with some innate cognitive ability, which might be approximated by a score, *g*, on a measure of general intelligence. The family's endowment of cognitive ability is an important, but not exclusive, determinant of its educational attainment; a variety of individual and social factors also play a role.

The Role of Race and/or Ethnicity. We believe it is critical to highlight the potential importance of race and/or ethnicity in determining a family's educational attainment and all subsequent economic and financial outcomes it will experience. We summarize race- or ethnicity-based influences on educational attainment in the concept of a legacy of discrimination. Although overt discrimination in housing, education, employment, and other spheres may be less evident

today, past discrimination and unfair treatment and access leave an unmistakable imprint on people alive today.[8]

The evidence for at least a legacy of discrimination is overwhelming. The raw high school graduation rate gap between black and white men, for example, is estimated at about 15 percentage points (Murnane, 2013). Even after accounting for differences in family income, eighth-grade attendance, and the child's score on an eighth-grade mathematics test, Murnane finds that a 4.3-percentage-point gap remains; and, of course, these controls themselves may embody past discrimination. The three control variables eliminate the graduation rate gap between black and white women, but they explain even less of the gaps for Hispanic men and women relative to their white counterparts. Those graduation rate gaps remain 9.1 percentage points for Hispanic men and 4.7 percentage points for Hispanic women even after controlling for family income, eighth-grade attendance, and eighth-grade math scores.

If the legacy of discrimination somehow attenuates the translation of innate cognitive ability into formal educational attainment, minority status may emerge as a significant predictor of differential economic and financial outcomes at every subsequent stage in the chain proposed in Figure 2. Not only will the fraction of people who have attained a particular degree status differ across racial and ethnic groups, but the quality of the education obtained also may differ systematically. The positive impact of on-the-job experience may be less for minorities, resulting in a smaller increment to their stock of human capital, h, and potential labor market earnings.

The Role of Age. Just as no one chooses one's cognitive ability or race or ethnicity, we cannot choose to be a different age than the one we are at a given time. Figure 2 suggests that age—in particular, being young—is potentially an important determinant of both economic vulnerability and financial fragility.

The upper half of Figure 2 combines job experience with innate ability and formal education and training—possibly attenuated by the legacy of discrimination—to augment a family's stock of human capital. Clearly, it takes time to acquire on-the-job experience. A younger worker has less time to build human capital and therefore may be less valuable to an employer in tough times. As shown in Figure 1, the unemployment rate among workers younger than 25 years of age remains more than double the overall rate. The unemployment rate among workers 25 to 34 years of age also is higher than for workers 35 years of age or older but is closer to the overall rate.

Age also influences a household's balance-sheet choice and is a critical determinant of outcomes (see the lower half of Figure 2). Consider first a young family with a large amount of human capital and a high income, both today and in the future. The path of this family's earnings over time is likely to be hump shaped.[9] This is the result of both labor market features, including the interaction of aging with pay for performance, and social insurance arrangements (Social Security and Medicare), which entail a significant degree of progressivity. Combining these two features, workers with higher levels of human capital are more likely to have high earnings, which occurs primarily in middle age. Anticipating a subsequent decline in earnings, these workers seek to shift some of their middle-age wealth to their retirement years through private saving, pension, and insurance arrangements. The key point is that these families have relatively strong incentives to acquire financial knowledge—the stock of which we summarize as an index level, f—so they can shift wealth into the future efficiently. Evidence suggests that acquiring financial

knowledge requires time—both to study and to learn by doing—and money. Financial planners and attorneys can be expensive, for example.

The future decline in earnings of lower-income workers is much smaller for two reasons. First, they do not receive large pay-for-performance bonuses in their peak productivity years. Second, they have less incentive to acquire financial knowledge because they will benefit from progressive social insurance schemes. If the cost of raising their stock of financial knowledge is sufficiently high, it may be rational to choose *not* to invest in acquiring financial knowledge.

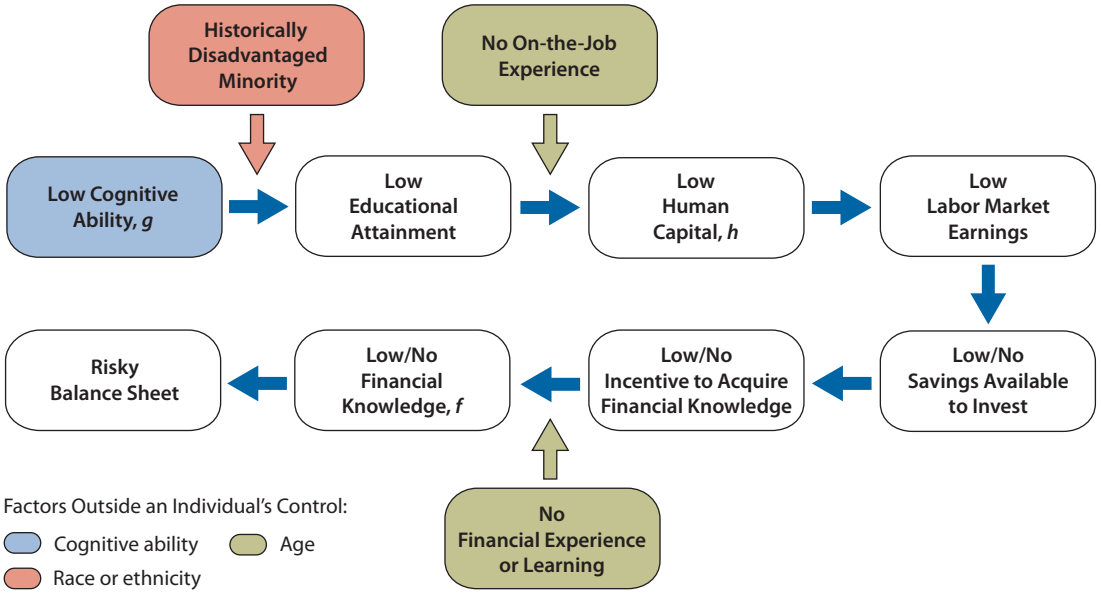
The final link in the chain shown in Figure 2 is using financial knowledge to shape financial behavior and create a strong balance sheet. Families with high financial knowledge, who, as just discussed, are more likely to have high human capital, also are more likely to engage in sound financial decisionmaking. Such families save regularly, maintain an emergency fund of safe and liquid assets, avoid wealth-depleting financial services, choose a diversified asset mix with a relatively high risk-adjusted expected return, and use debt conservatively and for specific, investment-like purposes such as buying a car or home or paying for a child's education. Families with low incomes are likely to have low financial knowledge and are less likely to engage in wealth-building financial behavior.

Thus, we have demonstrated that families likely to be economically vulnerable—in essence, those with relatively low levels of human capital and/or those who are young—also are likely to have poorly constructed, unnecessarily risky balance sheets because they have relatively low levels of financial knowledge. Figure 3 illustrates the "three strikes" faced by a young minority family whose head has less than a high school education. Being young means having little or no on-the-job experience and little time to have accumulated financial knowledge. Having little formal education likely means having little human capital to offer an employer, making oneself vulnerable to being laid off. In addition, a worker with poor career earnings prospects has little incentive to acquire financial knowledge. Finally, being a member of a minority means suffering from the legacies of discrimination in housing and education, which make learning more difficult and low human capital more likely with the economic and financial consequences described above. The results given this scenario include low earnings, high earnings volatility (not derived here but commonly associated with low earnings in practice), and a risky balance sheet.

Note that we do not assume any direct link between the level of cognitive ability or human capital and the *efficiency* of acquiring financial knowledge. In other words, even if—as we assume—increasing one's stock of financial knowledge takes the same amount of time and money, regardless of their stock of human capital, those families with higher human capital will tend to have higher financial knowledge, as described. If instead we assume that having high cognitive ability and/or high human capital makes acquiring higher financial knowledge easier, cheaper, or faster, then the link between economic vulnerability and risky balance sheets would be even stronger. In that case, families with higher human capital would have both a stronger incentive to acquire financial knowledge and a more efficient technology to do so. Families with low cognitive ability and/or low human capital would find it even more difficult to obtain financial knowledge were they so inclined to pursue it.

Figure 3

A Young Minority Family with Less than High School Education



PRE-CRISIS BALANCE SHEETS

Before the crisis, young, less-educated, and minority families were known to be among the most economically vulnerable groups. Differences in financial behavior and balance-sheet composition were perhaps less well recognized or understood. We show here that economically vulnerable families generally had risky balance sheets as well.

Demographically Defined Subgroups

Data from the Survey of Consumer Finances (SCF; Board of Governors of the Federal Reserve System, various years) reveal systematic differences in the average balance-sheet composition of different family groups before the crisis. We define 18 groups based on the characteristics of the head of the household (in the case of age and educational attainment) or the person interviewed, if that is a different person (in the case of race or ethnicity), along the following dimensions:

- Age
  - Family head is younger than 40 years of age (henceforth, "young");
  - family head is at least 40 years old but younger than 62 years old (henceforth, "middle-aged"); or
  - family head is 62 years of age or older (henceforth, "old").
- Educational attainment
  - Family head has received either a two-year or a four-year college degree (henceforth, "college graduate");

    - family head has received either a high school diploma or a General Educational Development (GED) certificate (henceforth, "high school graduate"); or
    - family head has not received a college degree, high school diploma, or a GED certificate (henceforth, "high school dropout").
- Race and/or ethnicity
    - Respondent is a member of an historically disadvantaged minority, in which the interviewee is black or Hispanic of any race (henceforth, "minorities"); or
    - respondent is white non-Hispanic, of Asian descent, or belongs to another minority group not included elsewhere (henceforth, "nonminorities").

Safe and Liquid Assets in 2007. A basic purpose of holding assets is to provide a buffer against shocks to labor market earnings to allow smoothing of consumption spending. Indeed, precautionary saving is just as important as life cycle saving in some respects. A simple measure of the adequacy of precautionary saving is the ratio of safe and liquid assets to annual family income.

Figures 4 and 5 show the 2007 safe assets-to-income ratios among nonminority and minority families, respectively. The most obvious pattern in Figure 4 is that older nonminority families hold much larger precautionary balances than do middle-aged or, especially, young families. The second pattern is less clear: More highly educated, nonminority families generally hold more liquid assets than do less-educated families, but not in every case. The exception occurs among older high school dropout families. Overall, however, the predictions in the first section of our article are confirmed: Nonminority families who are more economically vulnerable (young and less well educated) tend to have riskier balance sheets in terms of holding lower levels of safe and liquid assets.

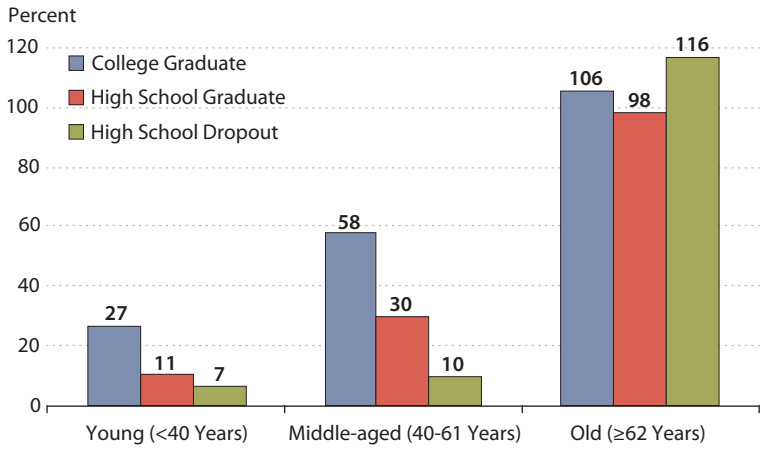
Figure 5 shows the 2007 ratios of safe and liquid assets to family income among minority families. The levels in Figure 5 are universally lower than those in Figure 4 for the corresponding group, confirming the prediction that the more economically vulnerable group—minorities—would hold riskier balance sheets. Qualitatively, Figures 4 and 5 tell the same story: The greater the degree of economic vulnerability, the lower the ratio of safe and liquid assets to family income. Although is it not possible to definitively state a minimum acceptable ratio, all but 1 minority group and 5 of the 9 nonminority groups violate a commonly suggested rule of thumb to hold 6 months of income in the form of safe and liquid assets (corresponding to 50 percent in the figures).

Residential Real Estate Portfolio Shares in 2007. In principle, we could look for concentrations in any risky asset to determine portfolio diversification. Instead, we focus on housing portfolio shares. To be sure, an element of hindsight bias is involved here—we know now that housing performed particularly poorly. However, we could make the argument that concentrations in residential real estate were particularly risky because housing was a relatively poor investment from a risk/return perspective long before the crash.

Should people have known before the recent collapse of the housing market that residential real estate was a low-return, high-risk asset class over the long term? We argue that the answer is yes. Even before the housing bubble burst, historical data suggested that residential real estate generally provides moderate returns just a bit above inflation and on a par with liquid assets and

Figure 4

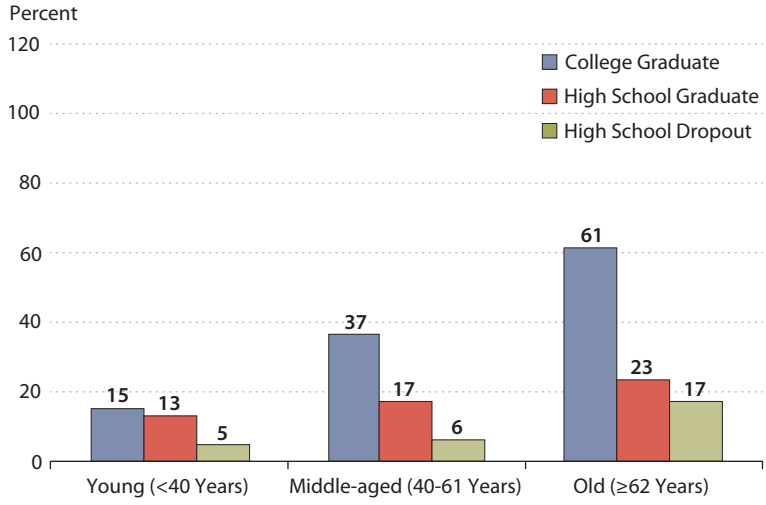
Safe Liquid Assets-to-Family Income Ratio Among Whites, Asians, and Other Non-Disadvantaged Minorities (2007)



SOURCE: Board of Governors of the Federal Reserve System.

Figure 5

Safe Liquid Assets-to-Family Income Ratio Among Blacks and Hispanics (2007)



SOURCE: Board of Governors of the Federal Reserve System.

Table 1

Rates of Return by Asset Type and Period (1983-2010)

	Average annualized percent return (nominal terms)									
	(1)		(2)		(3)		(4)		Total	
Asset type	**1983-89**	**Rank**	**1989-2001**	**Rank**	**2001-07**	**Rank**	**2007-10**	**Rank**	**1983-2010**	**Rank**
Financial assets, including stocks	13.3	1	13.0	1	2.3	5	–2.2	2	9.0	1
Pension accounts	6.1	3	8.6	2	4.9	3	–2.5	3	6.0	2
Liquid assets	6.7	2	4.7	3	3.1	4	1.3	1	4.4	3
Business plus non-home real estate	3.9	5	4.1	5	9.8	1	–7.3	5	4.1	4
Residential real estate	4.0	4	4.5	4	5.8	2	–7.2	4	3.4	5
Inflation (CPI-U, %)	3.7		3.0		2.7		1.7		3.0	

SOURCE: Wolff (2012), Appendix Table 1. CPI-U, Consumer Price Index for All Urban Consumers.

Table 2

Rates of Return by Asset Type: 1983-2001 and 1983-2007

	Average annualized percent return (nominal terms)			
Asset type	**1983-2001**	**Rank**	**1983-2007**	**Rank**
Financial assets, including stocks	13.1	1	10.3	1
Pension accounts	11.8	2	7.0	2
Liquid assets	4.0	5	4.8	4
Business plus non-home real estate	5.4	3	5.4	3
Residential real estate	4.3	4	4.7	5
Inflation (CPI-U, %)	3.2		3.1	

SOURCE: Authors' calculations based on Wolff (2012), Appendix Table 1. CPI-U, Consumer Price Index for All Urban Consumers.

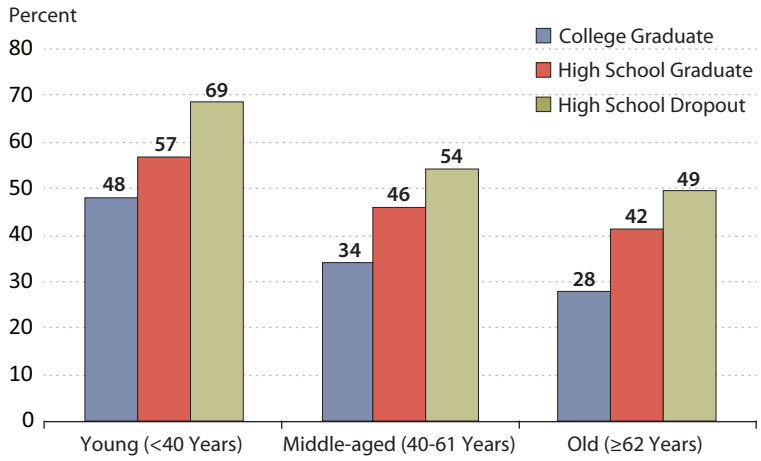
non-home real estate. Financial and pension assets have provided significantly higher returns over long periods of time. Moreover, each individual home entails significant idiosyncratic risk associated with the homeowner's region of the country, county, town, and even neighborhood.

To economists, the primary benefit of owning a home is not large capital gains but rather avoiding the risk of future rent increases and, in some places, obtaining housing services that are not readily available to rent. Housing is more like a durable good than a financial asset.[10]

Tables 1 and 2 reproduce and extend a summary of annualized rates of return for five asset classes between 1983 and 2010, as well as during several subperiods (Wolff, 2012). The only exception to the general rule that residential real estate is a relatively low-return asset class among the periods shown here is the 2001-07 subperiod, which most now agree was a bubble.

Figure 6

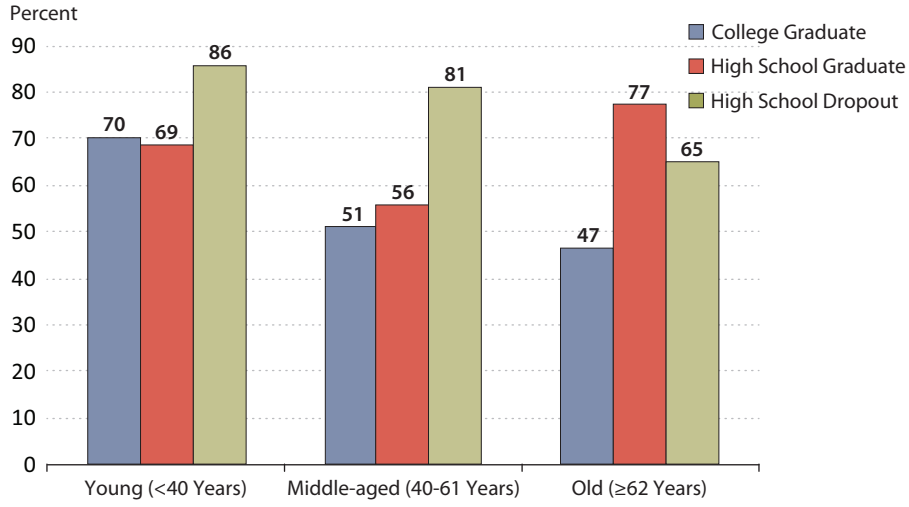
Residential Real Estate Portfolio Shares Among Whites, Asians, and Other Non-Disadvantaged Minorities (2007)



SOURCE: Board of Governors of the Federal Reserve System.

Figure 7

Residential Real Estate Portfolio Shares Among Blacks and Hispanics (2007)



SOURCE: Board of Governors of the Federal Reserve System.

Thus, people could (should) have known that housing was a low-return asset class, even if it was not well appreciated that it also was a very risky asset class. Yet, local and regional housing market downturns in recent decades had demonstrated that area-average house prices can, in fact, fall by double-digit percentages in relatively short periods of time. So, it is plausible to claim that housing was known to be—or should have been known to be—an asset class with a relatively low risk-adjusted expected return.[11]

Figure 6 shows the average share of total assets held in the form of residential real estate in 2007 by each of nine nonminority subgroups. Figure 7 shows the nine minority subgroups. Among nonminority families, the pattern of asset concentration in housing along both age and educational attainment dimensions is remarkably clear. The younger the family and the lower the level of educational attainment—that is, the more economically vulnerable the family—the higher the average housing concentration. The difference in housing portfolio shares between the economically strongest subgroup (older college-educated families) and the economically weakest (young high school dropouts) is an enormous 41 percentage points, making the latter group much more vulnerable to a housing market decline. Considering that the homeownership rate in this group is considerably lower than in the former, the average real estate share in total assets is even more striking.

The pattern for average minority portfolio concentrations in housing is very similar to that for nonminorities, albeit at uniformly higher levels (see Figure 7). With a few slight exceptions, the general principles previously stated also hold here. The younger and the less-educated the family, the higher the average portfolio concentration in housing. Comparison of Figures 6 and 7 clearly shows that the third dimension of economic vulnerability—being a member of an historically disadvantaged minority—also is strongly predictive of a relatively high exposure to housing risk.

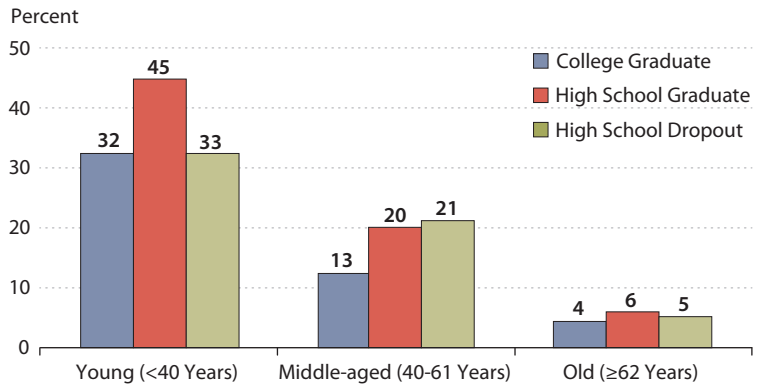
Total Debt-to-Total Assets Ratio in 2007. A high concentration in housing need not lead to financial distress in a housing market crash if the owner has sufficient net assets (including homeowner's equity) and free cash flow after debt service to meet other needs. The SCF data reveal that, rather than serving as a buffer for economically vulnerable families with high housing concentrations against a housing downturn, the liability side of their balance sheets generally tended to amplify the shocks. That is, among the subgroups considered, the economically most vulnerable have, on average, the highest concentrations in housing and the highest levels of debt, whether measured against assets or income.

Figure 8 shows that younger and less-educated nonminority families tended to have higher 2007 debt-to-assets ratios than older and better-educated families (a similar pattern existed for debt-to-income ratios; not shown). It appears that relative youth is the strongest influence on average debt ratios, while the effect of educational attainment is not as strong or clear-cut.

The dominant influence of age on balance-sheet leverage is also evident in Figure 9, which depicts debt-to-asset ratios for nine minority subgroups. Comparison of Figures 8 and 9 shows that race or ethnicity also emerges as a powerful predictor of debt ratios, as every minority subgroup has more leverage than the corresponding nonminority group. As with nonminorities, the liability side of the balance sheets for minority families tends to correlate with and amplify the effects of high housing concentrations for the most economically vulnerable subgroups.

Figure 8

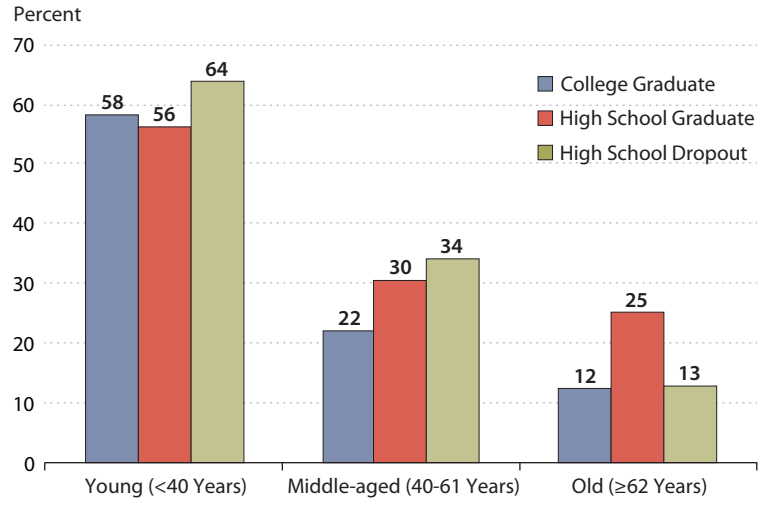
Total Debt-to-Total Assets Ratio Among Whites, Asians, and Other Non-Disadvantaged Minorities (2007)



SOURCE: Board of Governors of the Federal Reserve System.

Figure 9

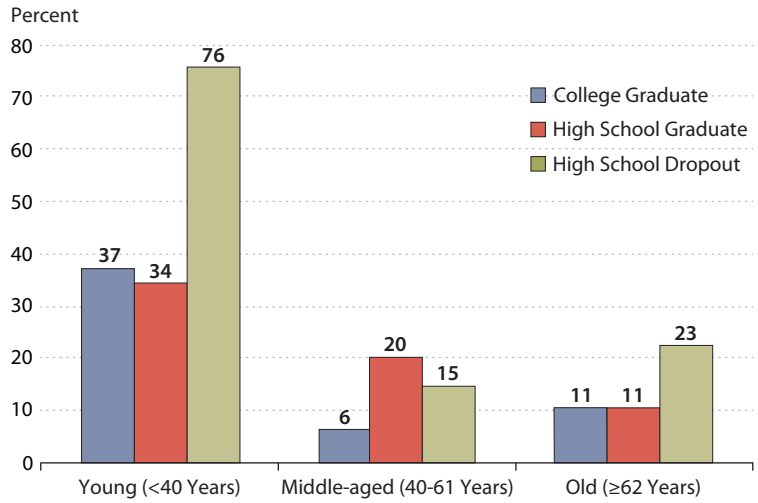
Total Debt-to-Total Assets Ratio Among Blacks and Hispanics (2007)



SOURCE: Board of Governors of the Federal Reserve System.

Figure 10

Percent Decline in Mean Net Worth between the 2004-07 Average and 2010 Among Whites, Asians, and Other Non-Disadvantaged Minorities



SOURCE: Board of Governors of the Federal Reserve System.

WHO SUFFERED THE LARGEST PERCENTAGE DECLINES IN NET WORTH?

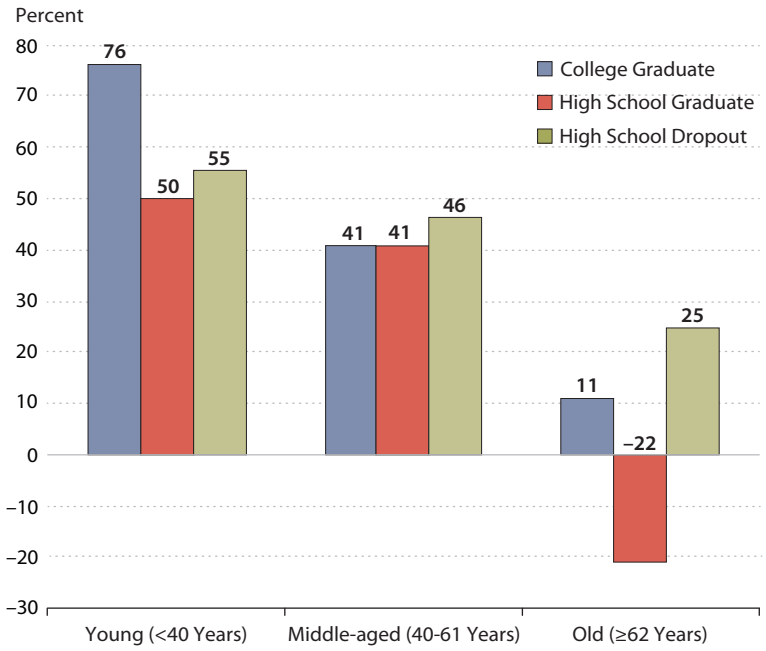
Figure 10 shows that young nonminority families lost vastly more of their wealth between the 2004-07 average and the 2010 survey than middle-aged or older families[12] across all educational attainment categories. Education levels also are important, as dropout families experienced at least twice the percentage decline in wealth compared with college graduate families in each age category.

Among minorities, age plays a strong role in wealth losses across education categories (Figure 11). Indeed, the losses suffered by young minority families were proportionally even larger compared with similarly educated older families than the same comparison among nonminority families (see Figure 10). Middle-aged minority families also fared quite poorly across all education levels. Within each age group, better-educated minority families generally lost less wealth than high school dropouts, with one glaring exception. As a group, young minority college graduates lost a staggering 76 percent of their wealth from the 2004-07 level, which was matched among the other 17 groups only by young nonminority dropout families.

2010 Leverage and Wealth Levels. How do post-crisis balance sheets look for each group? Figures 12 and 13 show that balance-sheet leverage increased during the crisis in 17 of the 18 groups (compared with Figures 8 and 9, which show the 2007 debt-to-assets ratios of nonminorities and minorities, respectively). The largest increase among nonminority families was for young high school dropouts; their debt-to-assets ratio increased from 33 percent to 63 percent.

Figure 11

Percent Decline in Mean Net Worth between the 2004-07 Average and 2010 Among Blacks and Hispanics



SOURCE: Board of Governors of the Federal Reserve System.

In most cases, the increases were driven primarily by falling asset values rather than increased debt.

Figure 13 presents the 2010 debt-to-assets ratios of minority groups. The only group whose ratio did not increase from 2007 was young minority dropouts; their debt-to-assets ratio declined from 64 percent to a still-high 55 percent. Looking at the assets and liabilities of this group, the best summary description of the balance-sheet changes might be "meltdown." Average total assets declined 71 percent, including an 81 percent decline in housing assets. Total liabilities decreased 74 percent, including a 78 percent decline in mortgage debt. Net worth declined 64 percent, to $10,463.

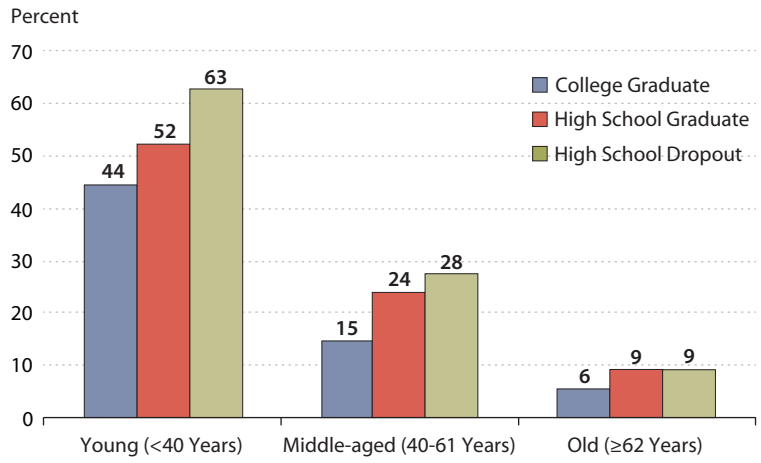
The largest increase in the debt-to-assets ratio between 2007 and 2010 was among young minority college graduates, whose average debt-to-assets ratio increased from 58 percent to 76 percent. This group's net worth declined 66 percent from 2007, to $33,155. Total assets decreased 40 percent, while total liabilities declined 21 percent.

Figures 14 and 15 show the 2010 levels of net worth for each of the 18 groups studied. Wealth levels vary enormously—in part because of vast differences before the crisis, but importantly, reinforced by widely disparate wealth losses during the crisis.

Figure 14 shows the 2010 family net worth among whites, Asians, and other non-disadvantaged minorities. Perhaps the most striking aspect of this figure is the stark difference between the

Figure 12

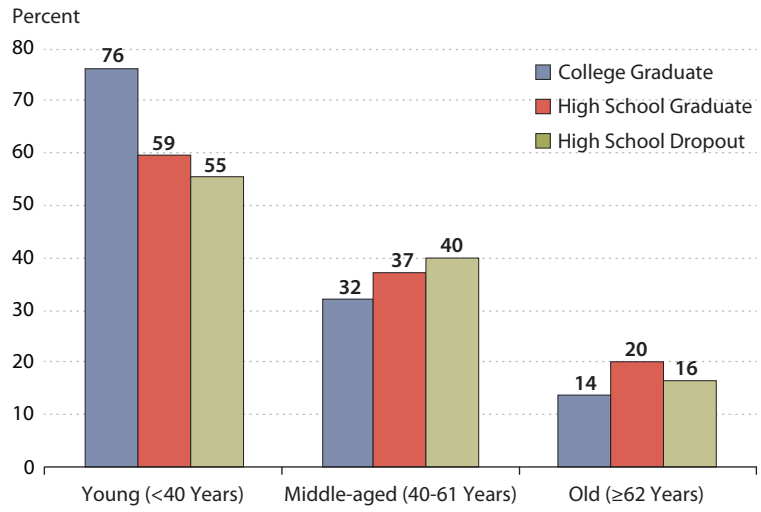
Total Debt-to-Total Assets Ratio Among Whites, Asians, and Other Non-Disadvantaged Minorities (2010)



SOURCE: Board of Governors of the Federal Reserve System.

Figure 13

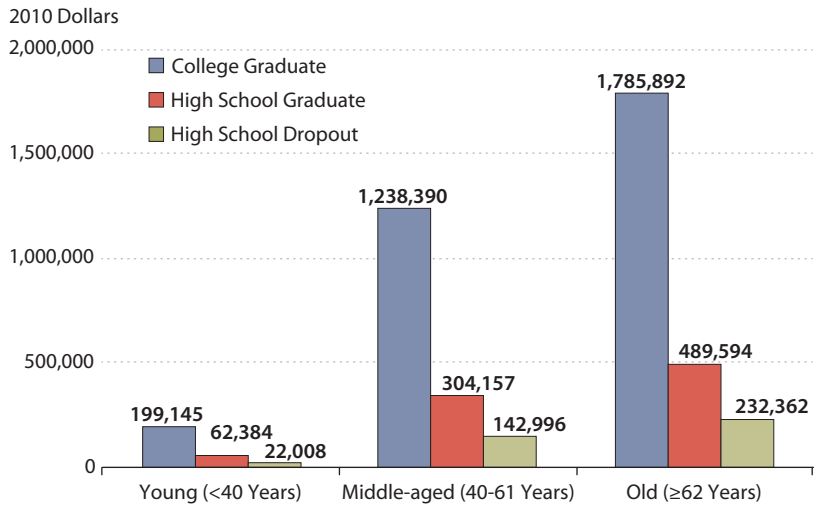
Total Debt-to-Total Assets Ratio Among Blacks and Hispanics (2010)



SOURCE: Board of Governors of the Federal Reserve System.

Figure 14

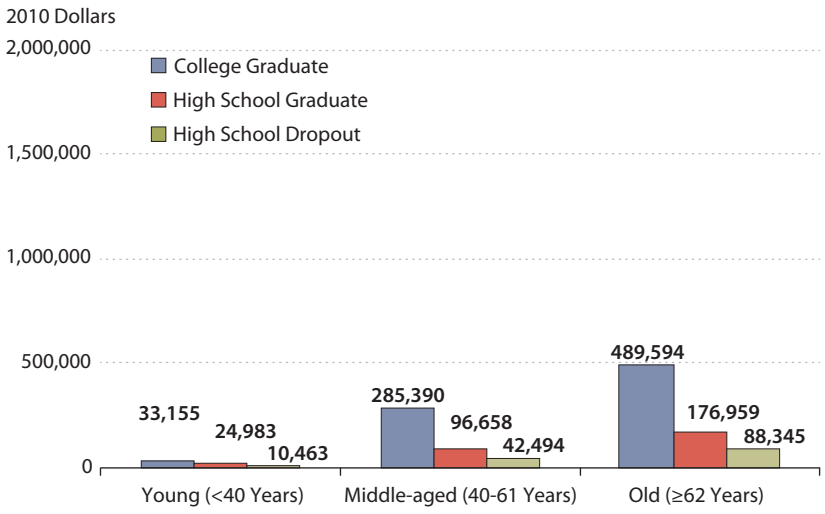
Average Net Worth Among Whites, Asians, and Other Non-Disadvantaged Minorities (2010)



SOURCE: Board of Governors of the Federal Reserve System.

Figure 15

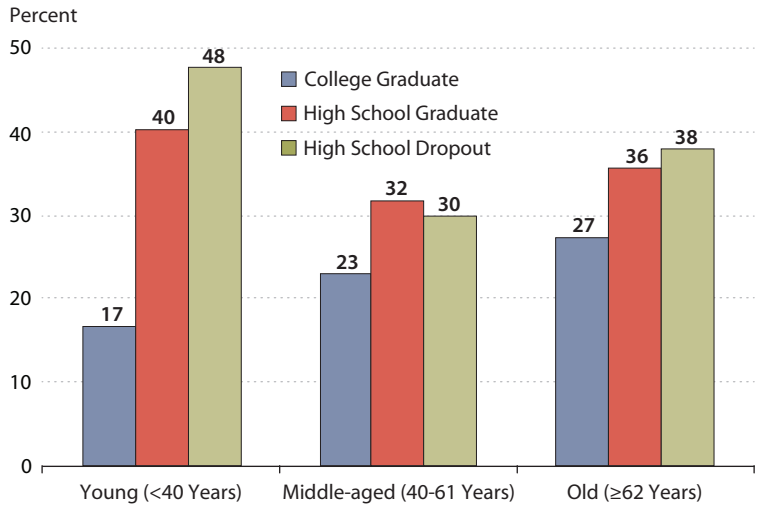
Average Net Worth Among Blacks and Hispanics (2010)



SOURCE: Board of Governors of the Federal Reserve System.

Figure 16

Net Worth of Historically Disadvantaged Minorities as Share of Whites, Asians, and Other Minority Counterparts (2010)



SOURCE: Board of Governors of the Federal Reserve System.

average net worth of nonminority families with college degrees and those without degrees, regardless of age. On closer inspection, the same pattern holds for high school graduates compared with high school dropouts across the life span. In other words, higher levels of educational attainment, on average, are strongly positively related to higher levels of wealth among nonminorities.

The second clear pattern in Figure 14 is that average wealth increases with age, especially between youth and middle age. Young families have average net worth that is a small fraction of the net worth of middle-aged families. Families with a household head between 40 and 61 years of age, in turn, have significantly less wealth, on average, than families with a household head 62 years or older.

Figure 15 provides the same information for minority families. Here the first strong impression is the much-lower average wealth for minorities compared with nonminorities. The same patterns connecting higher levels of education and older family heads to higher wealth also hold true among minority families.

Combining the information in the two previous figures, Figure 16 compares the 2010 average net worth of each minority family group with its nonminority counterpart. The ratio of average minority family net worth to comparable nonminority net worth ranges from a low of 17 percent among young college graduates to a high of 48 percent among young high school dropouts. Higher educational attainment appears to be less effective in building wealth for minority families than for nonminority families, as reflected in the lower ratios in Figure 16.

Table 3

Dependent Variable: Safe and Liquid Assets-to-Annual Family Income Ratio

	Regression		
Variable	**(1)**	**(2)**	**(3)**
Intercept	0.441***	0.490***	0.368***
Age <40 years dummy (ages 40-61 years omitted)	–0.209***		–0.162***
Age ≥62 years dummy (ages 40-61 years omitted)	0.667***		0.662***
Less than high school education dummy (high school or GED omitted)	–0.178***		–0.157***
College graduate dummy (high school or GED omitted)	0.226***		0.188***
Member of historically disadvantaged minority dummy (white or non-disadvantaged minority omitted)	–0.231***		–0.198***
Married deviation		–0.018	–0.055***
Number of children deviation (normalized)		–0.042***	–0.035***
Square root of income deviation (normalized)		–0.046***	–0.052***
Available credit line amount deviation (normalized)		0.028***	0.025***
Square root of assets deviation (normalized)		0.094***	0.083***
Saved within the past year dummy deviation		0.161***	0.148***
Emergency funds needed target deviation (normalized)		0.064***	0.067***
Believe you are financially lucky deviation		–0.110***	–0.112***
History of credit problems deviation		–0.173***	–0.191***
2001 Dummy	–0.008	0.002	–0.002
2004 Dummy	–0.048*	–0.024	–0.028
2007 Dummy	–0.073***	–0.022	–0.056**
2010 Dummy	–0.104***	–0.062***	–0.070***
R^2 for first implicate	0.1083	0.0735	0.1628

NOTE: Unweighted regressions using repeated-imputation inference techniques. The deviation variables are deviations from the weighted mean within the smallest demographic subgroup for age, race, and education level. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

THE IMPORTANCE OF DEMOGRAPHIC FACTORS IN BALANCE-SHEET CHOICE

The evidence presented previously suggests that age, educational attainment, and race or ethnicity are associated with key balance-sheet measures of risk and measures of wealth losses during the financial crisis and recession. In this section, we provide regression evidence that provides insight into the relative importance of demographic determinants of financial behavior and outcomes.

Safe and Liquid Assets. The ratio of safe and liquid assets to family income is a proxy for the size of a family's emergency fund. Table 3 displays results of three ordinary least squares regressions of a family's ratio of safe and liquid assets to family income on demographic indicator

variables; a host of economic, financial, and attitudinal variables from the SCF waves of 1998 through 2010; and year dummies. Each of the second set of variables is expressed as the deviation for a particular family from the mean of the subgroup to which it belongs (i.e., one of the 18 age, education, and race or ethnicity groups).

Regression (1) uses only the demographic variables and the year dummies. Each demographic indicator variable is highly significant in the direction we expect. That is, (i) the older the family, the higher the safe assets-to-income ratio; (ii) the higher the education level, the higher the safe assets-to-income ratio; and (iii) minorities have a lower safe assets-to-income ratio than nonminorities. The coefficient estimates also suggest the differences are economically large. Compared with middle-aged families, for example, being a young family is associated with a 21-percentage-point lower safe assets-to-income ratio. Older families have a remarkable 67-percentage-point higher safe assets-to-income ratio than middle-aged families.

Similarly, the differences across education groups are economically large. High school dropouts have an 18-percentage-point lower safe assets-to-income ratio than high school graduates, while college graduates have a 23-percentage-point higher safe assets-to-income ratio than high school graduates. Minority families have a 23-percentage-point lower safe assets-to-income ratio than nonminority families. The dummy variables for 2007 and 2010 are highly significantly negative, although not particularly large, indicating that safe assets-to-income ratios were depleted both before and after the financial crisis.

Regression (2) uses a host of endogenous variables in demeaned form to capture idiosyncratic deviations of families that are not explained by our exogenous demographic variables. The idea is that, relative to the subgroup's average value on, say, the income variable—which may be determined in large part by demographic variables—a family's deviation from the average may contain information relevant to its balance-sheet behavior.

Our preferred specification is regression (3). We use the exogenous demographic variables, the demeaned endogenous variables, and the year dummies together to explain a family's safe assets-to-income ratio. The coefficients and significance levels of most of the variables from all three sets of variables survive largely intact from regressions (1) and (2). We conclude that age, educational attainment, and race or ethnicity are very strong predictors of a family's chosen safe-assets-to-income ratio.

Residential Real Estate Portfolio Share. Table 4 presents the coefficient estimates from three ordinary least squares regressions of home-owning families' ratio of residential real estate to total assets on (i) demographic indicator variables, (ii) demeaned endogenous variables, and (iii) year dummy variables. Our decision to include here only regressions that include homeowners, rather than all families, represents a compromise. We would like to capture both the extensive margin of homeownership—the decision to become a homeowner—and the intensive margin—the decision of how much to spend for a home. However, both decisions are endogenous. We would need to model the two distinct decisions involved, but this is beyond the scope of our article.[13]

We could collapse the two decisions into a single dimension, as in Figures 6 and 7. In a regression framework, however, the large number of young families with no residential real estate would dominate the results in an unweighted regression. In our view, this would inaccu-

Table 4

Dependent Variable: Residential Real Estate Assets-to-Total Assets Ratio: Homeowners Only

	Regression		
Variable	(1)	(2)	(3)
Intercept	0.492***	0.511***	0.542***
Age < 40 years dummy (ages 40-61 years omitted)	0.138***		0.128***
Age ≥ 62 years dummy (ages 40-61 years omitted)	–0.048***		–0.035***
Less than high school education dummy (high school or GED omitted)	0.099***		0.092***
College graduate dummy (high school or GED omitted)	–0.146***		–0.130***
Member of historically disadvantaged minority dummy (white or non-disadvantaged minority omitted)	0.146***		0.135***
Married deviation		–0.057***	–0.060***
Number of children deviation (normalized)		0.013***	0.009***
Square root of income deviation (normalized)		–0.019***	–0.016***
Available credit line amount deviation (normalized)		–0.008***	–0.018***
Saved within the past year dummy deviation		–0.096***	–0.094***
Emergency funds needed target deviation (normalized)		–0.005***	–0.004***
Believe you are financially lucky deviation		0.044***	0.049***
History of credit problems deviation		0.047***	0.042***
2001 Dummy	–0.001	–0.010	–0.006
2004 Dummy	0.049***	0.047***	0.053***
2007 Dummy	0.057***	0.050***	0.059***
2010 Dummy	0.079***	0.061***	0.065***
R^2 for first implicate	0.1267	0.1321	0.2292

NOTE: Unweighted regressions using repeated-imputation inference techniques. The deviation variables are deviations from the weighted mean within the smallest demographic subgroup for age, race, and education level. *** indicates significance at the 1 percent level.

rately suggest that young families behave very conservatively in their housing decisions. To be sure, some do; but many do not. On the other hand, in a regression weighted by a family's housing assets, total assets, or other dollar measure, relatively few families could unduly influence the results we ascribe to young families overall. We adopt a compromise position involving unweighted regressions among home-owning families alone.

Once again, regression (1) suggests that demographic variables predict housing portfolio shares—conditional on being a homeowner—in the expected directions. There is strong evidence of a time trend, with increasing housing shares from 2004 onward. Regression (2) shows results using only the demeaned endogenous variables and year dummies, while regression (3) combines all three sets of variables.

The coefficient estimates from our preferred specification, regression (3), suggest that, after controlling for idiosyncratic factors and time effects, being young is associated with a 13-percentage-point higher housing portfolio share than among middle-aged families, who, in turn,

Table 5

Dependent Variable: Total Debt-to-Total Assets Ratio

	Regression		
Variable	**(1)**	**(2)**	**(3)**
Intercept	0.275***	0.350***	0.306***
Age < 40 years dummy (ages 40-61 omitted)	0.343***		0.322***
Age ≥ 62 years dummy (ages 40-61 omitted)	–0.180***		–0.178***
Less than high school dummy (high school or GED omitted)	–0.037**		–0.043***
College graduate dummy (high school or GED omitted)	–0.061***		–0.037***
Member of historically disadvantaged minority dummy (white or non-disadvantaged minority omitted)	0.080***		0.067***
Married deviation		–0.072***	–0.056***
Number of children deviation (normalized)		0.002	–0.001
Square root of income deviation (normalized)		–0.013***	–0.007***
Available credit line amount deviation (normalized)		0.018***	0.020***
Saved within the past year dummy deviation		–0.141***	–0.135***
Emergency funds needed target deviation (normalized)		–0.007**	–0.006*
Believe you are financially lucky deviation		0.139***	0.136***
History of credit problems deviation		0.232***	0.235***
2001 Dummy	–0.016	–0.030**	–0.021
2004 Dummy	0.025	0.014	0.023
2007 Dummy	0.039**	0.021	0.040***
2010 Dummy	0.104***	0.082***	0.091***
R^2 for first implicate	0.0868	0.0675	0.1386

NOTE: Unweighted regressions using repeated-imputation inference techniques. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively. The deviation variables are deviations from weighted mean within the smallest demographic subgroup for age, race, and education level.

have housing shares about 3.5 percentage points higher than older families. High school dropouts have housing portfolio shares 9 percentage points higher than high school graduates, who have housing shares 13 percentage points higher than college graduates. Finally, minorities have housing portfolio shares about 14 percentage points higher than nonminorities, after controlling for idiosyncratic and time effects.

Balance-Sheet Leverage

Table 5 shows the coefficient estimates from three ordinary least squares regressions of a family's total debt-to-total assets ratio on demographic indicator variables, demeaned endogenous variables, and year dummy variables. As before, regression (1) suggests that demographic variables are powerful predictors of balance-sheet leverage, although the relationship between educational attainment and leverage may be nonlinear. The years 2007 and 2010 appear to dif-

fer from earlier years, suggesting a time trend. Regression (2) shows results using only the demeaned endogenous variables and year dummies, while regression (3) combines all three sets of variables.

The coefficient estimates from our preferred specification, regression (3), suggest that age is a strong predictor of balance-sheet leverage. Being young is associated with a 32-percentage-point higher debt-to-assets ratio than being middle-aged, which, in turn, is associated with an 18-percentage-point higher ratio than among older families. The effect of educational attainment appears to be nonlinear. High school graduates have the highest debt-to-assets ratios, while both high school dropouts and college graduates have lower ratios, after controlling for idiosyncratic and time effects. The size of these effects is not large, however. Finally, controlling for other factors, minorities have 6-percentage-point higher debt-to-asset ratios than nonminorities.

INTERVENTIONS TO BREAK THE LINK BETWEEN ECONOMIC VULNERABILITY AND RISKY BALANCE SHEETS

Using the Federal Reserve's SCF, we found that several groups of economically vulnerable families entered the recession with risky balance sheets; they held low levels of emergency savings, were highly concentrated in housing, and carried a heavy debt burden. These same families, on average, generally suffered the largest percentage decreases in wealth. A decade or more of financial innovation and liberalization may have been a factor increasing the riskiness of many of these families' balance sheets, as greater amounts of credit were available to more people than ever before. Economically vulnerable families may have been more susceptible to the "siren songs" of homeownership and easy credit in part because of low levels of financial knowledge or sophistication.

Can the link between economic vulnerability and risky balance sheets be broken? In the following discussion, we briefly illustrate where several types of interventions fit into our schematic of the determination of earnings, financial knowledge, and financial behavior. Our general conclusion is that the earlier in the chain of causation the intervention occurs, the more likely it is to be effective.

Policy Interventions

Financial Literacy Training. It seems the most direct response to evidence of poor financial decisionmaking is to provide financial literacy training. As Figure 17 clearly shows, however, such an intervention may be "too little, too late." The fundamental determinants of financial knowledge, as we have argued, include human capital and its determinants, as well as the incentives to become financially knowledgeable. Financial literacy training of low-income adults, for example, may yield modest results.

In-Kind or Cash Benefits. If low incomes are the reason families do not save—which, in turn, reduces the incentive to become financially knowledgeable—then we could seek to raise families' incomes. However, there is no automatic link between higher income and higher saving, and the amounts of likely transfers may not remove the most important aspects of the "poverty

Figure 17

Intervention Strategy: Financial Literacy Training

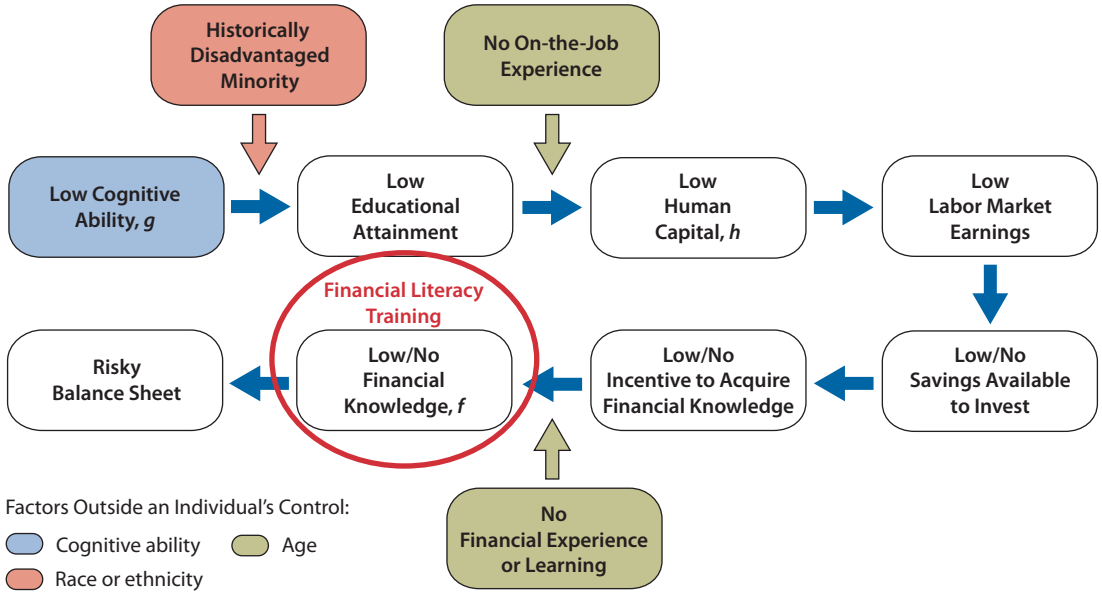


Figure 18

Intervention Strategy: Redistribution in Cash or In-Kind

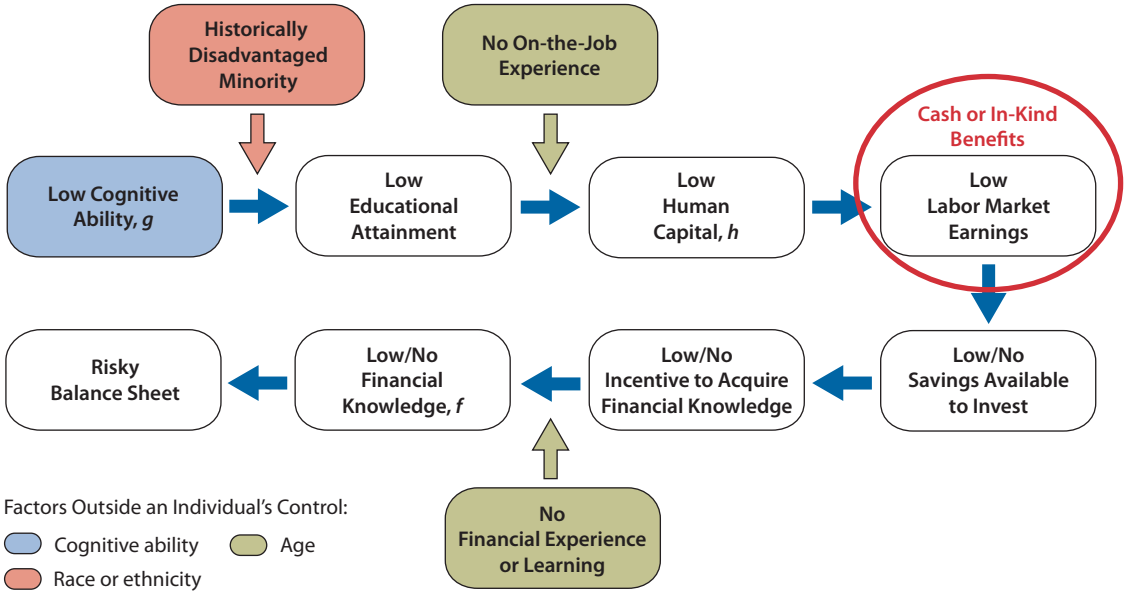


Figure 19

Intervention Strategy: Individual Development Accounts

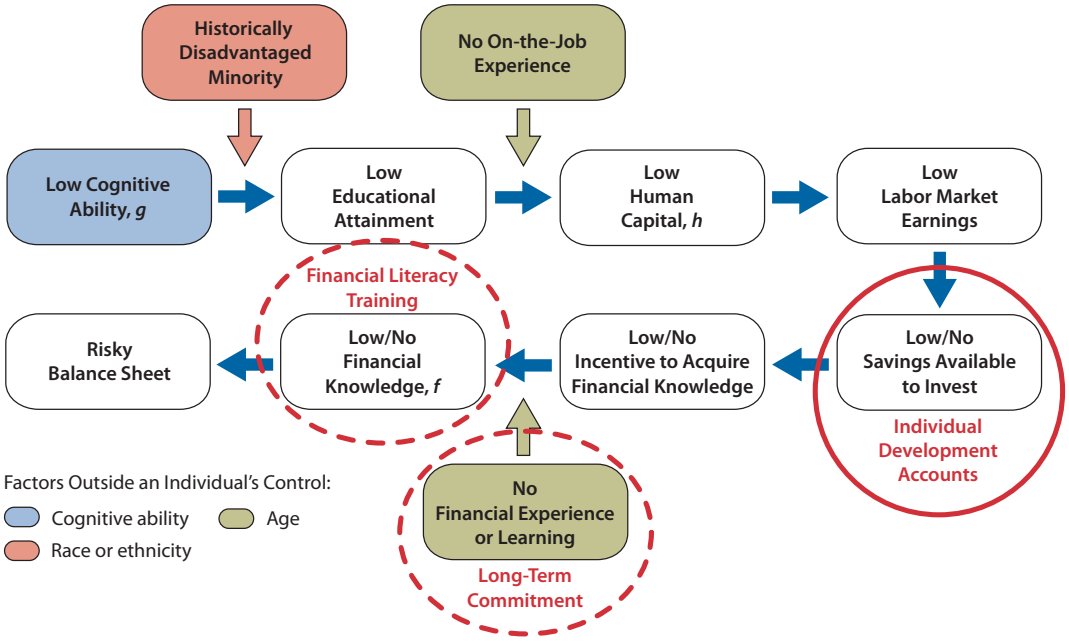
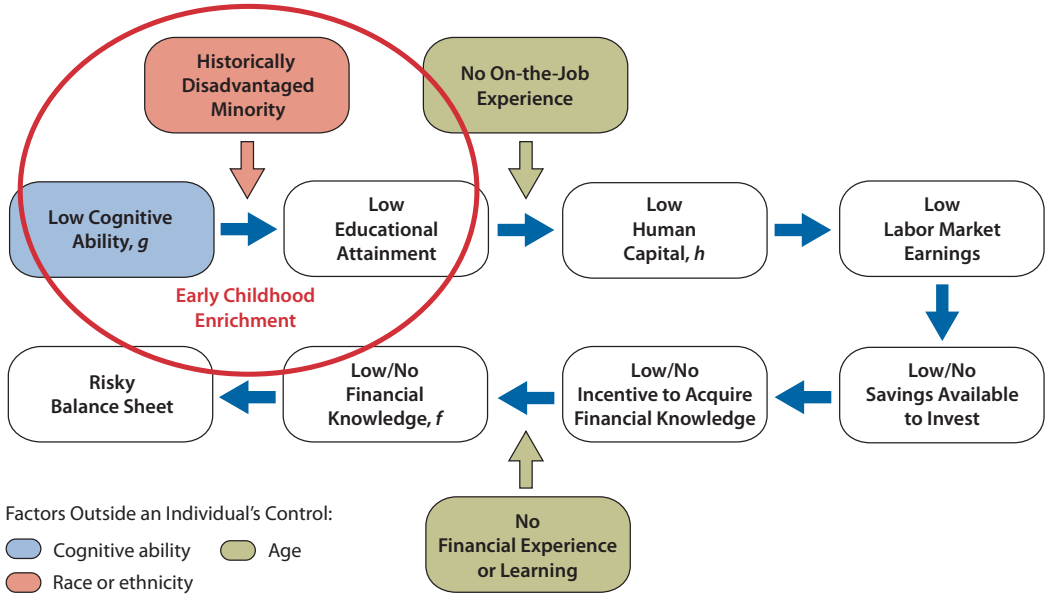


Figure 20

Intervention Strategy: Early Childhood Enrichment



trap" created by means-tested benefits and progressive social insurance. Thus, there is no compelling reason to believe that benefits targeted at low-income families would translate reliably into greater financial knowledge (Figure 18).

Individual Development Accounts (IDAs). IDAs combine saving subsidies with financial literacy training and, importantly, a long-term commitment by the participant to achieve a savings goal. As Figure 19 suggests, IDAs combine interventions at several stages in the financial behavior process. They do not necessarily affect human capital, which we have suggested is a key determinant of financial behavior and ultimate financial outcomes.

Early Childhood Intervention. The most effective interventions are likely to occur during the very early stages in an individual's life because human capital is a key to both economic and financial success and stability (Figure 20). These early interventions could include health, nutrition, or educational enrichment; savings accounts; or even financial education if it is properly designed.

CONCLUSION

Many factors, including low human capital and lack of financial knowledge and experience, combined to create very risky balance sheets for economically vulnerable families before the recent financial crisis. The balance sheets of such families typically had low levels of liquid assets, high portfolio concentrations in housing, and relatively high leverage. The families hardest hit by the recession tended to be young, those without college degrees, and/or members of historically disadvantaged minorities. Unemployment rates among all these groups increased sharply and remain elevated well into the recovery; thus, the affected families are both economically vulnerable and financially fragile.

We provide a framework to better understand why so many economically vulnerable families entered the recession with very risky balance sheets. We use SCF data to define 18 groups based on the characteristics of the head of the household or the person interviewed along the following dimensions: age, educational attainment, and race and/or ethnicity.

We discuss examples of interventions that may help break the link between economic vulnerability and risky balance sheets—specifically, financial literacy training, in-kind or cash benefits, Individual Development Accounts, and early childhood intervention. Our general conclusion is that the earlier in the chain of causation the intervention occurs, the more likely it is to be effective.

NOTES

[1] Hoynes et al. (2012) find that men, blacks, Hispanics, young people (especially under 25 years of age), and those with low levels of education incurred the most job market dislocations during the recent recession. These patterns were virtually unchanged from previous recessions at least as far back as 1979. The proximate cause of extreme cyclical sensitivity of workers with these demographic characteristics was the mix of industries and occupations in which they tend to engage, including construction and manufacturing sectors and associated job categories.

[2] Data are from the Federal Reserve's Survey of Consumer Finances (SCF; Board of Governors of the Federal Reserve System, various years) and are adjusted for inflation.

[3] According to the SCF, the average inflation-adjusted wealth loss among all families between 2007 and 2010 was 15 percent. The median loss was 39 percent; see Emmons and Noeth (2012) and Bricker et al. (2012).

[4] Hur (2012) provides evidence of large losses of labor income and net wealth in addition to declines in consumption among young families during the recession.

[5] A large finance literature explores the trade-off between income risk and portfolio risk. Heaton and Lucas (2000) find that households with high and variable business income hold less wealth in stocks than other similarly wealthy households. Similarly, holding stock in the firm where one works reduces the portfolio share of other common stocks for non-entrepreneurs.

[6] See Dynan, Skinner, and Zeldes (2004).

[7] For example, only 49 percent of young high school dropout minority individuals or families reported saving anything in the year before being surveyed in 2007 for the SCF. Only 40 percent of young high school dropout nonminority households saved. The population average was 56 percent. Carroll, Dynan, and Krane (2003) find that families with low levels of permanent income do not vary their precautionary wealth with their idiosyncratic risk of becoming unemployed, while moderate- and higher-income families do.

[8] There is strong evidence that actual discrimination continues today. For example, Bertrand and Mullainathan (2004) provide evidence of labor market discrimination against black job applicants. A legacy of discrimination includes poor primary and secondary school quality for many black children, who then fare much worse when they pursue higher education (Arcidiacono and Koedel, 2013).

[9] The discussion in this section follows the arguments in Lusardi, Michaud, and Mitchell (2013).

[10] More specifically, a house is a long-lived durable good that requires substantial maintenance and tax payments; the land on which it sits is an investment asset that tends to appreciate at about the rate of overall economic growth in its region. The low overall return on housing thus is a composite return blending the declining value of the structure and the slowly appreciating value of the land underneath it.

[11] Another piece of suggestive evidence pointing toward this judgment is that, when all families in the SCF are ranked from lowest to highest net worth, the housing share of assets declines nearly monotonically toward zero. In other words, housing plays a vanishingly small role in the portfolios of the wealthiest—and presumably financially savviest—families. The same is true of balance-sheet leverage: It declines toward zero as wealth increases in the cross section.

[12] The reason for computing the change from the average of 2004 and 2007, rather than simply 2007, is that five of the 18 groups considered had higher average inflation-adjusted net worth in 2004 than in 2007. Note also that all major national house price indexes peaked in 2006 in inflation-adjusted terms.

[13] Emmons and Noeth (2013) provide a detailed discussion of homeownership across age groups.

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The Effects of Health and Wealth Shocks on Retirement Decisions

Dalton Conley and Jason Thompson

Both health status and net worth can affect retirement decisions. In some cases, early retirement may be precipitated by a shock to an individual's health and/or economic status. The authors examine how health and wealth shocks affect retirement decisions. They use data from the Panel Study of Income Dynamics to estimate a first-differences model of health and wealth shocks on retirement over the course of the 2000s in the United States. Their results suggest that acute health shocks are associated with labor market exits for older American men but not women. These results appear particularly strong for blacks, whose labor force participation seems particularly sensitive to health status, which may be due to different occupations for blacks and whites. (JEL J26, I12, D91)

Federal Reserve Bank of St. Louis *Review*, September/October 2013, *95*(5), pp. 389-404.

Retirement decisions both affect and are affected by health status. Health status, in turn, has been linked to net worth. And according to the life cycle model of savings, retirement has an important effect on net worth because retirees begin to expend their assets to maintain consumption once they leave the labor force. Given the multidirectionality of all these influences at this three-factor nexus, it has been difficult to separate the direct impacts of health and wealth on retirement from the reciprocal effect of retirement on health and wealth. This is our goal in the present article.

Many studies have found that health shocks predict retirement decisions (see, e.g., Hagan, Jones, and Rice, 2009). For example, using fixed effects estimators and instrumenting subjective health by "health stock," Disney, Emmerson, and Wakefield (2006) find that ill health strongly predicts early retirement among respondents older than 50 years of age in the British Household Panel Survey. Health limitations have also been shown to have a similar impact on early retirement decisions. However, the evidence does not completely support the claim that health shocks lead to exit from the labor force. For example, French (2005) finds that health is not among the more important determinants of job exit at older ages.

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In addition to this ambiguity, we also know that retirement may adversely affect health. U.K. panel data have been marshaled to show that labor force participation has a gender-specific effect on health. Specifically, ongoing labor force participation is detrimental to male health but positive for female health (Cai, 2010). However, the evidence is more consistent in the United States: Thanks to the natural experiment of the Social Security notch, which applies to individuals born between 1917 and 1921, we know that retirement is not good for the health of septuagenarians. Specifically, individuals born before January 1, 1918, received lower Social Security benefits compared with their counterparts born on January 1, 1918, and thereafter. Lower payments resulted from a 1977 correction of a previous flawed calculation.[1] On average, those who received the higher payments thanks to a change in cost-of-living indexing during the 1970s left the labor force earlier than those who received the lower payments. However, despite the greater transfer income, Snyder and Evans (2006) found that those who retired earlier had a shorter life expectancy.

Meanwhile, just as health shocks can affect an individual's decision to continue working, so also can financial shocks. In addition to unexpected job loss, other shocks to individual net worth include investment performance, unexpected costs, family transitions (such as divorce), or other dynamics such as tax law changes. According to economic theory, smoothing consumption over the life course would require a delay in retirement when a negative shock to retirement savings occurs, just as a positive shock would allow an early exit from the labor market.[2]

Indeed, empirical research has consistently found a positive wealth effect on retirement exits from the labor market. Both higher annuity rates and/or stock prices lead to a greater probability of retirement (Zucchelli et al., 2010). Using data from the Health and Retirement Study, Coronado and Perozek (2003) found that "respondents who held corporate equity immediately prior to the bull market of the 1990s retired, on average, 7 months earlier than other respondents." House prices also seem to affect the exit decision in the same direction (Zucchelli et al., 2010, and Goodstein, 2008). Using changing stock or housing prices or interest rates (which, in turn, affect annuity payouts) as factors affecting retirement decisions is useful but may confound other effects. That is, when the entire stock market goes up or down, such movement affects perceptions of future wealth. The positive effect of higher wealth may be partially offset by rising expectations for the trend to continue, thus causing individuals to remain in the labor force to "grow" their nest egg more before they begin to draw it down or convert it into a retirement income stream. In addition, when markets are rising or falling, they are doing so for everyone, thereby changing individuals' calculations about their potential relative standard of living in retirement. That is, they may feel richer—but not as rich as they might have felt had their own stocks risen while the rest of the market was stable or falling. Relative comparisons may be at work in the retirement decision arena and affect decisionmaking.

Another approach uses receipt of an inheritance as the instrumental variable for retirement decisions to address these concerns. One in five households with older workers in the Health and Retirement Study receive an inheritance over an 8-year period. The median value of such a bequest is $30,000. Brown, Coile, and Weisbenner (2010) find that (i) receipt of an inheritance increases the probability of retirement by 12 percent and (ii) the effect is even larger when the inheritance is "unexpected." Their article provides a nice confirmation of the wealth effects iden-

tified using stock markets (also see Goodstein, 2008). However, it too suffers from some limitations—namely, the receipt of an inheritance may have other retirement-inducing effects that may bias the estimate of the wealth effect. The death of the close relative or friend who provided the bequest, for example, may induce an individual to reconsider life priorities or confront the finiteness of the life span, which may instigate an earlier exit from the labor force to enjoy "the good life." Similarly, the inheritance-related death may require rearrangement of family responsibilities and a shift from paid labor to unpaid caretaking work.

In this study, we build on existing work by combining the two strands of research previously discussed: We examine the relationship between health shocks and wealth shocks, on the one hand, and retirement decisions, on the other. There is ample reason to suspect that wealth shocks may be heterogeneous based on an individual's health characteristics. That is, if an individual is ailing and experiences a rise in wealth, the increase may remove a budget constraint and allow an exit from the labor market. However, the effect of positive wealth shocks may be lessened for those in good health who can continue to work without significantly depleting their health capital (Grossman, 1972). Thus, we use data from the Panel Study of Income Dynamics (PSID) to estimate a first-differences model of health and wealth shocks on retirement over the course of the 2000s in the United States. For the reasons discussed previously, we do not instrument wealth shocks from inheritance (though we do estimate the impact of inheritance receipt in the model directly), nor do we distinguish between idiosyncratic wealth shocks and those related to the markets as a whole.

To preview our findings, our models show that negative health shocks do lead to a greater probability of retirement, as do positive shocks to net worth. Both of these effects are strongest for men and insignificant for women, who show weaker labor elasticities. Further, the Great Recession led to a wave of retirements—net of other factors—but this effect was not moderated by asset levels or health. Meanwhile, wealth is affected by health shocks but the effects differ for blacks and whites.

DATA AND METHODS

The PSID originated in 1968 with a nationally representative sample of 5,000 American families and has followed the economic and health histories of individuals. As the longest-running longitudinal study on family and individual dynamics, the study design is too complex to detail completely here (see Hill, 1992, or Duncan and Hill, 1989, for fuller descriptions). We construct an unbalanced panel of data collected biennially from 1999 through 2009 to examine the role of health in retirement decisions and subsequent changes in wealth.[3] We truncate this sample to black and white[4] adult respondents 40 to 70 years of age in 1999 who were the head, wife, or cohabitating partner of their household in any years between 1999 and 2009. Because wealth is measured at the family level, all respondents must be a head, wife, or cohabitating partner for all years in which they are included in the sample. If a respondent were to be included in the sample but no longer as a head of the family, the wealth measure for that respondent would be for the new household to which the individual moved. This methodology might incorrectly assign resources to the individual that are not, in actuality, under the individual's management.

The random selection of one adult head[5] in the family was a careful decision on our part. Given the propensity for the male adult in a family to be labeled the head of the household, selecting only heads of households for analysis would potentially bias results. Illness of either head is likely to relate with changes in labor force participation (Bound et al., 1999; Charles, 1999; Wu, 2003) and changes in wealth. Therefore, we run analyses on the full sample and separated by gender.

Key Variables

Retirement. Our primary dependent variable is a measure coded "1" if the individual is currently retired. Just over 6 percent of person-waves represent transitions into retirement. However, in 2.73 percent of person-waves, individuals move in the opposite direction—out of retirement and back into the labor force. For this reason, we model this situation using an ordered logit regression when retirement is our left-hand-side variable.

Total Family Wealth.[6] This variable is from the 1999, 2001, 2003, 2005, 2007, and 2009 waves of the PSID. The PSID codes family wealth by summing the total assets, minus debts, that a family owns. Wealth is calculated by adding the values of a family business or farm, checking and savings accounts, real estate other than the main home, stocks and mutual funds, vehicles, bonds and life insurance policies, individual retirement accounts and annuities, and home equity, minus any debts.

As is common with monetary variables, the distribution of wealth is highly skewed in the sample. We perform an inverse hyperbolic sine (IHS) transformation to correct for this skewness. A log transformation of the wealth variable would also address the issue of non-normality of the dependent variable. However, log transformations do not allow zero or negative values, which are common in data concerning wealth. The IHS transformation addresses the issue of extreme values while allowing positive, zero, and negative values for our wealth variable (for more detail, see Burbidge, Magee, and Robb, 1988; MacKinnon and Magee, 1990; and Pence, 2006).[7] As outlined in detail by Burbidge, Magee, and Robb (1988), the IHS transformation has been used for data pertaining to wealth and health expenditures (Pence, 2006, and Zhang et al., 2000),[8] specifically when variables take both extreme positive and negative values and, in many cases, the value of zero. Given the potential for negative income coded in the PSID, we also transform the family income variable.[9] The key right-hand-side variables for regression models predicting changes in wealth include dummy variables for marital status ("1" for married), unemployment ("1" for currently unemployed), onset of acute illness or chronic illness, and total family income.

Family Income. We smooth income by using a 5-year average leading up to each wave to account for potential idiosyncratic fluctuations. Since income may have zero or negative values, we use the IHS transformation for this variable.

Acute Health Shock and Chronic Health Condition. In the past six published waves of data (1999-2009), the PSID codes for the incidence of 13 health conditions for the head of household and wife. We construct two variables to distinguish severe acute health shocks from the onset of chronic conditions. We classify the occurrence of a stroke, heart attack, heart disease, lung disease, or cancer[10] as acute health shocks. We include asthma, arthritis, diabetes, high blood pressure, learning disabilities, memory loss, psychiatric disorders, and "other" chronic

illnesses in the indicator (a PSID-created miscellaneous category) for chronic health conditions. Each of these indicator variables is coded "1" if an acute or chronic illness occurred over the course of each wave. Unfortunately, the PSID data do not allow us to determine precise dates for the onset of chronic illnesses and recovery for each individual. Given that the PSID does not code the precise date on which an individual recovered from a particular illness, we code each year as "1" following the initial onset of a chronic illness under the rationale that such conditions have lingering effects across many waves.

With our first-differences methodology, indicators for gender and race are de facto factored out and age drops from equations as each respondent ages 2 years across waves. We chose to omit education from the models as most individuals have completed their formal education by age 40. Table 1 presents descriptive statistics.

STATISTICAL APPROACH

All regression models implement a first-differences identification strategy. We implement the first-differences approach to factor out all unobserved, time-constant variables that may relate to retirement decisions. Our first analysis, the influence of the onset of acute and chronic illnesses on retirement decisions, implements ordered logit regression of retirement on changes in health, marriage, and IHS-transformed family wealth. We also model these regressions separately for male and female household heads. To analyze the relationship among health, retirement decisions, and subsequent changes in wealth, we regress separate models for the change in family wealth on the concurrent and lagged changes in family income, marriage, unemployment, retirement, health shocks, and an interaction between acute health shocks and retirement.

RESULTS

Table 2 presents results of first-differences ordered logit regressions of changes in retirement status on acute health shocks, the onset of chronic health conditions, marriage status, and IHS-transformed total family wealth. Models 1 through 3 regress changes in retirement status on changes in each category of health for the full sample, black respondents, and white respondents, respectively. Without separating the models by gender, it appears that acute health shocks hold little significance in predicting retirement. The experience of an acute shock is significant for only black individuals, with approximately a 56 percent [exp(0.443)] increase in the likelihood of retirement within the same wave. This finding remains when adding controls for changes in marital status and IHS-transformed total family wealth in models 4 through 9. While family wealth itself is not significant in predicting labor market entries, the 2009 indicator variable is significant and positive, suggesting that—*ceteris paribus*—the Great Recession led many older Americans to permanently leave the labor force.

When we separate the sample by gender, however, the relationship between acute health shocks and retirement becomes much clearer. In Table 3, we run the same analyses for only males. Models 1 through 3 regress changes in retirement status for males on the onset of acute health

Table 1

Weighted Descriptive Statistics: Means and (Standard Deviations) by Survey Wave

	1999			2001			2003		
Statistic	**Full**	**Black**	**White**	**Full**	**Black**	**White**	**Full**	**Black**	**White**
Black	0.124	1.000	0.002	0.124	1.000	0.002	0.126	1.000	0.002
	(0.330)	0.000	(0.049)	(0.329)	0.000	(0.049)	(0.332)	0.000	(0.049)
Male	0.425	0.318	0.439	0.426	0.320	0.440	0.428	0.330	0.441
	(0.494)	(0.466)	(0.496)	(0.495)	(0.467)	(0.497)	(0.495)	(0.471)	(0.497)
Age (yr)	51.675	49.977	51.907	53.747	52.091	53.972	55.683	53.862	55.936
	(8.443)	(7.984)	(8.475)	(8.446)	(7.989)	(8.478)	(8.403)	(8.023)	(8.420)
Married	0.658	0.385	0.697	0.649	0.361	0.690	0.634	0.353	0.674
	(0.474)	(0.487)	(0.460)	(0.477)	(0.481)	(0.463)	(0.482)	(0.478)	(0.469)
Total family income ($)	88,419	48,175	94,117	90,546	49,451	96,325	91,901	50,051	97,879
	(90,630)	(31,761)	(94,642)	(96,068)	(32,762)	(100,450)	(100,038)	(33,891)	(104,754)
Total family wealth ($)	419,654	68,670	469,203	461,773	93,799	513,499	489,663	103,516	544,682
	(1,470,809)	(323,880)	(1,559,037)	(1,771,370)	(195,510)	(1,883,182)	(1,796,024)	(390,370)	(1,906,739)
Median total family wealth ($)	143,979	30,759	180,470	159,113	36,946	188,424	169,431	31,161	202,014
Years of education	13.363	12.466	13.488	13.395	12.532	13.514	13.392	12.584	13.506
	(2.629)	(2.501)	(2.621)	(2.568)	(2.446)	(2.561)	(2.623)	(2.474)	(2.623)
Retired	0.125	0.096	0.128	0.157	0.161	0.157	0.177	0.155	0.179
	(0.331)	(0.295)	(0.335)	(0.364)	(0.368)	(0.364)	(0.381)	(0.362)	(0.384)
Acute health shock	0.035	0.042	0.034	0.087	0.096	0.085	0.096	0.094	0.096
	(0.184)	(0.201)	(0.181)	(0.281)	(0.294)	(0.279)	(0.295)	(0.292)	(0.295)
Onset of chronic health condition	0.138	0.154	0.135	0.188	0.219	0.183	0.180	0.228	0.173
	(0.345)	(0.361)	(0.342)	(0.391)	(0.414)	(0.387)	(0.385)	(0.420)	(0.378)

Continued on next page

Table 1, cont'd

Weighted Descriptive Statistics: Means and (Standard Deviations) by Survey Wave

	2005			2007			2009		
Statistic	**Full**	**Black**	**White**	**Full**	**Black**	**White**	**Full**	**Black**	**White**
Black	0.129	1.000	0.003	0.129	1.000	0.002	0.129	1.000	0.003
	(0.335)	0.000	(0.051)	(0.335)	0.000	(0.050)	(0.335)	0.000	(0.051)
Male	0.425	0.332	0.439	0.433	0.337	0.446	0.431	0.333	0.444
	(0.495)	(0.471)	(0.496)	(0.496)	(0.473)	(0.497)	(0.495)	(0.472)	(0.497)
Age (yr)	57.597	55.573	57.888	59.546	57.473	59.843	61.527	59.556	61.809
	(8.446)	(8.018)	(8.462)	(8.412)	(7.965)	(8.429)	(8.414)	(7.949)	(8.437)
Married	0.616	0.341	0.657	0.605	0.322	0.647	0.574	0.293	0.616
	(0.486)	(0.475)	(0.475)	(0.489)	(0.468)	(0.478)	(0.495)	(0.456)	(0.487)
Total family income ($)	92,635	50,453	98,816	92,538	50,632	98,685	90,858	49,210	96,959
	(114,121)	(36,528)	(120,102)	(122,728)	(38,196)	(129,391)	(135,077)	(38,049)	(142,784)
Total family wealth ($)	529,782	118,689	590,725	601,431	148,669	669,778	696,538	121,235	780,637
	(1,604,460)	(283,655)	(1,705,619)	(1,702,961)	(383,965)	(1,808,785)	(4,323,745)	(262,494)	(4,619,354)
Median total family wealth ($)	199,442	34,263	242,188	214,511	38,827	265,510	188,947	36,077	228,150
Years of education	13.405	12.532	13.531	13.402	12.536	13.526	13.381	12.666	13.484
	(2.646)	(2.678)	(2.616)	(2.655)	(2.676)	(2.627)	(2.714)	(2.515)	(2.725)
Retired	0.194	0.190	0.196	0.219	0.218	0.219	0.308	0.304	0.309
	(0.396)	(0.393)	(0.397)	(0.414)	(0.413)	(0.413)	(0.462)	(0.460)	(0.462)
Acute health shock	0.123	0.144	0.120	0.110	0.112	0.110	0.120	0.101	0.123
	(0.329)	(0.352)	(0.325)	(0.313)	(0.316)	(0.313)	(0.325)	(0.302)	(0.328)
Onset of chronic health condition	0.101	0.114	0.100	0.075	0.106	0.070	0.064	0.048	0.067
	(0.302)	(0.318)	(0.300)	(0.264)	(0.308)	(0.256)	(0.246)	(0.214)	(0.250)

NOTE: Standard deviations are listed in parentheses. All monetary values are reported in 2009 dollars. The sample is restricted to ages 40-70 in 1999 and 50-80 in 2009.

Table 2

First-Differences Ordered Logit Regressions of Retirement on Health

	Retirement								
Model number	1	2	3	4	5	6	7	8	9
Statistic	Full	Black	White	Full	Black	White	Full	Black	White
Acute health shock	0.118	0.443*	–0.018	0.118	0.443*	–0.016	0.121	0.443*	–0.013
	(0.096)	(0.177)	(0.112)	(0.096)	(0.177)	(0.112)	(0.096)	(0.177)	(0.112)
Onset of chronic illness	0.039	0.190	–0.036	0.030	0.188	–0.047	0.032	0.190	–0.045
	(0.089)	(0.143)	(0.110)	(0.089)	(0.144)	(0.110)	(0.089)	(0.145)	(0.110)
Married				–0.168	–0.023	–0.232	–0.178	–0.036	–0.241
				(0.124)	(0.218)	(0.149)	(0.124)	(0.217)	(0.149)
Total family wealth†							0.009	0.011	0.008
							(0.005)	(0.008)	(0.006)
2003	–0.184*	–0.377*	–0.122	–0.185*	–0.377*	–0.122	–0.182*	–0.373*	–0.120
	(0.088)	(0.164)	(0.105)	(0.088)	(0.164)	(0.105)	(0.088)	(0.164)	(0.105)
2005	–0.034	–0.026	–0.040	–0.035	–0.026	–0.041	–0.034	–0.019	–0.042
	(0.089)	(0.169)	(0.105)	(0.089)	(0.169)	(0.105)	(0.089)	(0.169)	(0.105)
2007	–0.085	–0.058	–0.105	–0.087	–0.058	–0.106	–0.083	–0.054	–0.102
	(0.095)	(0.179)	(0.112)	(0.095)	(0.179)	(0.112)	(0.095)	(0.179)	(0.112)
2009	0.572***	0.440**	0.623***	0.568***	0.439**	0.618***	0.578***	0.455**	0.626***
	(0.091)	(0.169)	(0.108)	(0.091)	(0.169)	(0.108)	(0.091)	(0.170)	(0.108)
Cut 1 constant	–3.543	–3.664	–3.508	–3.544	–3.664	–3.509	–3.542	–3.661	–3.507
	(0.073)	(0.140)	(0.085)	(0.073)	(0.140)	(0.085)	(0.073)	(0.140)	(0.085)
Cut 2 constant	2.839	2.874	2.823	2.839	2.873	2.824	2.844	2.882	2.827
	(0.065)	(0.122)	(0.077)	(0.065)	(0.122)	(0.077)	(0.065)	(0.122)	(0.077)
Observations	13,905	4,159	9,804	13,905	4,159	9,804	13,905	4,159	9,804

NOTE: Robust standard errors are listed in parentheses. *, **, and *** indicate significance at the 95 percent, 99 percent, and 99.9 percent levels. †Transformed using the IHS function.

Table 3

First-Differences Ordered Logit Regressions of Retirement on Health for Men

	Retirement								
Model number	1	2	3	4	5	6	7	8	9
Statistic	Full	Black	White	Full	Black	White	Full	Black	White
Acute health shock	0.621***	0.996***	0.460**	0.622***	0.999***	0.461**	0.626***	1.003***	0.465**
	(0.146)	(0.271)	(0.171)	(0.146)	(0.272)	(0.171)	(0.146)	(0.272)	(0.171)
Onset of chronic illness	–0.123	0.138	–0.252	–0.121	0.144	–0.251	–0.113	0.166	–0.247
	(0.145)	(0.220)	(0.189)	(0.146)	(0.219)	(0.190)	(0.146)	(0.220)	(0.190)
Married				0.077	0.112	0.057	0.041	0.052	0.034
				(0.222)	(0.408)	(0.251)	(0.222)	(0.410)	(0.250)
Total family wealth†							0.019*	0.022	0.016
							(0.008)	(0.015)	(0.008)
2003	–0.370*	–0.518*	–0.308	–0.370*	–0.515	–0.308	–0.368*	–0.494	–0.311
	(0.144)	(0.264)	(0.172)	(0.144)	(0.263)	(0.172)	(0.144)	(0.262)	(0.172)
2005	–0.001	–0.102	0.034	0.000	–0.101	0.034	0.001	–0.085	0.032
	(0.137)	(0.257)	(0.162)	(0.137)	(0.257)	(0.162)	(0.137)	(0.256)	(0.162)
2007	–0.038	–0.237	0.052	–0.038	–0.236	0.052	–0.034	–0.225	0.054
	(0.147)	(0.295)	(0.169)	(0.147)	(0.294)	(0.169)	(0.147)	(0.294)	(0.169)
2009	0.501***	0.199	0.615***	0.504***	0.208	0.616***	0.524***	0.246	0.630***
	(0.147)	(0.283)	(0.172)	(0.147)	(0.279)	(0.172)	(0.147)	(0.281)	(0.172)
Cut 1 constant	–3.866	–3.759	–3.932	–3.866	–3.756	–3.932	–3.865	–3.747	–3.933
	(0.119)	(0.232)	(0.140)	(0.119)	(0.232)	(0.140)	(0.119)	(0.232)	(0.140)
Cut 2 constant	2.855	2.776	2.898	2.856	2.780	2.898	2.866	2.806	2.904
	(0.102)	(0.202)	(0.120)	(0.102)	(0.202)	(0.120)	(0.102)	(0.203)	(0.120)
Observations	5,970	1,565	4,430	5,970	1,565	4,430	5,970	1,565	4,430

NOTE: Robust standard errors are listed in parentheses. *, **, and *** indicate significance at the 95 percent, 99 percent, and 99.9 percent levels. †Transformed using the IHS function.

shocks and chronic health conditions for all males, black males, and white males, respectively. Models 4 through 6 and 7 through 9 take the same pattern, adding controls for changes in marital status and total family wealth. The findings in models 1 through 3 remain significant across the remaining models. Controlling for changes in wealth, marital status, and the onset of chronic conditions, acute health shocks significantly predict retirement for both black and white males. In models 8 and 9 we see that black males with an acute health shock are 2.73 times [exp(1.003)] more likely to retire, while white males are 1.59 times [exp(0.465)] more likely to retire following the onset of an acute illness. Family wealth increases are also associated with labor market exits in model 7, but not for whites and blacks separately when we split the sample by race. Finally, 2009 is again associated with increased labor market exits net of other factors.

The high significance of acute illness in predicting retirement for males mostly vanishes for females. Models 1 through 3 in Table 4 show the results of regressing change in retirement status on health changes for all females in our sample and females separated by race. Counterintuitively, model 3 shows that the experience of an acute health shock is negatively associated with white females' decisions to retire within the same wave. With controls for changes in marital status and changes in total family wealth in models 4 through 9, the experience of an acute health shock remains significant. In model 9, an acute health shock relates to a 27 percent [1-exp(–0.317)] decrease in the likelihood of retirement for white females. Further, family wealth has no effect. Finally, women also permanently left the labor force in greater numbers between 2007 and 2009, holding other factors constant. When we tested interaction effects—for example, between acute illness onset and wealth levels or between survey wave 2009 and either health or wealth—we were surprised to find that such effects were not significant.

With findings suggesting that acute health shocks play a significant role in retirement decisions, we next analyze whether health shocks for retired individuals have a differential impact on wealth than for those still in the workforce. We run two analyses, one for concurrent changes in wealth and one for changes in wealth in the subsequent wave as acute health shocks and retirement may relate to short-term changes within the wave or over the next wave as retirees begin to spend down accumulated wealth. Table 5 presents the first-differences ordinary least squares (OLS) regressions of changes in IHS-transformed total family wealth on key independent variables. Model 1 of Table 5 presents results for the full sample regression of changes in IHS-transformed total family wealth on changes in IHS-transformed total family income, marital status, unemployment status, and retirement status. Models 2 and 3 present these regressions separated by race. Subsequent models follow the same pattern and add controls for changes in health status. In models 1 through 6, we do not find any significant effect of retirement on wealth in the same wave. However, when we interact retirement status with acute health shocks in models 7 through 9, significant results appear. Model 8 presents the interaction term between an acute health shock and retirement for black individuals. The significant coefficient suggests that the onset of an acute illness for retired black individuals drains total family wealth more than for nonretired black individuals. We present only the results for the full sample (males and females combined) as separating by gender fails to produce any significant results.

Table 6 presents the same analysis as Table 5 but with one-wave lags on all independent variables to examine how changes in health and retirement are associated with changes in wealth

Table 4

First-Differences Ordered Logit Regressions of Retirement on Health for Women

	Retirement								
Model number	1	2	3	4	5	6	7	8	9
Statistic	Full	Black	White	Full	Black	White	Full	Black	White
Acute health shock	–0.220	0.051	–0.325*	–0.217	0.050	–0.318*	–0.217	0.049	–0.317*
	(0.118)	(0.219)	(0.138)	(0.118)	(0.219)	(0.138)	(0.118)	(0.219)	(0.138)
Onset of chronic illness	0.127	0.233	0.069	0.103	0.223	0.042	0.103	0.222	0.042
	(0.111)	(0.187)	(0.135)	(0.112)	(0.192)	(0.134)	(0.112)	(0.192)	(0.134)
Married				–0.322*	–0.137	–0.385*	–0.324*	–0.137	–0.386*
				(0.142)	(0.213)	(0.181)	(0.142)	(0.213)	(0.181)
Total family wealth†							0.003	0.005	0.001
							(0.006)	(0.009)	(0.007)
2003	–0.082	–0.289	–0.027	–0.085	–0.290	–0.031	–0.084	–0.290	–0.030
	(0.113)	(0.211)	(0.134)	(0.113)	(0.211)	(0.134)	(0.113)	(0.211)	(0.135)
2005	–0.060	0.017	–0.090	–0.064	0.014	–0.093	–0.063	0.018	–0.093
	(0.117)	(0.224)	(0.137)	(0.117)	(0.225)	(0.137)	(0.118)	(0.225)	(0.137)
2007	–0.136	0.030	-0.224	–0.141	0.025	–0.225	–0.139	0.027	–0.224
	(0.124)	(0.227)	(0.146)	(0.124)	(0.228)	(0.146)	(0.124)	(0.228)	(0.147)
2009	0.614***	0.591**	0.625***	0.609***	0.591**	0.617***	0.613***	0.598**	0.619***
	(0.117)	(0.211)	(0.140)	(0.117)	(0.211)	(0.140)	(0.117)	(0.212)	(0.140)
Cut 1 constant	–3.374	–3.633	–3.285	–3.378	–3.635	–3.289	–3.377	–3.633	–3.288
	(0.093)	(0.177)	(0.110)	(0.093)	(0.178)	(0.110)	(0.093)	(0.178)	(0.110)
Cut 2 constant	2.839	2.958	2.777	2.840	2.957	2.779	2.842	2.960	2.780
	(0.086)	(0.157)	(0.102)	(0.086)	(0.157)	(0.102)	(0.086)	(0.157)	(0.102)
Observations	7,935	2,594	5,374	7,935	2,594	5,374	7,935	2,594	5,374

NOTE: Robust standard errors are listed in parentheses. *, **, and *** indicate significance at the 95 percent, 99 percent, and 99.9 percent levels. †Transformed using the IHS function.

Table 5

First-Differences OLS Regressions of Total Family Wealth on Health and Retirement

	Total family wealth†								
Model number	1	2	3	4	5	6	7	8	9
Statistic	Full	Black	White	Full	Black	White	Full	Black	White
Total family income†	0.392*	0.168	0.879**	0.387*	0.162	0.882**	0.383*	0.133	0.883**
	(0.178)	(0.130)	(0.305)	(0.180)	(0.129)	(0.305)	(0.180)	(0.134)	(0.305)
Married	0.949**	0.970	0.836	0.930**	0.936	0.823*	0.933**	0.951	0.821*
	(0.308)	(0.572)	(0.349)	(0.308)	(0.574)	(0.350)	(0.309)	(0.574)	(0.350)
Unemployed	-0.525	–0.664	–0.405	–0.535	–0.679	–0.413	–0.533	–0.670	–0.414
	(0.280)	(0.433)	(0.363)	(0.280)	(0.434)	(0.363)	(0.281)	(0.434)	(0.363)
Retired	0.195	0.376	0.125	0.198	0.388	0.120	0.235	0.675	0.092
	(0.138)	(0.381)	(0.119)	(0.137)	(0.381)	(0.119)	(0.140)	(0.392)	(0.123)
Acute health shock				–0.222	–0.072	–0.309*	–0.167	0.193	–0.360*
				(0.128)	(0.292)	(0.132)	(0.157)	(0.334)	(0.168)
Onset of chronic illness				–0.197	–0.306	–0.197	–0.196	–0.311	–0.199
				(0.154)	(0.363)	(0.151)	(0.154)	(0.363)	(0.151)
Acute health shock × Retired							–0.238	–1.445*	0.206
							(0.247)	(0.689)	(0.226)
2003	–0.390**	–0.495	–0.334*	–0.404**	–0.512	–0.351*	–0.403**	–0.524	–0.353*
	(0.143)	(0.347)	(0.142)	(0.143)	(0.348)	(0.141)	(0.143)	(0.348)	(0.142)
2005	–0.163	–0.688*	0.074	-0.180	–0.713*	0.056	-0.178	–0.708*	0.055
	(0.144)	(0.341)	(0.144)	(0.144)	(0.342)	(0.145)	(0.144)	(0.342)	(0.145)
2007	–0.435**	–0.530	–0.367**	–0.469**	–0.570	–0.405**	–0.469**	–0.576	–0.406**
	(0.142)	(0.344)	(0.140)	(0.143)	(0.347)	(0.142)	(0.143)	(0.347)	(0.142)
2009	–1.138***	–1.590***	–0.955***	–1.169***	–1.633***	–0.986***	–1.167***	–1.644***	–0.988***
	(0.154)	(0.363)	(0.156)	(0.154)	(0.364)	(0.157)	(0.154)	(0.364)	(0.157)
Constant	0.408	0.590	0.315	0.453	0.652	0.363	0.452	0.653	0.364
	(0.102)	(0.252)	(0.100)	(0.106)	(0.260)	(0.103)	(0.106)	(0.260)	(0.103)
Observations	13,536	4,043	9,551	13,536	4,043	9,551	13,536	4,043	9,551
R^2	0.009	0.008	0.011	0.009	0.008	0.012	0.009	0.01	0.012

NOTE: Robust standard errors are listed in parentheses. *, **, and *** indicate significance at the 95 percent, 99 percent, and 99.9 percent levels. †Transformed using the IHS function.

Table 6

First-Differences OLS Regressions of Total Family Wealth on Lagged Health and Retirement

	Total family wealth†								
Model number	1	2	3	4	5	6	7	8	9
Statistic	Full	Black	White	Full	Black	White	Full	Black	White
Total family income†	–0.348	–0.328	–0.405	–0.347	–0.331	–0.405	–0.349	–0.327	–0.407
	(0.183)	(0.211)	(0.294)	(0.183)	(0.209)	(0.294)	(0.182)	(0.211)	(0.294)
Married	–0.356	–0.614	–0.183	–0.358	–0.612	–0.188	–0.355	–0.612	–0.181
	(0.338)	(0.605)	(0.394)	(0.337)	(0.607)	(0.392)	(0.337)	(0.607)	(0.392)
Unemployed	–0.076	–0.396	0.181	–0.076	–0.392	0.182	–0.075	–0.392	0.186
	(0.327)	(0.474)	(0.447)	(0.327)	(0.475)	(0.447)	(0.327)	(0.475)	(0.447)
Retired	–0.178	–0.575	–0.016	–0.178	–0.571	–0.017	–0.152	–0.615	0.034
	(0.154)	(0.418)	(0.132)	(0.154)	(0.418)	(0.132)	(0.157)	(0.441)	(0.135)
Acute health shock				0.053	–0.163	0.170	0.089	–0.198	0.255
				(0.146)	(0.344)	(0.147)	(0.173)	(0.387)	(0.176)
Onset of chronic illness				–0.018	0.099	–0.040	–0.017	0.099	–0.037
				(0.158)	(0.345)	(0.166)	(0.158)	(0.345)	(0.166)
Acute health shock × Retired							–0.169	0.218	–0.369
							(0.292)	(0.772)	(0.286)
2003	0.260	–0.204	0.445**	0.261	–0.205	0.450**	0.262	–0.203	0.455**
	(0.143)	(0.338)	(0.146)	(0.143)	(0.339)	(0.145)	(0.143)	(0.338)	(0.145)
2005	0.013	0.010	0.029	0.011	0.019	0.027	0.012	0.018	0.030
	(0.140)	(0.333)	(0.141)	(0.140)	(0.333)	(0.141)	(0.140)	(0.333)	(0.141)
2007	–0.734***	–1.086**	–0.616***	–0.733***	–1.083**	–0.610***	–0.733***	–1.083**	–0.610***
	(0.153)	(0.359)	(0.157)	(0.153)	(0.360)	(0.158)	(0.153)	(0.360)	(0.158)
Constant	–0.028	0.041	–0.059	-0.027	0.027	–0.060	–0.028	0.027	–0.062
	(0.100)	(0.241)	(0.100)	(0.103)	(0.247)	(0.103)	(0.103)	(0.247)	(0.103)
Observations	10,666	3,179	7,532	10,666	3,179	7,532	10,666	3,179	7,532
R^2	0.006	0.006	0.007	0.006	0.006	0.008	0.006	0.006	0.008

NOTE: Robust standard errors are listed in parentheses. ** and *** indicate significance at the 99 percent and 99.9 percent levels. †Transformed using the IHS function.

over the next wave. Across all models, it appears that retirement and changes in health are not associated with changes in wealth over the next wave. Furthermore, the interaction between retirement and an acute health shock proves insignificant. Again, we present results for only the full sample because results are insignificant when the sample is split by gender.

DISCUSSION

Our results suggest that acute health shocks are associated with labor market exits for older American men but not women. These results appear particularly strong for blacks, whose labor force participation seems particularly sensitive to health status, which may be due to different occupations for blacks and whites. Perhaps, for instance, black men tend to work in industries and occupations that are more physically demanding, while white men are disproportionately employed in sedentary jobs and can withstand a health limitation. It could also be that other aspects of the job—such as benefits and medical leave policies—are important. Meanwhile, increases in family wealth between waves allow men to retire, but they have no effect on women. This lower female labor market elasticity may be due to the fact that women may be more economically vulnerable when they are the sole householder; conversely, women may be less critically responsive to family economic conditions when they are secondary earners.

It is also important to note that net of all these conditions—as well as income and marital status—2009 marked a huge exodus from the labor market for this sample. While the size of this labor market exit may be no surprise for those familiar with the fallout from the Great Recession, it is interesting to note that this effect (i) holds net of changes in income, health, and wealth and (ii) is not moderated by health shocks or wealth. In other words, all groups of individuals who left the labor market in greater numbers during the Great Recession did so regardless of their asset cushion or health status. Meanwhile, in our prediction of family net worth based on retirement status and health shocks, we find no significant effects regardless of whether we lag the right-hand-side measures—with two notable exceptions. For whites, it appears that net of labor market status and other factors, acute health shocks lower net worth contemporaneously (but not lagged). However, for blacks this effect is conditional on retirement status. Retirement alone does not affect the net worths of blacks, nor do health shocks alone. However, blacks suffer a wealth hit when they are retired and are struck by an acute medical condition. This may suggest that different occupational sectors or other factors lead to different exit pathways from the labor market for blacks and whites affected by health problems.

CONCLUSION

In some cases, early retirement may be precipitated by a shock to an individual's health status. We use data from the Panel Study of Income Dynamics to examine how health shocks and wealth shocks affect retirement decisions over the course of the 2000s in the United States using a first-differences model. We find that acute health shocks are associated with early labor market exits for older American men but not women. These results appear particularly strong for blacks, whose labor force participation seems particularly sensitive to health status.

NOTES

1 For more information, see "The 'Notch' Provision" (http://www.ssa.gov/pubs/EN-05-10042.pdf).

2 This prediction is very straightforward in contrast to, say, the effect of a change in earnings. If wages rise, then so do savings, indirectly leading to a positive income effect on the consumption of leisure (in the form of retirement). However, the substitution effect works in the opposite direction; higher wages make exits from the labor market more expensive in terms of opportunity cost. Of course, if potential pension income increases thanks to government policy or a change in the annuity rate, then this gain is more akin to a wealth shock than an earnings change.

3 We also ran regressions on all years that included data on family wealth (1984, 1989, 1994, 1999, 2001, 2003, 2005, 2007, and 2009) with similarly constructed variables; results did not significantly change. We chose to present the results for the analysis over the period of the PSID where health and wealth were measured consistently at 2-year intervals to avoid the complication of differing time intervals between waves.

4 Sample numbers were too small for further comparisons across racial groups.

5 The PSID enumerates heads and wives/cohabitating partners. For simplicity purposes, we refer to either of the household heads as a head of the family. Therefore, the random selection of one adult head includes male and female "heads," "wives," or "cohabiters."

6 The PSID offers many measurements of wealth, including the aggregated values of total family wealth with home equity and total family wealth without home equity. Given the potential for measurement error in individuals estimating the value of their home, we ran all analyses with and without home equity included to determine whether results were sensitive to the inclusion of home equity. Results were not significantly altered.

7 We also conducted regressions using log-transformed wealth variables with no significant change in results.

8 For details on the IHS transformation and analyses supporting its use versus other transformations, see Burbidge, Magee, and Robb (1988).

9 We also conducted all analyses using log-transformed family income without significant change in our regression results.

10 Our definition of "acute" health shocks largely mirrors definitions of "severe" illnesses in other studies (Smith, 2007). The inclusion of cancer in the acute category is potentially misleading, as some forms of cancer may not come as a "shock" to health given certain individual behaviors. However, our findings are robust to alternative definitions of acute illness that do not include the onset of cancer.

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Is Student Debt Jeopardizing the Short-Term Financial Health of U.S. Households?

William Elliott and IlSung Nam

In this study, the authors use the Survey of Consumer Finances to determine whether student loans are associated with household net worth. They find that median 2009 net worth ($117,700) for households with no outstanding student loan debt is nearly three times higher than for households with outstanding student loan debt ($42,800). Further, multivariate statistics indicate that households with outstanding student loan debt and a median 2007 net worth of $128,828 incur a loss of about 54 percent of net worth in 2009 compared with households with similar net worth levels but no student loan debt over the same period. The main policy implication of this study is that outstanding student debt may jeopardize the short-run financial health of households. However, this topic is complex and more research is needed before suggesting policy prescriptions. (JEL I2, I22, I24)

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Today, more households than ever before are paying off student loan debt. Fry (2012) finds that 40 percent of all households headed by individuals younger than 35 years of age have outstanding student debt. For the 2011-12 school year, about 37 percent ($70.8 billion) of all undergraduate financial aid received was from federal loans (Baum and Payea, 2012). Federal Pell grants were the next-highest source of aid at 19 percent, with institutional grants accounting for 18 percent of financial aid. According to Fry (2012), the average total household outstanding student loan debt in 2007 was $23,349 and rose to $26,683 by 2010. Further, total borrowing for college hit $113.4 billion for the 2011-12 school year, up 24 percent from 5 years earlier (Baum and Payea, 2012).

While high-income households are more likely to have student loan debt, low-income households carry the greatest student loan debt as a share of household income. According to Fry

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(2012), outstanding student loan debt represented 24 percent of household income for households with income less than $21,044 in 2010, 7 percent of income for households with incomes between $97,586 and $146,791, and 2 percent for households with incomes of $146,792 or higher. Fry (2012) finds similar patterns with respect to assets, which suggests that the relative burden of student debt on households may not be equally shared. Changes in federal and state policies that have favored students and their families assuming more of the burden of college costs may disproportionately affect low-income and minority students (see Elliott and Friedline, 2013). While a growing body of literature suggests these shifts affect students' decisions about higher education, this article examines the relationship between student loan debt and family finances even after college graduation.

STUDENT LOANS AND SHORT-TERM HOUSEHOLD FINANCIAL HEALTH

Generally, student debt is considered detrimental to the financial health of households and the U.S. economy only when individuals default on their student loans. According to the U.S. Department of Education (2012), the national 2-year student loan default rate was 9.1 percent in 2010 and the 3-year default rate was 13.4 percent.[1] Not surprisingly, students from higher-income households are less likely to default (Woo, 2002). We speculate that higher-income families might be able to provide students with a safety net against fluctuations in their own personal income, while lower-income families are less able to offer such support. Further, the higher the amount of debt incurred by borrowers, the more likely they are to default on their loans (Schwartz and Finnie, 2002).

However, student loan debt can damage household balance sheets even when not in default. According to Boshara (2012), household balance sheets include the quality of financial services and credit scores, savings, assets, and consumer mortgage debts. Delinquency can also damage a household's overall financial health. Student loans become delinquent when payment is 60 to 120 days late. Delinquent accounts may be reflected in students' credit scores. According to Cunningham and Kienzl (2011), 26 percent of borrowers who began repayment in 2005 were delinquent on their loans at some point but did not default. About 21 percent of borrowers avoid delinquency by using deferment (temporary suspension of loan payments) or forbearance (temporary postponement or reduction of payments for a period of time because of financial difficulty) to temporarily alleviate the problem (Cunningham and Kienzl, 2011). In total, Cunningham and Kienzl (2011) find that nearly 41 percent of borrowers have been delinquent or have defaulted on their loans.

Student loan delinquency and default have negative consequences for the borrower and may have negative consequences for society as a whole. For example, in 2011 the U.S. Department of Education spent $1.4 billion to pay collection agencies to track down students whose loans are delinquent or in default (Martin, 2012). The high percentages of student loans in delinquency or default might have led some in the popular media to speculate whether student loans represent the next financial crisis for America (see, e.g., Cohn, 2012).

The effects of delinquency and default on student loans may extend beyond students to their families. Parents often cosign for student loans, making them equally liable for repayment and the consequences of default. According to the Federal Reserve Bank of New York, about 2.2 million Americans 60 years of age or older were liable for repayment of $43 billion in federal and private student loans in 2012, up $15 billion from 2007 (Greene, 2012). Among student loans held by Americans aged 60 or older, 9.5 percent were at least 90 days delinquent, up about 7.4 percent from 2007. Even without defaulting, cosigners' responsibility for loan repayment affects their credit, and as such may make it more difficult for cosigners to qualify for loans for homes or other major purchases.

Student loan debt can damage household financial health even when loans are not delinquent or in default (see, e.g., Gicheva, 2011; Minicozzi, 2005; Mishory and O'Sullivan, 2012). For example, Stone, Van Horn, and Zukin (2012) find that 40 percent of students who graduate from four-year colleges with student loan debt delay a major purchase such as a home or car. Evidence also suggests that students with outstanding student loans may delay marriage and earn less. For example, Gicheva (2011) finds that borrowing an additional $10,000 for education above the average student loan debt for full-time students when the respondent was 18 years old reduces the short-term likelihood of marriage. Minicozzi (2005) finds evidence that an increase in student loan debt from $5,000 to about $10,000 is associated with a 5 percent decline in wage growth four years after college graduation.

THEORETICAL FRAMEWORK

Using the traditional life cycle model in economics, Rothstein and Rouse (2011) posit that debt from student loans should have little effect on consumption throughout the life course. They further suggest that "student debt has only an income effect—proportional to the ratio of debt to the present discounted value of total lifetime earnings—on career and other post-college decisions" (p. 149). As such, students are treated as rational actors who weigh the amount of student debt they will incur in completing a college degree against their potential lifetime earnings as a college graduate. Rothstein and Rouse (2011) point out that $10,000 in student debt represents less than 1 percent of the present value of the average college graduate's potential lifetime earnings. They argue that since the amount of debt incurred by the typical student to attain a college degree is so small relative to potential lifetime earnings, student debt will have little effect on consumption at any point during the life course.

However, young adults' annual earnings upon leaving college are often much lower than during their prime earning years in middle age. Further, in most cases, young adults cannot rely on their parents to provide the money needed to purchase large-ticket, wealth-building assets. Therefore, most young adults are forced to rely on credit as a key mechanism to smooth their consumption and purchase of wealth-building assets such as a house (Oliver and Shapiro, 2006, and Keister, 2000).

The life cycle hypothesis of student debt assumes (i) there are few or no constraints on credit (a perfect credit market) and (ii) individuals, particularly those with lower incomes, are able to borrow against future earnings to purchase large-ticket items that require considerable financial

investment. In America, houses are the main source of wealth accumulation for the middle class (Mishel et al., 2012). They find that home equity represents about 64.5 percent of all U.S. wealth. There is evidence to suggest that credit constraints may actually force young adults with outstanding student debt to either delay purchasing a house or force them to purchase it at a much higher interest rate in the subprime loan market (Hiltonsmith, 2013; Mishory and O'Sullivan, 2012). The higher interest rate may make it harder to earn equity in the house. For example, Mishory and O'Sullivan (2012) find that average single student debtors would have to pay close to 50 percent of their monthly income toward student loans and mortgage payments. As a result, they would not qualify for Federal Housing Administration (FHA) or many private loans (Mishory and O'Sullivan, 2012).

Shand (2007) uses cross-sectional data in 2003 from the Survey of Consumer Finances (SCF) to find that student debt has a negative effect on homeownership rates. However, she finds little evidence to suggest that this loss is the result of credit constraints. For example, the presence of student loans on a household's balance sheet does not render a household unable to obtain a mortgage. Instead, she suggests that households with outstanding student debt might be averse to obtaining a mortgage for a home.

Hiltonsmith (2013) finds that an average student debt burden for a dual-headed household with bachelor's degrees from four-year universities leads to a lifetime wealth loss of nearly $208,000. Further, he finds that a large portion of this loss ($134,000) comes from lower assets among households with student debt and lower home equity ($70,000). Hiltonsmith (2013) uses 2010 SCF data to project potential wealth losses across the life course.

Despite evidence that student loan debt may have negative economic consequences for individuals and the households in which they live after graduation, there has been little academic research on the role of student debt in the overall financial health of households. In this study, we attempt to provide a more in-depth look at this issue. We posit that regardless of whether there are actual credit constraints or aversion to additional debt, student loan debt may represent a source of substantial debt effects on postcollege outcomes not accounted for by the traditional life cycle hypothesis in economics.

Research Questions

We explore three research questions. First, is having outstanding student loan debt associated with household net worth? Second, among households with outstanding student debt, is the amount of debt associated with household net worth? Third, regarding the equity of a college degree, is outstanding student loan debt associated with household net worth among four-year college graduates and postgraduates?[2]

METHODS

Data

We used 2007-09 panel data from the SCF, which was sponsored by the Board of Governors of the Federal Reserve System. The panel data collected observations on 3,857 families who

responded in 2007 and 2009. These panel data offer the advantage of using a true longitudinal design instead of the normal cross-sectional SCF data, thereby providing an opportunity to analyze changes in net worth. We analyzed data on survey respondents, rather than the heads of households, in part because the SCF does not provide information on such key variables as the race of the head of household. The respondent in a household is defined as "the economically dominant single individual or the financially most knowledgeable member of the economically dominant couple" (Kennickell, 2010, p. 4). Questions were focused on the primary economic unit, which "includes the core individual or couple and any other people in the household or away at school who were financially interdependent with that person or couple" (Kennickell, 2010, p. 4).

The aggregate sample for this study consisted of all 3,857 households in the SCF, from which we created two subsamples. First, we restricted the sample to include only respondents who graduated from a four-year college (n = 2,385) to test whether the effects of student loan debt on financial well-being were mitigated by college completion. Second, we restricted the sample to students with outstanding student loans (n =543) to determine whether the amount of student loans is important in determining household net worth.

Measures

We used the macro provided by the SCF (created for use with the 2007-09 survey panel) to construct the variables in this sample.[3]

Dependent Variables. Net worth in 2009 was the dependent variable of interest and was calculated by using the SCF macro for the 2007-09 survey panel. Net worth was composed of the sum of savings, checking, money market accounts, certificates of deposit, stocks, bonds, mutual funds, 401(k) plans, pension plan balances, IRAs, the cash value of whole life insurance policies, tangible assets such as real estate and cars, as well as loans against these assets minus credit card balances and other consumer loans including student loans. For a more detailed explanation of the SCF calculation of net worth, see Bucks et al. (2009).

Because student loans were a liability and we wanted to examine the effects of student loans on net worth using the net worth variable calculated from the SCF macro, we had to remove the student loan amount from the net worth variables. To remove a liability, it has to be added. Therefore, we added the student loan amount into the net worth variables. Moreover, we transformed net worth using the inverse hyperbolic sine (IHS). The IHS conversion allowed us to maintain negative net worth values without restricting the sample or distorting standard errors (Pence, 2006). The transformation can be expressed as

$$\sinh^{-1}(\theta w) = \theta^{-1}\ln\left(\theta w + (\theta^2 w^2 + 1)^{1/2}\right),$$

in which θ is a scaling parameter and w is net worth. According to Pence (2006), the IHS transformation provides a way to estimate a percentage change specification without excluding households with negative net worth.

To simplify interpretation of results, we converted IHS net worth values back into dollar amounts. The conversion can be expressed as

$$\frac{1}{2}\left(e^{\theta y}+e^{-\theta y}\right)\beta_X,$$

and can be considered a marginal effect of a change in independent variable X on dollars of wealth w, where $y = \sinh^{-1}(w)$, θ is a scaling parameter for IHS transformation, and β_X is a coefficient for variable X. The IHS marginal effects depend on the chosen value of θ. The regression estimates in this study were based on a θ value of 0.00011, the optimal value estimated by the maximum likelihood method.[4]

Covariates. We included 10 covariates in our analyses as follows: (i) whether any member of the household had a four-year college degree or postgraduate degree, (ii) age of the head of the household, (ii) occupational prestige, (iv) marital status, (v) welfare use, (vi) race, (vii) health insurance coverage, (viii) income, (ix) net worth, and (x) outstanding student loans.[5] With regard to our variable of interest—outstanding student loans—respondents were asked whether they or anyone in their household owed any money or had any loans for educational expenses (yes/no). We also examined the student loan amount, which was a continuous variable. All controls were drawn from the 2007 wave of the SCF using the macro provided by the SCF (see note 1). Highly skewed variables can be appropriately analyzed using median regression without transformation because median regression does not assume any distribution (Hao and Naiman, 2007).

Analysis Plan

Median Regression. Data analysis steps were conducted using Stata (version 12). The main analysis uses median regression. According to Pence (2006), median regression offers two advantages over ordinary least squares regression. First, median regression can handle extreme values in data without a major distortion in estimation because it is affected only by the order of the data. Second, the difference-in-differences estimator by median regression is an unbiased estimator of percentage change (Wooldbridge, 2002). Using a series of median regression analyses, we estimated the effect of outstanding 2007 student loan debt on 2009 net worth. The covariates such as four-year college graduation, age, income, occupational prestige, marital status, use of welfare, race, and health insurance use were used. We used four different sample groups: the aggregate sample, a sample of four-year graduates, a sample of respondents with student loans, and a sample of respondents between the ages of 30 and 60.

Missing Data and Adjustment of Standard Errors. As many respondents in the SCF dataset were reluctant to reveal the values of their assets (Kennickell, 1997), imputation was inevitable for unbiased model estimation, which introduces uncertainty into the process. Additionally, median regression standard errors were potentially inaccurate because of heteroskedasticity. Finally, the standard errors should be adjusted because of the complex stratification and clustering in the SCF sample design; the SCF data do not provide information on respondent confidentiality.

We used the same methods Pence (2006) used in her study with the tools provided by the SCF to adjust standard errors for heteroskedasticity, survey design, and imputation uncertainty. The first method we used was bootstrapping, using 999 bootstrapped sample weight replicates provided by the SCF (Kennickell, 1997, 2000; Pence, 2006). We also used the repeated-imputation inference technique to adjust the standard errors for imputation uncertainty (Pence, 2002, 2006).

Facts about U.S. Student Loan Debt

- About 18 percent of households have outstanding student loan debt, and on average they owe about $26,018.27.
- Median 2009 net worth for a household with no outstanding student debt ($117,700) is nearly three times higher than for a household with outstanding student debt ($42,800).
- Households with outstanding student loan debt and a median 2007 net worth of $128,828 incur a loss of about 54 percent of net worth in 2009 compared with households with similar net worth levels but no student loan debt.
- Living in a household with student debt and 2007 net worth of $296,802 is associated with having $185,995.90 (a loss of about 63 percent) less in 2009 net worth compared with households with no student debt.
- Outstanding student debt may reduce the short-term financial health of households by reducing net worth, but more research is needed on this topic.

Sensitivity Analysis. We also estimated models restricting the sample by (i) whether an individual with a four-year college degree or postgraduate degree lived in the household and (ii) the age of the head of the household. In the main models, we control for four-year college graduation; but, by restricting the sample to only households with individuals with a four-year degree or postgraduate degree, we were able to better account for differences that might result from having a four-year degree (see Table 6 for these results). We restricted our sample to ages 30 to 60. We used the cutoff of 60 years because at this age saving decisions might be affected by retirement options (Pence, 2006). Results remained similar to those of the aggregate sample (see Table A1).

Finally, we estimated a model using assets as the dependent variable in place of net worth. Assets are composed of the sum of savings, checking, money market accounts, certificates of deposit, stocks, bonds, mutual funds, 401(k)s, pension plan balances, IRAs, the cash value of whole life insurance policies, and tangible assets such as real estate and cars. This variable was also derived from the SCF 2007-09 macro (see note 1). Table A2 shows these results. We find that living in a household with outstanding student debt was associated with $43,532.79 less in assets compared with living in a household with no outstanding student debt.

RESULTS

Sample Characteristics

As expected, given that the SCF panel data cover the Great Recession, median 2007 net worth ($128,828) declines in 2009 ($98,000). Further, approximately 36 percent of households have a family member who has either a four-year college or postgraduate degree. About 18 percent of households have outstanding student loan debt, and on average they owe about $26,018.27 (see the boxed insert). The average respondent's age is approximately 52 (minimum age 19; maximum age 95). The median household income is $50,053.89. About 12 percent of households use welfare, and about 92 percent of households include at least one member with health insurance. For further information on the sample characteristics, see Table 1.

Table 1

Sample Characteristics*

Characteristic	No. or mean	Percent or median
Education loan use	19,891,202	17.6%
Amount of education loan (education loan users only)	$26,018.27	$15,000.00
2009 Net worth	$481,397.18	$98,000.00
2007 Net worth	$598,232.02	$128,828.35
Is a four-year college graduate	41,136,768	36%
Age (yr)	51.52	50.00
Income	$88,971.87	$50,053.89
Occupational prestige		
Professional	32,674,464	28.9%
Technical services	24,703,413	21.8%
Other	23,807,313	21.0%
Not working	31,993,600	28.3%
Married	67,511,805	59.7%
Use of welfare	13,226,579	11.7%
Race		
White	83,313,885	73.6%
Black	14,911,713	13.2%
Hispanic	10,160,730	9.0%
Asian	4,792,463	4.2%
Has health insurance	104,111,747	92.0%

NOTE: Weighted data from the SCF survey are used. SCF imputes data using multiple imputations. Column percentages are rounded to the nearest whole percent or number. *N = 113,178,790.

SOURCE: SCF.

Sample Characteristics by Student Loan Use

Table 2 provides information on student loan borrowers. Among respondents with a four-year college degree, about 49 percent live in households with outstanding student loan debt, while the average age of respondents who live in households with student loans is 39. In contrast, 33 percent of respondents with four-year college degrees live in households with no outstanding loans, and the median age of respondents living in a household with no student loans is 52. The median household income is $57,508.72 for households with student loans, while it is $47,923.46 for households with no student loans.[6] A higher percentage of black households (27.9 percent) has loans than Hispanic households (14.1 percent; see Table 2 note). For more information on characteristics of student loan use, see Table 2.

Net Worth by Student Loan Use

Table 3 provides information on net worth by student loan use. Median 2009 net worth for households with no outstanding student debt is nearly three times higher than for households

Table 2

Sample Characteristics by Student Loan Use*

	Student loans		No student loans	
Characteristic	**No. or mean**	**Percent or median**	**No. or mean**	**Percent or median**
Income	$75,443.42	$57,508.72	$91,856.47	$47,923.46
Is a four-year college graduate	9,819,552	49.4%	31,065,119	33.3%
Is not a four-year college graduate	10,071,649	50.6%	62,222,470	66.7%
Age (yr)	40.67	39.00	53.83	52.00
Occupational prestige				
Professional	7,587,411	38.1%	25,087,053	26.9%
Technical services	5,459,732	27.4%	19,243,681	20.6%
Other	4,402,555	22.1%	19,404,758	20.8%
Not working	2,441,503	12.3%	29,552,097	31.7%
Married	13,035,998	65.5%	54,475,807	58.4%
Not married	6,855,204	34.5%	38,811,782	41.6%
Use of welfare	2,289,349	11.5%	10,937,230	11.7%
No use of welfare	17,601,853	88.5%	82,350,359	88.3%
Race[†]				
White	13,241,607	66.6%	70,072,278	75.1%
Black	4,167,678	21.0%	10,744,035	11.5%
Hispanic	1,426,037	7.2%	8,734,693	9.4%
Asian	1,055,880	5.3%	3,736,582	4.0%
Has health insurance	18,600,050	93.5%	85,511,697	91.7%
Does not have health insurance	1,291,151	6.5%	7,775,892	8.3%

NOTE: Percentages are rounded to the nearest whole percent. *N = 113,178,790. †In the case of race/ethnicity, within-group percentages may also be important. The following percentages of households have outstanding student loan debt: white, 15.9; black, 27.9; Hispanic, 14.1; Asian, 22.1.

SOURCE: SCF. Data are weighted.

Table 3

Net Worth by Student Loan Use*

	Student loans		No student loans	
Characteristic	**No. or mean**	**Percent or median**	**No. or mean**	**Percent or median**
2009 Net worth ($)	190,945.80	42,800.00	543,328.54	117,700.00
2007 Net worth ($)	284,324.81	68,427.14	665,164.74	149,022.50
Change net worth ($)	–76,917.45	–5,410.03	–122,778	–10,957.34
Change in net worth/ 2009 net worth (%)	40.28	12.4	22.6	9.31

NOTE: *N = 113,178,790.

SOURCE: SCF. Data are weighted.

Table 4

Median Regression Results Predicting 2009 Net Worth (Using 2007 Net Worth Percentiles)*

	15th Percentile ($1,761†)		30th Percentile ($33,780†)		50th Percentile ($128,828†)		
Characteristic	**Coefficients**	**SE**	**Coefficients**	**SE**	**Coefficients**	**SE**	***p*-Value**
Student loan use	–$5,017.26	740.60	–$18,954.12	2,797.84	–$69,976.00	10,329.25	<.000
Income	$0.01	0.00	$0.04	0.01	$0.14	0.05	0.010
2007 Net worth	$0.00	0.00	$0.01	0.00	$0.04	0.00	<0.000
Four-year college graduate	$6,379.97	616.11	$24,102.13	2,327.55	$88,981.78	8,592.98	<0.000
Age	$362.72	17.40	$1,370.29	65.74	$5,058.93	242.70	<0.000
Occupational prestige (ref. professional)							
Technical/services	–$3,330.62	735.55	–$12,582.36	2,778.75	–$46,452.37	10,258.76	<0.000
Other	–$4,973.97	898.68	–$18,790.56	3,395.03	–$69,372.18	12,533.97	<0.000
Not working	–$7,134.36	591.35	–$26,952.07	2,234.00	–$99,503.35	8,247.62	<0.000
Married	$6,495.43	584.62	$24,538.34	2,208.55	$90,592.20	8,153.67	<0.000
Use of welfare	–$14,650.37	971.47	–$55,345.92	3,670.02	–$204,329.60	13,549.21	<0.000
Race (ref. white)							
Black	–$4,983.58	934.56	–$18,826.89	3,530.57	–$69,506.29	13,034.38	<0.000
Hispanic	–$5,687.63	856.06	–$21,486.61	3,234.01	–$79,325.63	11,939.53	<0.000
Asian	$41.96	1,082.96	$158.52	4,091.17	$585.24	15,104.03	0.044
Has health insurance	$6,999.12	1,583.09	$26,441.17	5,980.59	$97,617.16	22,079.51	<0.000

NOTE: Standard errors are bootstrapped with 999 replications and are adjusted for imputation uncertainty (Pence, 2002, 2006). Coefficients are marginal effects evaluated at median net worth in 2007. Net worths in 2009 are calculated using the IHS transformation (Pence, 2006).
*N = 113,178,790. †2007 net worth for this percentile group. ref., reference; SE, standard error.

SOURCE: SCF. Data are weighted.

with outstanding student debt ($117,700 vs. $42,800.00, respectively). Though slightly smaller, this pattern also holds true for 2007 net worth data ($149,022.50 vs. $68,427.14). Households with no outstanding student loans have a bigger decrease in the median change in net worth from 2007 to 2009 than do households with outstanding student loans (–$10,957.34 vs. –$5,410.03, respectively). However, regardless of whether we examine the mean or median change in net worth, the change in net worth represents a higher percentage of 2009 total net worth for households with outstanding student debt (mean 40.28 percent; median 12.4 percent) than for households with no outstanding student debt (mean 22.6 percent; median 9.31 percent).[7]

Predicting 2009 Net Worth by Percentiles (15th, 30th, and 50th) of 2007 Net Worth

In the next series of analyses, we evaluate the marginal effects of coefficients at the 15th, 30th, and 50th percentiles of net worth. With regard to our variable of interest, student loans are an important predictor of net worth after holding all other factors constant. Regardless of the percentile of net worth in 2007, the association between student loans and net worth in 2009 remains

consistently negative (Table 4). Living in a household at the 15th percentile with outstanding student debt and 2007 net worth of $1,761 is associated with a $5,017 decrease in 2009 net worth (a loss of about 285 percent) compared with a similar household with no student debt. Living in a household at the 30th percentile with outstanding student debt and 2007 net worth of $33,780 is associated with a $18,954 decrease in 2009 net worth (a loss of about 56 percent) compared with a similar household with no student debt. Living in a household at the 50th percentile with outstanding student debt and 2007 net worth of $128,828 is associated with a $69,976 decrease in 2009 net worth (a loss of about 54 percent) compared with a similar household with no student debt.

In addition to student loans, occupational prestige, welfare use, and black or Hispanic race have a significant negative association with 2009 net worth. Several of these covariates stand out. For example, a household that uses welfare and with 2007 net worth at the 15th, 30th, or 50th percentiles has a lower 2009 net worth (–$14,650.37, loss of 832 percent at the 15th percentile; –$55,345.92, loss of 164 percent at the 30th percentile; or –$204,329.60, loss of 159 percent at the 50th percentile) than a household that does not use welfare and has similar levels of 2007 net worth. It is also worth noting that black households and households with 2007 net worth at the 15th, 30th, or 50th percentiles also have lower 2009 net worth (–$4,983.58, loss of 283 percent at the 15th percentile; –$18,826.89, loss of 56 percent at the 30th percentile; –$69,506.29, loss of 54 percent at the 50 percentile) than white households with similar levels of 2007 net worth. For Hispanic households, households with 2007 net worth at the 15th, 30th, or the 50th percentile also have lower 2009 net worth (–$5,687.63, loss of 323 percent at the 15th percentile; –$21,486.61, loss of 64 percent at the 30th percentile; –$79,325.63, loss of 17 percent at the 50th percentile) than white households with similar levels of 2007 net worth.

In contrast, higher income, higher 2007 net worth, a four-year college graduate living in the household, being older, being married, Asian race, and having health insurance are all associated with an increase in 2009 net worth. In particular, two of these covariates stand out: households with a four-year college graduate and those with health insurance. Living in a household with a four-year college graduate and 2007 net worth at the 15th ($6,379.97, gain of 362 percent), 30th ($24,102.13, gain of 71 percent), or the 50th ($88,981.78, gain of 69 percent) percentiles is associated with higher 2009 net worth compared with living in a household without a four-year college graduate and similar 2007 net worth levels. Living in a household with health insurance and 2007 net worth at the 15th, 30th, or the 50th percentiles is associated with higher 2009 net worth ($6,999.12, gain of 397 percent at the 15th percentile; $26,441.17, gain of 78 percent at the 30th percentile; $97,617.16, gain of 76 percent at the 50th percentile) compared with living in a household without health insurance and similar 2007 net worth levels.

Predicting 2009 Net Worth Among Students with Loans

In addition to student loan use (loans vs. no loans), the student loan amount has a significant negative association with 2009 net worth (Table 5). For each one-dollar increase in student loans, living in a household with median 2007 net worth is associated with $0.87 less in 2009 net worth. Marital status, use of welfare, and race remain significant negative predictors of net worth. Interestingly, Hispanic households do not differ significantly from white households. However, for

Table 5

Median Regression Results Predicting 2009 IHS Net Worth Using Median 2007 Net Worth: Households with Outstanding Student Loans*

Characteristic	Coefficients	SE	*p*-Value
Student loan amount	–$0.87	0.33	0.009
Income	$0.18	0.18	0.072
Net worth 2007	$0.06	0.02	<0.000
Four-year college graduate	$38,259.48	11,152.98	0.003
Age	$4,032.32	437.01	<0.000
Occupational prestige (ref. professional)			
Technical/services	–$19,530.33	10,431.50	0.082
Other	–$23,042.92	17,500.74	0.072
Not working	–$18,548.50	16,852.29	0.102
Married	$60,418.50	10,443.99	<0.000
Use of welfare	–$126,617.30	22,370.60	<0.000
Race (ref. white)			
Black	–$57,015.09	16,321.80	<0.000
Hispanic	–$21,195.40	21,076.65	0.091
Asian	–$14,612.86	15,456.11	0.147
Has health insurance	$40,816.01	28,974.29	0.093

NOTE: Standard errors are bootstrapped with 999 replications and are adjusted for imputation uncertainty (Pence, 2002, 2006). Coefficients are marginal effects evaluated at median net worth in 2007 ($68,427) among households with outstanding student loans. Net worths in 2009 are calculated using the IHS transformation (Pence, 2006). *N = 19,891,202. ref., reference; SE, standard error.

SOURCE: SCF. Data are weighted.

black households, living in a household with median 2007 net worth is associated with $21,195.40 less 2009 net worth (a loss of about 31 percent) compared with white households.

Higher 2007 net worth, a four-year college graduate living in the household, being older, and being married have a significant positive association with 2009 net worth. Living in a household with a four-year college graduate and 2007 net worth at the 50th percentile is associated with a $38,259.48 increase in 2009 net worth (a gain of 56 percent) compared with a household with a four-year college graduate and similar 2007 net worth levels.

Predicting 2009 Net Worth Among Four-Year College Graduates

Student loans continue to have a significant association with 2009 net worth when the sample is restricted to households with a four-year college graduate (Table 6). Living in a household with student debt and 2007 net worth of $296,802.00 (50th percentile) is associated with having $185,995.90 less in 2009 net worth (a loss of about 63 percent) compared with households with no student debt. Other factors contributing to low net worth are occupational prestige, use of welfare, and race. Again, the biggest predictor associated with a reduction in net worth is use of welfare. Living in a household that uses welfare and has median 2007 net worth of $296,802.00

Table 6

Median Regression Results Predicting IHS 2009 Net Worth Using Median 2007 Net Worth: Four-Year College Graduates*

Characteristic	Coefficients	SE	*p*-Value
Student loan use	–$185,995.90	35,752.15	<0.000
Income	$0.16	0.08	0.032
2007 Net worth	$0.07	0.01	<0.000
Age	$12,738.37	846.78	<0.000
Occupational prestige (ref. professional)			
Technical/services	–$60,808.44	31,530.04	0.083
Other	–$250,533.70	54,494.68	<0.000
Not working	–$239,295.00	43,235.00	<0.000
Married	$205,331.70	25,240.04	<0.000
Use of welfare	–$576,623.00	175,315.10	0.008
Race (ref. white)			
Black	–$183,868.30	70,415.51	0.002
Hispanic	–$208,177.90	73,475.10	0.007
Asian	–$18,733.47	35,071.55	0.091
Has health insurance	$357,010.60	116,803.90	0.032

NOTE. Standard errors are bootstrapped with 999 replications and are adjusted for imputation uncertainty (Pence, 2002, 2006). Coefficients are marginal effects evaluated at median 2007 net worth ($296,802) among households with four-year college graduates. Net worths in 2009 are calculated using the IHS transformation (Pence, 2006). *N = 41,136,768. ref., reference; SE, standard error.

SOURCE: SCF. Data are weighted.

is associated with $576,623.00 less in 2009 net worth compared with living in a household that does not use welfare (a loss of about 194 percent). For black households, living in a household with median 2007 net worth is associated with $183,868.30 less in 2009 net worth compared with living in a white household with median 2007 net worth (a loss of about 62 percent). Further, living in a Hispanic household with median 2007 net worth is associated with $208,177.90 less in 2009 net worth compared with living in a white household with median net worth in 2007 (a loss of about 70 percent).

Income, 2007 net worth, being older, being married, and having health insurance all are significantly related to increases in 2009 net worth. It is worth noting that both 2007 net worth and income, while significant, have a weak association with 2009 net worth. Somewhat surprisingly, living in a household with median net worth and having health insurance in 2007 are associated with an increase of $357,010.60 in 2009 net worth compared with living in a household with no health insurance (a 120 percent difference). Findings also suggest that being married is related to relatively strong gains in net worth. The combination of living in a household with median net worth and a married respondent in 2007 is associated with an increase of $205,331.70 in 2009 net worth compared with living in a household with an unmarried respondent (a gain of 69 percent).

DISCUSSION

About 18 percent of households in our sample have outstanding student loans. Further, the average family in 2007 has about $26,018 in student loans. This figure is slightly higher than amounts found in past research. Fry (2012) finds that the average household in 2007 has about $23,349.00 of outstanding debt, though Fry uses 2011 dollars. Not surprisingly, we also see a sharp decrease in median net worth from 2007 to 2009 ($128,828 to $98,000). This decrease may be explained by the 2007-09 Great Recession when a large number of households experienced a drop in their net worth, largely as a result of declining home values (Fry, 2012).

Our first main research question in this study is whether student loan debt is associated with 2009 household wealth. We find that median 2009 net worth for a household with no outstanding student debt ($117,700) is nearly three times (275 percent) higher than for a household with outstanding student debt ($42,800). Moreover, when we consider the change in net worth, the relative burden appears to be much greater for households with student debt. Regardless of whether we examine the mean or median change in net worth, the change in net worth represents a higher percentage of total 2009 net worth (12.4 percent) for households with outstanding student debt than it does for households with no outstanding student debt (9.31 percent). This difference might suggest that households with outstanding student debt are more burdened by the negative change in net worth from 2007 to 2009 than households with no student loans.

After controlling for demographic factors, we find the pattern suggested by the descriptive data remains: Outstanding student loans are associated with lower household net worth. A hypothetical household with exactly median 2007 net worth ($128,828) with outstanding student loans is associated with a loss of about 54 percent in 2009 net worth compared with a household with similar levels of net worth but no student debt. The idea that student debt might negatively affect adults' post-graduation outcomes is consistent with previous research. For example, findings suggest that graduates of a four-year college delay purchasing major assets such as a car or a home (Stone, Van Horn, and Zukin, 2012), delay marriage (Gicheva, 2011), and earn lower wages after the first year after graduation (Minicozzi, 2005).

Our findings might also suggest that outstanding student debt has a consistent negative association with 2009 net worth among households at the 15th, 30th, and the 50th percentiles of 2007 net worth. However, we find that households with less net worth might be more burdened by outstanding student debt than those with higher levels of net worth. While households at the 15th percentile with outstanding student debt lost less net worth ($5,017.26) than similar households at the 50th percentile ($69,976) from 2007 to 2009, the loss for households at the 15th percentile represents 285 percent of their 2009 net worth but only 54 percent for households at the 50th percentile. This outcome is in line with the findings of Elliott and Friedline (2013) that suggest the increasing student debt burden on households may not be equally shared at different income levels.

In addition, it is important to highlight that a four-year college graduate living in the household is associated with higher net worth compared with households without a four-year college graduate. However, the size of the effect of college graduates in the household is larger when the household has higher levels of net worth. Therefore, while all households appear to benefit from

a four-year college graduate living in the household, wealthier households appear to benefit even more. Income and net worth in 2007 are also significantly associated with higher 2009 net worth but they appear to have a weak association controlling for all other factors. However, more research into this association is needed.

Our second question is whether the amount of outstanding student loan debt is associated with net worth. We find that higher amounts of debt result in greater net worth losses. This finding is consistent with previous research in other areas. For example, the findings of Dwyer, McCloud, and Hodson (2011) suggest that student loans totaling more than $10,000 actually reduce the chance that a student will graduate from college. Similarly, Minicozzi (2005) finds evidence that the positive effects of student loans on earnings diminish at debt levels above about $10,000, and Gicheva (2011) finds that borrowing an additional $10,000 for education above the average student loan debt for full-time students when the respondent was 18 years old reduces the short-term likelihood of marriage.

Our third question is whether student loans are associated with the financial health of four-year college graduates compared with their counterparts with no student debt. We find that living in a household with a four-year college graduate with outstanding student debt is associated with a net worth loss of $185,995.90 (about 63 percent less) compared with living in a household with a four-year college graduate with no outstanding debt.

Limitations

A number of notable limitations should be considered. Importantly, we cannot rule out that student loan debt may be a marker for larger but unobserved household economic challenges. In other words, student loan debt may not be the cause of the decline in net worth. This possibility is mitigated somewhat by controlling for a number of factors considered important in predicting household net worth. Further, this possibility is less problematic for the sample of households that all have outstanding student debt. Even if households with student loans face unobserved household economic challenges, findings from the all-student-loan sample would lessen these concerns. However, findings from this study can be interpreted only as suggesting the possibility of an association between student loans and household net worth. We cannot completely rule out the possibility that some other factor—not the student loans—is causing the decline in net worth.

Another important limitation is the short time frame: 2007-09. This restriction makes it difficult to fully account for the fact that human capital is created by student debt. Conventional net worth does not include the value of human capital. As a result, conventional net worth is biased to show that student debtors have less wealth because the debt is counted as a liability but human capital is not included as an asset. We address this problem in two ways. First, we drop student loan debt from the net worth variable as discussed earlier. Second, we estimate a model using assets only. The asset variable does not include debt, so the problem of including debt but not human capital is removed. We find that student loans also have a significant negative association with household assets (see Table A2).

Moreover, the problem of including student debt but not accounting for human capital as an asset seems less problematic in the sample including only households with a college graduate.

Unless there is reason to assume that households with student debt and a college graduate will earn more in the future than households with no student debt and a college graduate, losses in the short term that are most likely the result of credit constraints will be hard to make up over the long term. That is, there is little reason to believe that households with student debt will be able to better leverage (i.e., earn more) their college degree at some point in the future than households with no student debt. This rationale is in line with our hypothesis that short-term credit constraints after college might be a source of substantial debt effects on the financial health of households.

We also acknowledge that using the change in net worth instead of net worth would lead to different results. However, the change in net worth does not account for the fact that change in net worth makes up more of the total net worth of households with outstanding student debt than for those with no outstanding student debt.

Policy Implication

The main policy implication of this study is that outstanding student debt may threaten the short-term financial health of households. However, our findings should be viewed as a first look at this question; more research will be required to refute or substantiate these findings. Moreover, the policy issues are complex and must be considered within the broader context of educational finance.

Future Research

More research should be undertaken on the effects of student loans on household financial health generally, and particularly in different time periods. The period between 2007 and 2009 is unusual because of the Great Recession. Research across longer periods is also desirable. Researchers may also want to determine whether similar effects exist when different assets are examined (e.g., home equity, savings, stocks, or more generally, financial assets and nonfinancial assets). Another important area of inquiry will be determining whether households with outstanding loans are also highly leveraged and whether this explains the lower net worth of these households. Researchers might also want to investigate whether a threshold amount exists above which student loans become more harmful to the financial health of households. While this body of research has barely begun, the findings in our study signal that it may be important to continue the inquiry.

CONCLUSION

Overall findings from this study suggest that a four-year college graduate who has outstanding student debt will be in worse financial health (i.e., have less net worth) than a four-year college graduate with no outstanding student debt, at least in the short term. This does not mean, however, that a college degree no longer pays off. In fact, we find evidence indicating that households with a four-year college graduate have higher amounts of household net worth than households without a four-year college graduate even while controlling for student debt. But according

to the ethos of the American dream, people with the same level of ability and effort should have similar financial outcomes. That is, it is not enough that a college graduate who needed to use loans to pay for college is better off than if he or she did not graduate from college. A graduate with loans must have an equal chance to achieve a similar level of financial health as his or her peers, the college graduates who do did need to use student loans. Given this, our findings begin to raise questions, but are not definitive, about whether our higher education system, which increasingly relies on student loans to finance college, can retain its position as one of the greatest equalizing forces in the American economy.

APPENDIX

Table A1

Median Regression Results Predicting 2009 Net Worth Using Median 2007 Net Worth: Heads of Households 30 to 60 Years of Age*

Characteristic	Coefficients	SE	*p*-Value
Student loan use	–$60,022.04	10,409.91	<0.000
Income	$0.12	0.05	<0.000
2007 Net worth	$0.04	0.01	0.041
Four-year college graduate	$68,931.93	8,997.32	<0.000
Age	$5,899.91	560.25	<0.000
Occupational prestige (ref. professional)			
Technical/services	–$37,502.71	11,266.58	0.002
Other	–$53,214.87	10,364.55	<0.000
Not working	–$73,154.08	11,911.44	<0.000
Married	$95,308.15	9,498.26	<0.000
Use of welfare	–$221,796.60	11,437.75	<0.000
Race (ref. white)			
Black	–$75,448.15	11,288.89	<0.000
Hispanic	–$46,812.08	12,752.02	<0.000
Asian	$9,282.56	14,527.14	0.197
Has health insurance	$92,396.30	16,350.69	<0.000

NOTE: Standard errors are bootstrapped with 999 replications and are adjusted for imputation uncertainty (Pence, 2002, 2006). Coefficients are marginal effects evaluated at 2007 median net worth ($116,691) among heads of households 30 to 60 years of age. Net worths in 2009 are calculated using the IHS transformation (Pence, 2006). *N = 69,638,811. ref., reference; SE, standard error.

SOURCE: SCF. Data are weighted.

Table A2

Median Regression Results Predicting 2009 Assets Using 2007 Median Assets*

Characteristic	Coefficients	SE	*p*-Value
Student loan use	–$43,532.79	10,557.75	<0.000
Income	$0.17	0.07	0.041
2007 Assets	$0.07	0.01	<0.000
Four-year college graduate	$117,758.70	11,657.11	<.0000
Age	$5,175.66	357.98	<0.000
Occupational prestige (ref. professional)			
Technical/services	–$51,534.02	10,168.48	<0.000
Other	–$78,348.94	14,806.69	<.0000
Not working	–$158,919.60	14,629.30	<0.000
Married	$155,967.30	12,707.21	<0.000
Use of welfare	–$345,849.20	21,962.50	<0.000
Race (ref. white)			
Black	–$79,816.08	12,534.73	<0.000
Hispanic	–$113,068.40	20,226.29	<0.000
Asian	$5,192.62	16,580.95	0.191
Has health insurance	$211,597.90	26,436.26	<0.000

NOTE: Standard errors are bootstrapped with 999 replications and are adjusted for imputation uncertainty (Pence, 2002, 2006). Coefficients are marginal effects evaluated at median 2007 net worth of $225,035. Assets in 2009 are calculated using the IHS transformation (Pence, 2006).
*N = 113,178,790. ref, reference; SE, standard error.

SOURCE: SCF. Data are weighted.

NOTES

1 These default rates refer to the time (2 or 3 years) between when the loan repayments start and when the borrower enters into default.

2 In this article, "college graduate" is defined as anyone with a bachelor's or postgraduate college degree.

3 The macro can be found at http://www.federalreserve.gov/econresdata/scf/files/fedstables.macro.txt.

4 We used a macro created by Pence (2006) to calculate the optimal values. The macro can be found at http://works.bepress.com/karen_pence/16/.

5 Welfare use was measured by asking respondents whether they or anyone else in the household had income from Temporary Assistance for Needy Families (TANF), Supplemental Nutrition Assistance Program (SNAP), or other forms of welfare or assistance such as Supplemental Security Income from Social Security (SSI).

6 All households with student loans have a member with at least some college, while households with no student loans may or may not have a member with some college, which might explain income differences.

7 We also investigated change in net worth as the dependent variable. However, this table suggests that change in net worth might not be the correct dependent variable to use because even though households with no outstanding student loans on average experience larger declines in net worth than households with outstanding student loans, these losses make up considerably less of their total net worth holdings.

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The Relationship Between Leverage and Household Spending Behavior: Evidence from the 2007-2009 Survey of Consumer Finances

Karen Dynan and Wendy Edelberg

Some recent studies suggest that high levels of household debt and leverage have contributed to the relatively sluggish growth of consumer spending in the past few years (Dynan, 2012; Mian, Rao, and Sufi, 2013). However, this conclusion has not been widely accepted because of the empirical challenges associated with identifying the relationship amid the dramatic and complicated changes in the household economic environment during the Great Recession and subsequent slow recovery. Leverage may indirectly influence spending by increasing borrowing constraints, impeding refinancing, and raising the likelihood that a household will face future borrowing constraints. Leverage may directly influence spending simply by making some households uncomfortable with their leverage compared with some behavioral benchmark. The authors use the 2007-09 Survey of Consumer Finances panel to explore these issues. They find that highly leveraged households were more likely to report cutting back their spending in 2009, even after controlling for other factors expected to influence spending, such as changes in income and wealth. In analyzing that relationship, the authors find evidence that leverage influenced household spending through several channels. (JEL E21, E44, E51)

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The recovery in U.S. consumer spending following the Great Recession was unusually weak by historical standards. In the first 12 quarters following the business cycle trough in June 2009, consumer spending's post-recession contribution to the cyclical strength in gross domestic product (GDP) was just over half of its historical average since World War II (Figure 1). The lackluster gains probably were due in part to developments among the con-

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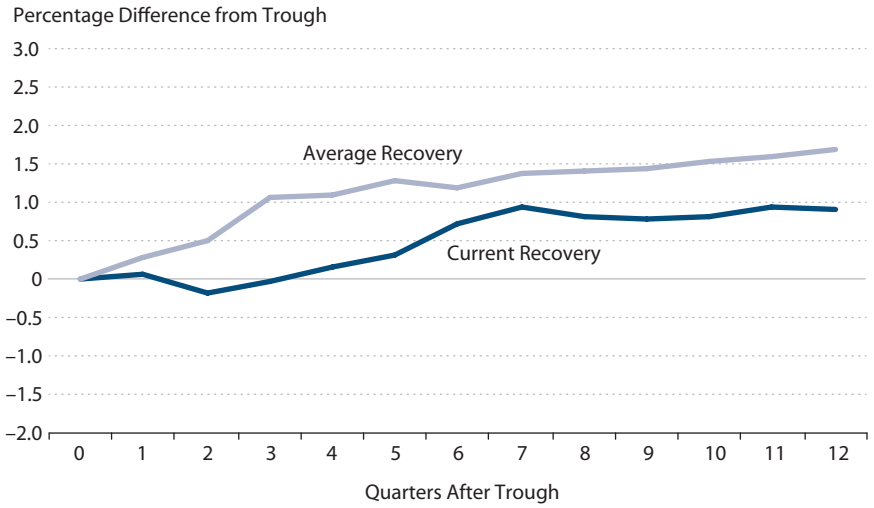
Figure 1

Contribution of Real Personal Consumption Expenditures to the Cyclical Variation in Real GDP Following Recessions



NOTE: Percentage difference from trough as a ratio of potential GDP.

SOURCE: Congressional Budget Office (2012), Figure 3.

ventionally accepted determinants of consumption—including wealth losses, weak income growth, limited availability of credit, and a more uncertain and pessimistic outlook for future income. However, recent research highlights another factor that may have dampened consumption: the high levels of household debt and leverage produced by the credit boom and subsequent asset price bust. For example, Dynan (2012) found that highly leveraged homeowners had substantially larger declines in spending between 2007 and 2009 than other homeowners, despite smaller changes in net worth. Similarly, Mian, Rao, and Sufi (2013) found that the response of retail sales to declines in wealth during the housing bust was more pronounced in counties with higher household leverage than elsewhere.

Further study of the relationship between leverage and consumer spending is needed, as the view that debt can independently weigh on consumption has not been widely accepted. Some analysts have argued that the empirical evidence is unpersuasive (Pence, 2012, and Cooper, 2012). In addition, the traditional models used by economists suggest that debt does not exert an independent influence on consumption—there is merely a positive and endogenous relationship because debt represents a means to finance spending that is spurred by other factors. However, going beyond these models reveals several reasons why high debt might have held back consumption. First, some households may have been forced to reduce their consumption because their high levels of debt relative to assets prevented them from obtaining any further credit needed to finance their desired spending. Second, some households may have spent less than they otherwise would have because high leverage prevented them from raising their discretionary monthly

cash flow by refinancing their mortgages with lower-rate loans. Third, highly leveraged households may have become more uncertain about future credit availability, leading them to cut consumption to decrease leverage. Fourth, some households may target a given level of debt relative to their assets. If recent events pushed leverage above households' target ratios (and possibly simultaneously lowered households' target ratios), these households might have chosen to pare consumption to pay down debt.

The lack of consensus to date on the linkage between leverage and consumption largely reflects the empirical challenges associated with identifying the relationship amid the dramatic and complicated changes in the economic environment households faced in recent years. However, some further light can be shed on these issues through analysis of the 2007-09 Survey of Consumer Finances (SCF) panel. The panel consists of the regular 2007 SCF cross section, which contains comprehensive balance-sheet data for a representative (after weighting) sample of U.S. households, combined with information from a limited follow-up of the same households two years later. Importantly for our purposes, the follow-up included a rich set of attitudinal questions, providing an abundance of information about changes in households' economic situations and behavior over the 2007-09 period in addition to some insight into their plans for the future.

Our primary empirical approach is to examine how behavior, experiences, and future plans vary across households with different amounts of debt relative to their assets. The SCF panel provides information about how balance sheets changed over the period. We can use that information to control for the effects of factors correlated with high debt but expected to have their own influence on household spending behavior, which might otherwise complicate the interpretation of the results. Such factors include changes in respondents' net worth and income. In brief, the data corroborate earlier evidence that leverage weighs on consumption outside the usual correlation between leverage and consumption implied by the wealth effect. In particular, leverage appears to have an indirect effect on consumption, as higher leverage is clearly associated with reduced access to credit and a lower propensity to refinance a mortgage. In addition, we find that highly leveraged households showed a more pronounced increase in their precautionary concerns, which should imply lower household spending. Our results cannot determine whether this effect of leverage on spending is indirect (through the relationship between leverage and expectations of future access to credit) or direct (through high leverage simply making households feel uncomfortable or vulnerable in some more general way).

LITERATURE REVIEW

The dramatic developments in mortgage and consumer credit markets over the past few years produced a revival in the literature on household debt. Much analysis has been done on how households accumulated so much debt in the lead-up to the financial crisis and why household delinquencies and defaults subsequently soared. A full review of these studies is beyond the scope of this article, but notable contributions include those of Mayer, Pence, and Sherlund (2009); Foote et al. (2010); Bhutta, Dokko, and Shan (2010); and Keys et al. (2010).

Only a few studies to date have directly linked high household debt to real economic activity. Using data from the Panel Study of Income Dynamics (PSID), Dynan (2012) showed that spend-

ing by highly leveraged households fell more sharply between 2007 and 2009 than would be expected based on other factors affecting these households, including their decline in wealth. The noisy household-level data used by Dynan did not allow for precise estimates of the effect of excess household debt on the economy as a whole, but her point estimates implied a fairly modest impact. Cooper (2012) obtained similar findings at the household level using the PSID.[1] Using novel estimates of consumption and wealth at the county and zip code levels, Mian, Rao, and Sufi (2013) concluded that the marginal propensity to consume out of wealth was higher among households with more leverage than among other households.

The previous studies most closely related to the question of *why* leverage may be restraining consumption are those that use credit bureau data to examine why aggregate household debt has fallen in recent years. Many of the factors explaining this trend presumably also affect spending. The findings from this research approach are somewhat mixed; different studies underscore the importance of different factors. For example, Brown et al. (2013) find that defaults, more-restrictive lending conditions, and voluntary steps to reduce debt all played a role between 2008 and 2012. Bhutta (2012) presents evidence suggesting that reduced new borrowing was more important than defaults in explaining the decline in debt between late 2009 and late 2011. Demyanyk and Koepke (2012) conclude that the reduced rate of new household borrowing since the crisis primarily reflects a decreased appetite for debt rather than an unwillingness by banks to lend.

OUR APPROACH

The simplest theoretical models of consumer spending offer little guidance about whether high leverage might have restrained consumption during the recession and recovery and, if so, through what channels. In the most basic model, consumer spending, C, is a function of wealth, W, and expected lifetime (or "permanent") income, Y:

$$C = C(W, Y). \tag{1}$$

Consumer spending is predicted to increase with higher wealth and income. Debt does not play a direct role in these models, but it could play an indirect role by means of the *wealth effect* (the positive relationship between consumption and wealth predicted by the model). In principle, because wealth equals the difference between assets, A, and debt, D, an exogenous increase in debt could lower wealth and, in turn, result in lower consumption. However, debt does not generally change exogenously. Rather, because it serves as a means to finance spending, debt tends to rise and fall endogenously as consumption rises and falls in response to movements in the traditional determinants of consumption.

Note, too, that the wealth effect associated with an exogenous movement in asset prices will mechanically produce a relationship between consumption and leverage, L, when leverage is defined as follows:

$$L = \frac{D}{A}. \tag{2}$$

In particular, if asset prices fall, wealth will fall and lead to a decline in consumption. The decline in asset prices will simultaneously produce an increase in leverage such that a negative correlation between consumption and leverage could be observed. A key point, however, is that the increase in leverage is not the driving force behind the decline in consumption in this case. Indeed, an increase in consumption as the result of an increase in expected lifetime income could be financed by an increase in debt. In that case, a positive correlation between consumption and leverage could be seen.

Richer specifications of the consumption function may include a role for interest rates, r; income uncertainty, σ^Y; borrowing constraints, B; cash flow (the net of flows in from monthly income and flows out from expenses previously obligated such as taxes and payments to service existing debt); and expected borrowing constraints, B^{exp}:

$$C = C\left(W, Y, r, \sigma^Y, B, cashflow, B^{exp}\right). \tag{3}$$

Such consumption functions offer additional channels through which debt and leverage can indirectly affect spending. To begin, a change in leverage can alter the degree to which a household faces borrowing constraints. We know that when lenders are deciding whether to extend a loan, they consider the losses they would incur if the borrower stops making payments. For example, a lender would be more reluctant to extend a second mortgage to a borrower with a highly leveraged primary mortgage. In the case of borrower default, the lender would be less likely to recover the full amount of the second mortgage after the proceeds from selling the home are used to cover the first mortgage. More generally, the role of leverage in determining borrowing constraints can change over time. Changes in economic and financial conditions may lead lenders to become more or less conservative in the benchmarks used to assess a prospective borrower's leverage or debt burden such that previously acceptable levels become unacceptable (and vice versa).[2]

In a related manner, leverage may be indirectly linked to consumption through its influence on a household's ability to refinance its mortgage. When interest rates drop, many borrowers seek to refinance their mortgages to lower-rate loans to reduce their required mortgage payments. Just as lenders are reluctant to issue new debt to highly leveraged borrowers, a borrower's high leverage makes lenders reluctant to issue a new mortgage with a lower interest rate to replace an existing mortgage with a higher rate.[3]

A household's inability to refinance because of high leverage means the household is denied two related benefits that might have motivated or allowed the household to spend more. First, refinancing at a lower interest rate lowers the total cost of servicing the debt, effectively increasing a household's wealth. As the simplest model of consumer spending shows, higher wealth typically increases spending. Second, a household's monthly cash flow is improved because less money is required to service the mortgage. Cash flow is likely a strong predictor of spending for households with low financial assets and an inability to increase their debt.

Finally, the model described by equation (3) allows leverage to have an indirect effect on consumer spending through its influence on households' expectations of access to credit in the future. Some households may want the option of future borrowing to avoid a sharp drop in con-

sumption in the face of unexpected income disruptions. All else equal, the higher a household's current leverage, the higher its expected future leverage and the more likely it is to face borrowing constraints in the face of such circumstances. Highly leveraged households may feel particularly vulnerable to future borrowing constraints if they are already straining to make large required debt payments and/or the rate of job loss is elevated, leaving them at high risk of impaired credit records through delinquency.[4] Households may also worry that future unexpected events in credit markets, such as another financial crisis, could tighten their access to credit at a given level of leverage. Thus, even if highly leveraged households do not face immediate borrowing constraints, precautionary concerns related to the possibility of future constraints may lead them to pare back consumption to pay off debt or build up assets and, in turn, reduce leverage.[5]

An even broader model of consumer spending might allow for a direct relationship between leverage and spending, in addition to the indirect relationships in equation (3). Some households may simply be uncomfortable with levels of leverage that exceed a particular behavioral benchmark. For example, households may feel stigmatized or vulnerable if their mortgage exceeds the value of their home such that they are "under water" on their loan. In this case, the consumption function might look like

$$C = C\left(W, Y, r, \sigma^{Y}, B, cashflow, B^{exp}, \left(L - L^{*}\right)\right), \tag{4}$$

where L^{*} is the target level of leverage. In this specification, a higher level of leverage or a lower target level of leverage would directly dampen consumer spending. Note that households, like lenders, might change their benchmarks for what they consider an acceptable level of leverage as economic conditions vary over time. For example, the dramatic developments from 2007 to 2009 could have induced households to lower their target leverage ratio.

Using the 2007-09 SCF panel, our empirical analysis attempts to isolate the predictive relationship between leverage and consumer spending over this period. The question of whether leverage has restrained consumer spending in more recent years is an interesting one. However, because of data limitations, our evidence relates primarily to the period directly following the onset of the financial crisis and recession, when households were highly leveraged by historical standards and real (inflation-adjusted) consumer spending was generally falling.

We present new evidence on the relationship between leverage and spending that endeavors to set aside the mechanical correlation between increases in leverage and decreases in consumption resulting from the wealth effect. Instead, we look for evidence that leverage independently restricted consumption through the channels described previously by (i) increasing borrowing constraints, (ii) impeding refinancing, (iii) raising the likelihood that a household will face future borrowing constraints, or (iv) simply making some households uncomfortable with their leverage compared with some behavioral benchmark. Such relationships may have been underappreciated before the recession, partly because the United States had not experienced an episode of widespread very high leverage in recent history. Or, the relationships may have changed as a result of the recession and financial crisis.

One limitation of our analysis is that it is difficult to empirically distinguish the role of leverage from that of debt service. Both are functions of the level of debt and thus are fairly highly correlated across households. In addition, lenders and households may avoid new debt (thus constraining household spending) because of high debt service obligations. For example, lenders make underwriting decisions based in part on the relationship between debt service obligations and income, which informs a household's ability to service new debt. Moreover, just as leverage jumped for many households during the recession because of the decline in asset values, so also might have their current and expected debt service "burdens" (the share of household income used for required debt payments) because of weak current income and dimmer prospects for future income.

DATA

The 2007-09 SCF Panel

Our analysis uses data from the 2007-09 SCF panel. The SCF is primarily a triennial cross-sectional survey of about 4,000 households conducted by the Board of Governors staff of the Federal Reserve System. The SCF measures very detailed information on households' finances, demographics, attitudes, and other characteristics. In 2009, the Board of Governors reached out to the 2007 survey respondents to resurvey them; the response rate was nearly 90 percent. The panel dataset released to the public contains data from 3,862 households. Detailed information about the panel dataset is available in Kennickell (2011).

Our baseline analysis uses the full SCF panel. The SCF oversamples wealthy households, but the responses can be weighted so the results are representative of the entire population. These weights are used to calculate all statistics in our analysis. To account for missing data and other problems with some responses, the SCF panel, like the SCF cross-sectional datasets, imputes some information using five different replicates to approximate the distribution of the missing data. We use the procedure suggested by the Board of Governors staff to correct our standard errors for this feature.

One important feature of our dataset is that the rich background information provided about households allows us to control for other characteristics and features of the economic environment that might be correlated with both leverage and consumption. Most importantly, it allows us to directly control for changes in wealth, as it is highly likely that the housing boom and bust not only influenced leverage but also had a considerable independent effect on consumption choices through the wealth effect. The credit bureau datasets used in the closely related literature on the factors explaining the decline in aggregate household debt offer the advantages of a much larger sample size and less noise (assuming that firms' administrative records are more accurate than households' self-reported information). However, the datasets do not provide a rich set of potential covariates and thus are limited in their capacity to identify the independent effects of leverage.

We measure leverage as a household's debt relative to its assets, as described below. In addition to leverage, we also use several other variables that capture household financial characteristics, including net worth, homeownership status and home value, and liquid assets as a share of

income. The SCF also provides additional information about critical aspects of household financial experiences between 2007 and 2009. For example, the survey asked whether households refinanced their mortgage between 2007 and 2009. The survey also asked whether households applied for but were denied credit between 2007 and 2009, as well as whether households attribute the reason for such denial to their leverage or similar characteristics.

The SCF also includes information about households' attitudes about credit and the economy, as well as how they manage their money. For example, in 2007 households reported whether they thought buying things on credit was a good idea. In addition, households reported whether they thought the U.S. economy would perform better, worse, or about the same over the next five years as it had over the past five years. Households were also asked about their willingness to take financial risks in return for larger financial returns.

Finally, the survey asked several questions that shed light on households' spending and saving behavior. For example, in both 2007 and 2009, households were asked whether they had saved (i.e., spent less than their total income) over the preceding year. In both years they were also asked whether they "usually" save and how much they need to have in savings for emergencies and other unexpected needs. In addition, in 2009 households reported whether they planned to cut back on spending in various ways and whether they anticipated large future expenditures on a home purchase, health care, and the like.

Measuring Leverage

It seems there is no apparent consensus in the recent household literature regarding the exact meaning of the terms "leverage" or "deleveraging." Dynan (2012) defines "leverage" as the ratio of a household's debt relative to assets (D/A), which is closely related to the traditional leverage ratio of assets to net worth used in the corporate finance literature. However, other studies, such as that by Bhutta (2012), associate the term "deleveraging" with declines in the absolute level of debt, and yet others focus on the ratio of household debt to income or even the ratio of household debt service obligations to income (see, for example, Roxburgh et al., 2012).

Our primary measure of leverage is a household's D/A ratio, but we also generally find the results are robust to using the ratio of debt to income (for sake of brevity, the latter results are not shown). One might be concerned about cross-sectional variation being driven by differences in the denominator, such that any differences found for highly leveraged households are actually picking up effects related to the forces that led households to have low assets. Therefore, it is important to include controls that are correlated with these forces. Because leverage is so highly skewed and no doubt measured with error, most of our analysis uses quartiles or centiles of leverage (calculated on a weighted basis).

The timing of our leverage measures also merits further explanation. We primarily group households by their leverage as of 2007—the first year of the panel. We focus on ex ante levels of debt because of concerns that ex post levels of debt (that is, a household's debt as of 2009) may be endogenous with respect to some of the outcome variables of interest in our study. For example, as a group, indebted households that cut back on consumption between 2007 and 2009 for any reason other than high debt should have tended to reduce their debt over the period solely because they needed less debt to finance their lower levels of spending. However, the ex ante

Table 1

Summary Statistics: 2007-09 SCF Panel

		Quartile of 2007 D/A ratio			
Statistic	**All households**	**1**	**2**	**3**	**4**
D/A ratio (2007)*	0.22	0.00	0.10	0.37	0.84
Characteristics					
Age (yr; in 2007)	49.42	59.03	52.42	46.54	39.69
College degree (2007)	0.36	0.28	0.45	0.41	0.33
Income (in $1,000s, 2007)*	50.05	29.29	63.90	68.16	46.86
Income (in $1,000s, 2009)*	49.81	27.89	59.27	69.73	47.82
Unemployed past year (2007)	0.15	0.13	0.11	0.13	0.23
Unemployed past year (2009)	0.21	0.15	0.20	0.20	0.30
Net worth (in $1,000s, 2007)*	125.51	149.33	364.01	192.01	12.32
Net worth (in $1,000s, 2009)*	95.96	110.20	291.25	136.10	6.50
Homeowner (2007)	0.69	0.57	0.78	0.83	0.58
Homeowner (2009)	0.70	0.59	0.80	0.84	0.58
Attitudes					
Income uncertain (2007)	0.27	0.28	0.23	0.25	0.31
Income uncertain (2009)	0.28	0.29	0.25	0.25	0.32
OK to use credit (2007)	0.28	0.22	0.28	0.31	0.30
OK to use credit (2009)	0.27	0.24	0.24	0.30	0.30

NOTE: All statistics are means except those marked with an asterisk, which are medians. Quartiles and all statistics were calculated on a weighted basis.

measure of leverage misses the dramatic changes in asset values for many households between 2007 and 2009, owing to the financial crisis and recession. In the SCF survey, the median leverage ratio rose from 0.22 in 2007 (quite high by historical standards) to 0.26 in 2009. As a result, an analysis based solely on ex ante levels could miss some of the effects of leverage shocks that many households experienced.[6]

Table 1 shows various characteristics for all households in the 2007-09 SCF and households in different quartiles of leverage. Most households in the first quartile, denoted (1) in the table, had no debt as of 2007 (the upper cutoff value of leverage was about 0.01). The median household in the second-lowest quartile had a 2007 D/A ratio of 0.10. The median ratios were 0.37 and 0.84 in the third and fourth (top) quartiles, respectively.

As Table 1 shows, the more-indebted households in 2007 tended to be younger. Those without college degrees were likely to have the highest and lowest levels of leverage. Median income in 2007 rose with debt through the third quartile of leverage but fell back for the top quartile. Not surprisingly, all groups were more likely to have reported an unemployment spell in 2009 than in 2007. In addition, the share with a recent unemployment spell in 2009 rose with leverage.

Net worth in 2007 was higher for households in the second and third quartiles of the D/A ratio distribution compared with those in the first quartile, while, as with income, those in the

fourth quartile were considerably less affluent than those in the next-lowest quartile. About 80 percent of the households in the second and third quartiles of the D/A ratio distribution were homeowners in 2007, compared with about 60 percent of those in the top and bottom quartiles. Households in the top quartile of the 2007 D/A ratio distribution also appear to have suffered the most on a percentage basis from the financial and housing crises: Their median net worth fell by almost 50 percent over this period compared with declines of between 20 and 30 percent for the other groups. This pattern is consistent with findings in Dynan (2012), Mian, Rao, and Sufi (2013), and many other studies showing that debt was concentrated in the regions with the largest booms and busts in home values. The pattern also underscores the importance of controlling for net worth changes in any study attempting to isolate the effects of debt on household behavior.

The lower panel of Table 1 shows summary statistics for selected variables associated with the attitudes of SCF respondents. As of 2007, households in the top quartile of the D/A ratio distribution were more likely to report uncertainty about the direction of their income over the coming year (although the lowest quartile showed considerable uncertainty). Perhaps not surprisingly, households in the top half of the leverage distribution were more likely to report buying things on credit was a good idea. But, perhaps surprisingly, there was little change in household attitudes about credit between 2007 and 2009.

EVIDENCE ON THE RELATIONSHIP BETWEEN LEVERAGE AND CONSUMPTION

We use a set of questions about households' financial plans to assess whether leverage had any relationship with spending before we try to discern the underpinnings of the relationship. Overall, we find that leverage is correlated with households' reported spending behavior, even after accounting for the effect of the decline in asset values and other factors that would be expected to independently drive consumption. In later sections, we explore the possible reasons for that role.

Debt and Cutting Back

In 2009, the SCF asked households what types of decisions they had made "to change the ways you arrange your money or investments" in response to the events of the preceding two years. While the SCF did not ask directly about households' consumption, we use answers to the question on financial planning to make inferences about how households had changed or intended to change their spending behavior. Six of the more than 60 coded responses offered by households appear to be consistent with *cutting back* consumption in some way:

- *"Spend less, cut back."*
- *"Budget expenses more carefully, more cautious about buying/spending."*
- *"Use old things longer."*
- *"Buy less expensive things."*
- *"No money to spend beyond necessities."*
- *"Save more."*

Table 2

Leverage and Share of Households that Reported Cutting Back: 2007-09 SCF Panel

Sample/subsample (No. of households)	All households	Quartile of 2007 D/A ratio			
		1	2	3	4
Full sample (3,857)	0.29	0.20	0.25	0.31	0.41
Subsample of homeowners reporting rise in home value (566)	0.23	0.13	0.19	0.23	0.39
Subsample of homeowners reporting rise in home value, net worth, and income (154)	0.21	0.12	0.15	0.17	0.39

NOTE: Quartiles and all statistics were calculated on a weighted basis. Households were assigned to quartiles just once, based on where they fell within the full sample.

The SCF allows each household to report up to 10 different changes. For our analysis, we created a variable equal to 1 if a household reported making one or more of the above changes and 0 otherwise.

The first row of Table 2 shows the shares of households that reported cutting back in 2009 for the entire sample as a group and according to leverage quartiles. As the first column ("All households") shows, close to 30 percent of households reported trimming their spending plans in some way. For households with different levels of debt relative to assets in 2007, the propensity to report cutting back in 2009 rises with leverage. In the top quartile, 41 percent of households reported cutting back in some way compared with 20 percent of households in the lowest quartile.

As noted, it is important for our analysis to control in some way for features of households' economic environments that might be correlated with leverage. The plunge in households' asset values should have had its own effect on consumer spending through the usual wealth effect channel. We also attempted to control for the correlation between other adverse economic developments (e.g., loss of income) and household leverage. The remainder of the table does this simply by limiting the sample. We start with restrictions based on changes in homeowner-reported home values because the most obvious bias would arise from the relationship between debt and home value declines produced by the housing bubble. As the middle row of the table shows, the pattern for the much smaller subsample of homeowners who reported a rise in their home value over the 2007-09 period is even starker than that for the full sample, with an even more-pronounced difference between homeowners holding the most and the least debt relative to their assets. The pattern holds up even when we restrict the sample to the very small and very fortunate group of homeowners that reported that their home values, their net worth, and their incomes all increased between 2007 and 2009 (last row). Strikingly, a comparison of the first and third rows of the final column indicates the most-indebted households in this group showed nearly as high a propensity to cut back as the most-indebted households in the population at large. This latter result is consistent with the view that the greater propensity of more-indebted households to report cutting back is indeed largely debt-related and does not simply reflect the

other dramatic changes these households may have personally experienced in the wake of the housing bust and the Great Recession.

In Table 3, we formalize the result using a probit regression, which allows us to explore the relationship between cutting back and leverage for a broad group of households while controlling for net worth, income, and other factors. The dependent variable for the regression was whether a household reporting cutting back. The key coefficients of interest are those on the variables capturing households' D/A ratio, shown at the bottom of the table. We include a wide range of controls in an effort to remove the effects of other household features possibly correlated with leverage and driving decisions to cut back. These controls include two categorical variables capturing the deciles into which the 2007-09 changes in households' income and net worth fell, respectively.[7] We also included age, indicator variables for experiences such as spells of unemployment, measures capturing the emergency funds available to households (their liquid assets and access to funds from friends and relatives), as well as a number of variables that captured their expectations and attitudes.

Our baseline sample consists of households owning homes in both 2007 and 2009 that did not move. We focus on this group because moving might be associated with other developments, leading to both a change in spending behavior and a change in debt that might bias our results, although the estimated coefficients on the debt-related variables are generally similar when the full sample is used. The first three columns in Table 3 differ in the debt-related variables included. Column (1) contains a variable corresponding to the 2007 D/A quartile, column (2) contains separate indicator variables for each of the quartiles, and column (3) contains an indicator variable capturing the 2007 D/A decile, along with the squared value of this variable to detect nonlinear effects. The results across the three columns tell a similar story: The estimated coefficients suggest a positive and statistically significant relationship between a household's leverage and its propensity to cut back. Columns (4) and (5) are similar to column (1) in specification but show the results when the sample is (i) restricted to homeowners with increased home values and then (ii) further restricted to those who also experienced increased net worth and income. Not surprisingly, the standard errors are considerably higher for these smaller subsamples. However, the estimated coefficients on leverage are still positive (and statistically significant in column (4)). All in all, the positive relationship between leverage and a desire to cut back holds up in this more formal context.

Many of the estimated coefficients on the control variables in these regressions are as expected. Among the more notable results, greater income and net worth changes are associated with a reduced likelihood of cutting back (surprisingly, though, these coefficients are not statistically significant, nor were those on any of the variations we tried in specifications not shown). Experiencing an unemployment spell and expecting significant future expenses were associated with a greater propensity to report cutting back, and being willing to take risks as of 2007 was associated with a reduced propensity to report cutting back in 2009.

Table 3

Probit Regression Results (Dependent Variable = Whether Cutting Back)

	(1)	(2)	(3)	(4)	(5)
Characteristic	**All households**	**All households**	**All households**	**Households with increases in home values**	**Households with increases in home values, incomes, and net worth**
Age class	–0.120**	–0.120	–0.110	–0.148**	–0.241*
	(0.025)	(0.120)	(0.110)	(0.060)	(0.136)
Had unemployment spell	0.359**	0.361	0.355	0.436**	1.0352**
	(0.081)	(0.361)	0.355	(0.176)	(0.386)
Has access to funds	–0.029	–0.034	–0.031	0.030	0.584
	(0.067)	(0.157)	(0.157)	(0.161)	(0.411)
Okay to use credit	0.053	0.052	0.049	0.055	0.280
	(0.067)	(0.039)	(0.123)	(0.156)	(0.407)
Expect improved economy	0.123*	0.123	0.122**	–0.092	–0.277
	(0.063)	(0.124)	(0.014)	(0.162)	(0.412)
Expect large future expenses	0.146**	0.143**	0.147	0.202	0.038
	(0.058)	(0.013)	(0.139)	(0.140)	(0.368)
Change in income class	–0.008	–0.008	–0.009		
	(0.011)	(0.695)	(0.007)		
Income uncertain	–0.013	–0.011	–0.003	–0.121	0.065
	(0.065)	(0.418)	(0.011)	(0.162)	(0.427)
Liquid assets/income	–0.001	0.001	0.004	–0.049	–1.100
	(0.027)	(0.054)	(0.051)	(0.100)	(0.878)
Change in net worth class	–0.014	–0.014	–0.013		
	(0.010)	(0.144)	(0.148)		
Willing to take risks in 2007	–0.152**	–0.157**	–0.156**	–0.262	–0.258
	(0.063)	(0.016)	(0.016)	(0.160)	(0.411)
2007 D/A quartile	0.219**			0.156**	0.062
	(0.036)			(0.079)	(0.221)
2007 D/A quartile 1		–0.695**			
		(0.196)			
2007 D/A quartile 2		–0.418**			
		(0.055)			
2007 D/A quartile 3		–0.191**			
		(0.028)			
2007 D/A quartile 4		–0.046			
		(0.030)			
2007 D/A decile class			0.138**		
			(0.014)		
2007 D/A decile^2			–0.004		
			(0.956)		

NOTE: Sample restricted to homeowners who did not move. Standard errors are indicated in parentheses. * indicates significance at the 10 percent or higher level; ** indicates significance at the 5 percent or higher level.

Table 4

Household Access to Credit Between 2007 and 2009: 2007-09 SCF Panel

Characteristic	All households	Quartile of 2007 D/A ratio			
		1	2	3	4
Share applying for credit	0.47	0.21	0.51	0.56	0.58
Share reporting having been denied credit at some point	0.12	0.04	0.08	0.14	0.21
Ratio	0.25	0.19	0.16	0.25	0.36
Share reporting having not applied for credit at some point because they feared being denied	0.17	0.12	0.11	0.18	0.28

NOTE. Quartiles and all statistics were calculated on a weighted basis. Shares are based on the full sample of 3,857 households. The reference period for all shares was the two years preceding the 2009 resurvey.

EVIDENCE ON WHY HIGH LEVERAGE MAY BE CONSTRAINING CONSUMPTION

In this section, we use the 2007-09 SCF to explore possible explanations for the observed positive relationship between a household's leverage and its propensity to report cutting back spending. We look at responses to the following question from the 2009 resurvey: *"In the past two years, has a particular lender or creditor turned down any request you made for credit, or not given you as much credit as you applied for?"* We label a household as being denied if it reported being turned down for credit.[8]

Table 4 shows how being turned down for credit varies across households with different degrees of leverage. The first row shows that more-leveraged households were more likely to have applied for credit between 2007 and 2009 than their counterparts with less leverage. They were also more likely to have been denied; 21 percent of households in the top quartile of the 2007 D/A ratio were turned down for credit at least once compared with 12 percent for the sample as a whole. These figures imply that the share of households that applied for credit between 2007 and 2009 and was denied credit at some point was somewhat higher for highly leverage households (36 percent in the top quartile) than for all households in the SCF panel (25 percent). The fourth row shows further evidence of debt-related constraints; it shows the shares of households reporting they considered applying for credit at some point between 2007 and 2009 but did not do so because they feared being turned down. The share of households in the top quartile of 2007 D/A in this category was 28 percent, compared with 17 percent for the sample as a whole.

The clearest "take-away" message from this analysis is that the higher leverage of some households appeared to impair their access to credit over the 2007-09 period and, in turn, likely limited their consumption. This conclusion is perhaps not surprising given that lenders make underwriting decisions based in part on household leverage.

Leverage, Credit Access, and Cutting Back

We examine whether the relationship between leverage and access to credit fully explains the relationship between leverage and a household's desire to cut back. Since more highly leveraged households appear to have less access to credit, and less access to credit should lower consumer spending, our results in the previous section may reflect that indirect effect of leverage on spending. To gauge the importance of this channel, we augment the probit specification used for Table 3 to include a measure of whether households were denied credit. If the measure fully captures whether households lack access to credit and if leverage has no effect on households' financial decisions other than through its effect on access to credit, we would expect leverage to no longer predict households' reported plans to cut back on spending after that measure is included.[9]

Table 5 shows the estimation results for our baseline sample. The columns are identical to the first three specifications estimated for Table 3, but we added the indicator variable for whether a household was turned down for credit between 2007 and 2009 to the set of independent variables. As shown, the coefficients on the leverage variables remain statistically significant and are, in fact, similar in magnitude to their counterparts in Table 3. Thus, even after including whether a household has been denied credit, the estimated coefficients suggest a positive and statistically significant relationship between a household's leverage and its propensity to cut back its expenses. All in all, the results suggest that leverage is an important factor in a household's financial decisions beyond its effect on access to credit.

Leverage and Refinancing

As discussed earlier, difficulty in refinancing a mortgage may also contribute to the correlation between leverage and a household's propensity to cut back. Between mid-2007 and mid-2009, the interest rate on new 30-year fixed-rate mortgages fell by about 1¼ percentage points; a reduction of this magnitude in the interest rate on a mortgage of $100,000 would lower monthly payments by about $80, creating an annual increase in cash flow of about $950. For many households with low financial assets (see, for example, Bricker et al., 2012) and a limited ability to borrow through credit cards over the 2007-09 period, such an increase in cash flow could have a significant impact on consumption. However, many homeowners were not able to realize that increase in cash flow: Highly leveraged households (especially those under water on their mortgages) had difficulty refinancing their mortgages, particularly relative to households with less leverage.[10]

Table 6 provides some evidence from the 2007-09 SCF panel on the relationship between leverage and refinancing. As the first column shows, 14 percent of all households (first row), or 20 percent of households with mortgages (third row), reported refinancing their mortgages between 2007 and 2009.[11] As the third row shows, very high leverage does appear to affect a household's ability to refinance. The share of mortgage holders that refinanced is 6 percentage points lower in the top quartile than in the next-highest quartile and 3 percentage points lower than for the sample as a whole. As the final row of the table shows, the median reduction in

Table 5

Probit Regression Results (Dependent Variable = Whether Cutting Back, including measures of credit constraints)

Characteristic	(1)	(2)	(3)
Age class	–0.111**	–0.110**	–0.098**
	(0.027)	(0.027)	(0.028)
Had unemployment spell	0.393**	0.392**	0.384**
	(0.089)	(0.089)	(0.089)
Has access to funds	–0.017	–0.022	–0.014
	(0.074)	(0.074)	(0.075)
Okay to use credit	0.068	0.066	0.062
	(0.071)	(0.071)	(0.071)
Expect improved economy	0.122*	0.122*	0.120*
	(0.067)	(0.068)	(0.067)
Expect large future expenses	0.125**	0.119*	0.125**
	(0.062)	(0.062)	(0.062)
Change in income class	–0.004	–0.004	–0.006
	(0.011)	(0.011)	(0.011)
Income uncertain	–0.001	0.000	0.011
	(0.070)	(0.070)	(0.070)
Percent of credit limit used	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Liquid assets/income	–0.005	–0.003	0.003
	(0.029)	(0.029)	(0.028)
Change in net worth class	–0.015	–0.014	–0.014
	(0.010)	(0.010)	(0.010)
Willing to take risks in 2007	–0.131**	–0.138**	–0.137**
	(0.066)	(0.066)	(0.066)
Denied credit	0.289**	0.303**	0.301**
	(0.096)	0.096)	(0.095)
2007 D/A quartile	0.213**		
	(0.041)		
2007 D/A quartile 1		–0.821**	
		(0.182)	
2007 D/A quartile 2		–0.497**	
		(0.160)	
2007 D/A quartile 3		–0.319**	
		(0.157)	
2007 D/A quartile 4		–0.173	
		(0.163)	
2007 D/A decile class			0.186**
			(0.052)
2007 D/A decile^2			–0.009*
			(0.005)

NOTE: Sample restricted to homeowners who did not move. Standard errors are indicated in parentheses. * indicates significance at the 10 percent or higher level; ** indicates significance at the 5 percent or higher level.

Table 6

Mortgage Refinancings between 2007 and 2009: 2007-09 SCF Panel

		Quartile of 2007 D/A ratio			
Characteristic	**All households**	**1**	**2**	**3**	**4**
Share refinancing	0.14	0.01	0.14	0.22	0.17
Share with mortgage	0.69	0.02	0.70	0.95	0.97
Share with mortgage that refinanced	0.20	0.05	0.18	0.23	0.17
Median change in payment for refinancers ($/month)	–36	…	–26	–43	–47

NOTE: Quartiles and all statistics were calculated on a weighted basis. Shares are based on the full sample of 3,857 households. The reference period for all shares was the two years preceding the 2009 resurvey. The ellipsis signifies that the relevant sample was too small to produce reliable figures.

mortgage payments for households that were able to refinance was meaningful, amounting to $47 a month in higher cash flow ($564 a year) for those in the top quartile of debt relative to assets and $36 a month ($432 a year) for all households that refinanced.

The results in Table 6 indicate that higher leverage likely dampened a household's ability to refinance, which in turn dampened cash flow and spending. However, more work is warranted in this area, particularly given that such a linkage has implications about whether policy initiatives aimed at facilitating refinancing for highly leveraged households are an effective way to raise aggregate demand. Most importantly, the simple framework used here likely does not cleanly separate credit supply effects from demand effects as there is a higher payoff to refinancing for households with more mortgage debt.

Leverage, Refinancing, and Cutting Back

We look for evidence regarding whether an impaired ability to refinance might explain the higher propensity of more highly leveraged households to indicate cutting back consumption by reestimating the specifications from Table 5 including an indicator variable for whether a household had refinanced between 2007 and 2009. The results are shown in Table 7.

Leverage still appears to play a direct role in predicting whether a household reports cutting back on spending after adding whether the household refinanced. The estimated coefficient on the refinancing variable is of the expected sign (negative, implying that households that refinanced were less likely to report cutting back on spending). However, it is statistically insignificant, which might suggest that the change in cash flow induced by refinancing was not very relevant to a household's spending over this period. (It may also reflect the presumably high degree of collinearity between a household's access to credit and its ability to refinance.) More importantly, the estimated coefficients on the leverage terms remain statistically significant, consistent with the view that leverage might affect spending in ways that extend beyond its indirect effects on access to credit and cash flow increased by refinancing.

Table 7

Probit Regression Results (Dependent Variable = Whether Cutting Back, including indicator of refinancing)

Characteristic	(1)	(2)	(3)
Age class	–0.089**	–0.090	–0.074
	(0.033)	(0.090)	(0.074)
Had unemployment spell	0.345**	0.347	0.338
	(0.098)	(0.348)	(0.338)
Has access to funds	–0.016	–0.015	–0.007
	(0.087)	(0.202)	(0.184)
Okay to use credit	0.087	0.086**	0.090**
	(0.079)	(0.022)	(0.040)
Expect improved economy	0.046	0.045**	0.038
	(0.079)	(0.012)	(0.321)
Expect large future expenses	0.095	0.098	0.107**
	(0.073)	(0.327)	(0.030)
Change in income class	–0.004	–0.004	–0.006
	(0.014)	(0.021)	(0.254)
Income uncertain	–0.014	–0.016	0.005
	(0.084)	(0.467)	(0.016)
Percent of credit limit used	0.000	0.000	0.000
	(0.000)	(0.024)	(0.009)
Liquid assets/income	–0.024	–0.023	–0.015
	(0.044)	(0.020)	(1.348)
Change in net worth class	–0.025**	–0.025	–0.028
	(0.012)	(0.086)	(0.090)
Willing to take risks in 2007	–0.196**	–0.200**	–0.183**
	(0.077)	(0.030)	(0.032)
Denied credit	0.327**	0.327**	0.321**
	(0.103)	(0.048)	(0.014)
Refinanced	–0.017	–0.019	–0.027
	(0.083)	(0.099)	(0.108)
2007 D/A quartile	0.172**		
	(0.054)		
2007 D/A quartile 1		–0.461	
		(0.466)	
2007 D/A quartile 2		–0.456*	
		(0.244)	
2007 D/A quartile 3		–0.236*	
		(0.124)	
2007 D/A quartile 4		–0.099*	
		(0.056)	
2007 D/A decile			0.254**
			(0.017)
2007 D/A decile^2			–0.013
			(0.017)

NOTE: Sample restricted to homeowners who did not move. Standard errors are indicated in parentheses. * indicates significance at the 10 percent or higher level; ** indicates significance at the 5 percent or higher level.

Leverage and Precautionary Behavior

The previous discussion suggests that precautionary concerns might induce highly leveraged households to be more likely to reduce spending. In particular, highly leveraged households might worry about future access to credit. They might anticipate a higher cost of job loss because they believe (correctly) that their high levels of leverage might make it more difficult to borrow to sustain their spending. Moreover, such concerns would likely have increased after the onset of the financial crisis and recession as both the risk of job loss and concerns about future access to credit worsened. In a related manner, highly leveraged households might tend to report greater precautionary concerns if they are uncomfortable because their leverage is too high compared with a behavioral benchmark.

Unfortunately, the SCF does not provide explicit information about households' expectations regarding their future access to credit or their desired leverage ratios, so it is difficult to directly test these channels. However, we can look for evidence of greater precautionary concerns in general, which might be expected to be correlated with worries about future credit access and higher-than-desired leverage.

To begin, households with greater precautionary concerns in 2009 presumably would be less willing to assume financial risk than before the financial crisis and recession. Thus, in Table 8, we examine the relationship between leverage and the change over time in responses to the following question:

> *Which of the following statements comes closest to describing the amount of financial risk that you are willing to take when you save or make investments?*
>
> 1. *Take substantial financial risks expecting to earn substantial return*
> 2. *Take above average financial risks expecting to earn above average returns*
> 3. *Take average financial risks expecting to earn average returns*
> 4. *Not willing to take any financial risks*

We identify households as willing to take risks if they select either the first or the second response above.

Table 8 shows that the change in willingness to assume financial risk varied by leverage; a larger share of highly leveraged households showed a reduction in risk tolerance. As the first two rows show, households in the top half of the leverage distribution have a higher average tolerance for risk than those with less leverage. In addition, tolerance for risk declined between 2007 and 2009 for households across all four leverage quartiles. However, the share with a decline was higher for households with more leverage. The third row of the table shows the share of households that reported less tolerance for risk in 2009 than in 2007; in other words, the difference between each household's 2007 and 2009 response was negative. The results in this row also indicate that a larger share of highly leveraged households showed a reduction in risk tolerance relative to their counterparts with less leverage. Interestingly, the last line of the table shows this difference is even more pronounced for the relatively fortunate households that experienced an increase in home values, incomes, and net worth.

Table 8

Changes in Households' Tolerance for Financial Risk between 2007 and 2009: 2007-09 SCF Panel

		Quartile of 2007 D/A ratio			
Characteristic	**All households**	**1**	**2**	**3**	**4**
Share willing to take financial risk:					
2007	0.21	0.10	0.25	0.27	0.21
2009	0.15	0.07	0.18	0.19	0.15
Share reporting less willingness to take financial risk in 2009 than in 2007	0.26	0.19	0.27	0.29	0.29
Share reporting less willingness to take financial risk in 2009 than in 2007 with increases in home value, income, and net worth	0.25	0.11	0.20	0.30	0.32

NOTE: Quartiles and all statistics were calculated on a weighted basis. Shares are based on the full sample of 3,857 households.

The SCF also asks respondents a question that assesses their need for precautionary savings: *"About how much do you think you (and your family) need to have in savings for emergencies and other unexpected things that may come up?*" Table 9 summarizes the responses to this answer. In both 2007 and 2009, the households with the most leverage reported lower precautionary needs in terms of dollar amounts. However, when these needs are compared with the liquid assets available, the most highly leveraged households tended to fall short of their desired needs; in other words, the median needs as a share of liquid assets were greater than 1. Furthermore, shortfalls for the mostly highly leveraged households were larger than for other groups. Indeed, in 2007, other groups tended to have enough liquid assets for precautionary purposes, with median ratios less than or equal to 1. The dollar amounts and shares for all groups rose between 2007 and 2009, as might be expected given the turmoil in economic conditions. In addition, the share increase was much larger for highly leveraged households than for those with less leverage. In 2009, households in the top quartile of leverage reported needing an amount of precautionary reserves more than three times as high as the value of their actual liquid assets. Even highly leveraged households fortunate enough to experience increases in their home values, incomes, and overall net worth show a considerably greater shortfall than their counterparts with less leverage. Given these large gaps, it is not surprising that highly leveraged households were more likely to report cutting back on spending.[12]

Thus, relative to households with less leverage, highly leveraged households not only showed a greater drop in risk tolerance but also a more pronounced jump in concerns about their ability to sustain their spending in the face of adverse economic developments. This evidence seems consistent with the view that high leverage may dampen spending partly through the indirect channel of heightening households' fears of not having access to credit in the future. However, we cannot be certain of this link given that the SCF questions explored are so loosely related to expectations of future borrowing constraints. Admittedly, the evidence could also be consistent

Table 9

Households' Precautionary Needs in 2007 and 2009: 2007-09 SCF Panel

		Quartile of 2007 D/A ratio			
Characteristic	**All households**	**1**	**2**	**3**	**4**
2007					
Median of desired precautionary reserves	$5,000	$5,000	$5,000	$5,000	$3,000
Median of desired precautionary reserves as a share of liquid assets*	1.1	0.9	0.9	1.0	1.6
2009					
Median of desired precautionary reserves	$6,000	$5,300	$10,000	$6,800	$5,000
Median of desired precautionary reserves as a share of liquid assets*	1.7	1.4	1.3	1.4	3.3
Median of desired precautionary reserves as a share of liquid assets with increases in home value, income, and net worth*	1.4	0.9	1.3	1.1	2.3

NOTE: Quartiles and all statistics were calculated on a weighted basis. Shares are based on the full sample of 3,857 households. *Statistics are computed for households with positive liquid assets.

with high leverage simply making households feel uncomfortable or vulnerable in some vague way—the "direct" channel described earlier. Given these uncertainties about interpretation of these results, we do not attempt to formalize the analysis by adding these measures to a probit regression as we did for the credit access and refinancing measures.

CONCLUSION

Results from the 2007-09 Survey of Consumer Finances are consistent with earlier research suggesting that high leverage has contributed to the lackluster growth in consumer spending since the onset of the recent recession. In particular, we find highly leveraged households were more likely to report spending cutbacks even after controlling for other factors expected to influence spending, such as changes in income and wealth. Furthermore, evidence suggests this linkage likely arises from several channels, including not only effects of high leverage on current access to credit and the ability to refinance, but also precautionary worries about the effects of leverage on future access to credit (and, possibly, worries related to their leverage being higher than a target ratio).

Future research should drill down further into the underpinnings of the relationship between leverage and spending. More work is needed to cleanly separate the different channels of causation. As yet, we have tapped only a limited portion of the rich set of attitudinal variables in the dataset to explore why high leverage may induce some households to cut back spending. More

comprehensive results in this area will shed light on what current levels of leverage (which still remain quite elevated for many households) might predict for the macroeconomic outlook and the efficacy of different policy options in the future.

NOTES

1 Cooper (2012) emphasizes that a negative relationship between consumption and debt at the household level existed before the Great Recession, suggesting that behavior itself does not appear to have changed in recent years. Thus, any dampening effect of debt on consumption at the aggregate level would have to be the result of more households being burdened by debt and leverage than in recent periods.

2 See Carroll, Slacalek, and Sommer (2012) for a somewhat different interpretation of how changes in the risk of job loss might cause borrowing constraints to change over time.

3 Allowing a highly leveraged borrower to refinance at a lower rate has partially offsetting effects for the original mortgage lender. On one hand, the lender earns less because of the drop in interest payments. On the other hand, by improving the borrower's cash flow, the decline in interest payments reduces the likelihood of a highly leveraged borrower defaulting. In the years following the financial crisis, lenders were generally unwilling to refinance mortgages for highly leveraged borrowers, suggesting that lenders estimated that those costs outweighed the benefits.

4 Casselman (2012) provides an anecdotal accounting of the concerns expressed by borrowers who perceive they have too much debt.

5 Mishkin (1977) argued that such behavior contributed to the unusually weak 1973-75 recession.

6 Note that coefficients on ex ante leverage should pick up some effects of the shock if these levels were correlated with the subsequent shock. Given that the highest levels of debt were seen in the areas with the largest housing busts (and, relatedly, the largest economic slumps), one might expect this to be the case. Indeed, we did find that the estimated coefficients were little changed when we substituted 2009 leverage for 2007 leverage in the regression analysis of households' propensities to say they were "cutting back."

7 We classified households based on the 2007-09 change in net worth relative to 2007 income and the 2007-09 percent change in income. We used the decile groupings rather than the actual changes to avoid undue weighting of extreme observations. However, we used the actual changes (as well other variants on these variables) and found little difference for the estimated coefficients of interest.

8 A somewhat similar question was asked in the 2007 wave, but we found it did not provide a useful benchmark for credit access because the look-back period was much longer—the preceding five years. The longer look-back period may explain why the frequency of households reporting they were denied credit was actually higher in this earlier wave despite the subsequent dramatic tightening of credit conditions.

9 One caveat is that our probit model makes strong assumptions about the empirical representation of equation (4).

10 This difficulty spurred a major government effort to facilitate such transactions, the Home Affordable Refinance Program (http://www.makinghomeaffordable.gov/programs/lower-rates/Pages/harp.aspx). However, the initial version of this program saw limited take-up because of various unanticipated obstacles (see Dynan, 2011).

11 A household was counted as having refinanced if it reported obtaining a new mortgage since the last survey that was taken out to "refinance or roll over an earlier loan" or to "borrow additional money on [its] home equity." Mortgages reported as "modified" (less than 1 percent of the sample) were not counted, as the term "modification" is typically associated with an accommodation provided by the lender on a distressed loan and so would be expected to have different dynamics (quoted material is from the 2009 SCF codebook; http://www.federalreserve.gov/econresdata/scf/files/codebk2009p.txt).

12 Highly leveraged households appeared to have had a larger jump in precautionary needs (relative to what they have available) and, as shown in Table 4, were more likely to report that they applied for credit between 2007 and 2009. Both developments could be congruent if highly leveraged households were engaging in "precautionary borrowing"; that is, they were attempting to access credit so as to build buffers of assets in anticipation of their credit possibly being cut off in the future.

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