

The Sustainability of U.S. Household Finances

Daniel H. Cooper
Federal Reserve Bank of Boston
daniel.cooper@bos.frb.org

Barry Z. Cynamon
Federal Reserve Bank of St. Louis
bcynamon@wustl.edu

Steven M. Fazzari
Washington University, St. Louis
fazz@wustl.edu

October 14, 2016
Preliminary draft, please do not quote without permission

Abstract:

The financial sustainability of U.S. households is usually proxied by intuitive measures, like the debt-income ratio, that are only loosely linked with a more rigorous definition of sustainability. We employ balance sheet and income data from the PSID to project lifetime resources and compare these resources with household consumption to assess household financial sustainability. Preliminary results show that while the vast majority of American households were sustainable in the mid 1980s, sustainability declined sharply through the early 2000s and remained low until the eve of the Great Recession. Sustainability improved modestly in the aftermath of the crisis, but remains well below levels from two decades ago.

Cynamon and Fazzari thank the Institute for New Economic Thinking for generous financial support that made the research presented in this paper possible. Cynamon thanks the Private Debt Project for supporting this study. The authors are grateful to Sarah Morse for research assistance. The findings and conclusions presented here are those of the authors and do not necessarily reflect the position of the Federal Reserve Banks of Boston or St. Louis or the Board of Governors of the Federal Reserve System.

I. Introduction

For several decades prior to the Great Recession of 2008 and 2009, the financial sustainability of U.S. households received growing attention in macroeconomic research, forecasting, and policy analysis. Many of the issues fall into one or more of three broad areas. First, well before the crisis, the declining personal saving rate began to raise concerns about the ability of households to finance retirement, college education, home purchases, etc.¹ Second, in the early 2000s some commentators worried about unsustainability in the trend of household debt.² Once the crisis broke out and household finances imploded with rising actual and threatened default rates, pronouncements of U.S. household financial unsustainability quickly became widespread. Third, even though economists have long argued that a rising share of income going to the wealthy will reduce spending per dollar of income, US aggregate household spending relative to income seemed strong despite a quarter century of rising income inequality from about 1980 to the eve of the Great Recession.³ Cynamon and Fazzari (2015b,c) argue that unsustainable household financial dynamics were concentrated in the part of the income distribution with stagnant incomes and that the Great Recession forced the consumption of this group back more in line with their income, slowing the recovery compared with the household spending dynamics typical of postwar recoveries. Petev, et al. (2011) reported that wealthier households did cut back their spending during the Great Recession, possibly in reaction to the sharp decline in the values of their financial assets at that time.

¹ Guidolin and La Jeunesse (2007) provide an overview of economic research on the decline in the US saving rate and link this issue directly to financial sustainability when they write (page 491) that “a negative personal saving rate simply means that U.S. households are consuming more than their after-tax income allows them to.”

² Early concerns about household debt and spending were raised by the late Federal Reserve Governor Edward Gramlich (e.g. in his 1999 speech “Consumer credit in the 21st century”, available <https://www.federalreserve.gov/boarddocs/speeches/1999/19991104.htm>). Pre-crisis academic articles on the topic include Godley and Izureta (2002), Palley (2002), Wray (2007), Cynamon and Fazzari (2008), and Setterfield (2008-09). See also Cynamon and Fazzari’s October 3, 2007 op-ed in the *St. Louis Post Dispatch*, “Consumer Spending—Not Housing—Is the Key: If Credit Dries Up, It’ll Get Ugly Out There.”

³ See Dynan, et al. (2004), Johnson, et al. (2006), and Bakker and Felman (2014).

These themes all sound possible alarms about the sustainability of household finances, particularly in advance of the 2008-09 crisis, but the analyses that support these ideas are somewhat unclear about what sustainability actually means. They usually rely on sensible, but largely intuitive, concepts rather than a systematic definition of financial sustainability *per se*. A falling aggregate saving rate may suggest trouble for households' retirement financing, but what saving rate would be adequate? Similarly, a rising aggregate debt-income ratio may suggest unsustainable spending, but what level of debt-income ratio would be sustainable and how does it depend on demographics and expectations about income growth? The answers to these questions likely differ across time, and the questions are best investigated at the household level taking into account differences based on demographics. For example, low saving can be sustainable for a younger household with rapidly rising income, and high debt is more likely to be sustainable with low interest rates, other things equal.

This paper strives to address these issues by considering household financial sustainability directly rather than relying on proxies like the saving rate or the debt-income ratio. The basic definition of sustainability we develop is straightforward: a household is sustainable if its current consumption path can be maintained through its remaining working and retirement years without leading to negative net worth in its terminal year.⁴ This definition requires a number of assumptions about future income and consumption growth, retirement circumstances, interest rates, rates of return on assets, and so on, that we lay out below.

⁴ This definition is closely related to the concepts developed by Auerbach, et al. (2016), who estimate what households can spend as determined by current net wealth and projected labor earnings, taxes, and transfers. While Auerbach, et al. (2016) estimate what households *could* spend sustainably, our study considers how sustainable spending relates to current *actual* spending. It also relates to the study by Scholz, et al. (2006), which estimated household wealth predictions based on a life cycle model and compared them to actual wealth. Scholz et al. (2006) estimated that roughly 80% of households with heads aged 40 or older, as of 1992, had the wealth level of wealth their life-cycle model predicted they should hold.

We implement this measure of financial sustainability and compare it with actual expenditure derived using data from the Panel Study of Income Dynamics (PSID). This rich source of information for a large, national sample of U.S. households provides balance sheet information beginning in 1984 (earlier for income data). The panel structure is critical because it allows the estimation of actual household expenditure by differencing household balance sheet variables across survey waves and exploiting the identity between income, spending, and the change in net worth as described in Cooper (2010). The PSID also provides extensive demographic data that allow us to consider how financial sustainability differs across sub-groups of the U.S. population.

Preliminary results show that financial sustainability has declined substantially over the past quarter century. For our baseline specification, the share of sustainable households dropped from nearly 70% in the late 1980s to just over 50% in 2008. The share of total consumption in the sample that exceeds our estimate of the sustainable level rose from 12% to as high as 24% in 2004, before dropping modestly. The timing of the dynamics of household sustainability are somewhat different, however, than suggested by research on this topic using aggregate data. For example, we find that the decline in sustainability begins in the early 1990s and was well entrenched by the early 2000s. This finding implies that problems in the household sector began before the years immediately prior to the financial crisis. Furthermore, our results show very little improvement in household financial sustainability since the crisis. This outcome raises the question of the consequences of a financially over-stretched American household sector going forward.

Section II of the paper derives the definition of sustainable household consumption from basic balance sheet identities. Section III explains how the sustainability calculations are

implemented with PSID data and describe our assumptions about household income growth and demographics that are necessary to estimate sustainable consumption. These calculations rely on original estimates of income growth profiles by age and education based on data from the Current Population Survey (CPS) and an algorithm to estimate Social Security benefits from individual historical income records. Section IV presents the sample characteristics and discusses how conventional measures of household financial health evolve in our data. Preliminary results for our sustainability measure are described in section IV. Section V concludes with a brief discussion of the implications of the limited improvement in household financial sustainability since the Great Recession.

II. The Algebra of Household Financial Sustainability

This section develops an operational definition of household financial sustainability. Our approach uses simple accounting identities to link the household balance sheet with key financial flows, such as after-tax labor and transfer income, capital income, debt service, and consumption. We derive the conditions for a sustainable consumption path that leaves the household with zero net worth in its terminal year. The focus is on households during their working years prior to retirement. We treat households as composed of two individuals to accommodate the possibility of two earners and different ages and longevity across partners. A household that consists of a single individual is easily handled by setting the data for one of the partners to zero.

Define nominal financial variables for a household at time t as follows. Variables with a k subscript are individual-specific and take on different values for each partner (indexed with 1 and 2). Variables without a k subscript are defined for the household as a unit:

A_t :	Assets, excluding the value of an owner-occupied home
H_t :	Nominal value of owner-occupied home
L_t :	Liabilities (debt)
r_t^A :	After-tax, nominal rate of return on assets
r_t^L :	After-tax, nominal interest rate on liabilities
$Y_{k,t}^{NA}$:	Disposable income for each adult partner, excluding asset income
$C_{k,t}$:	Consumption spending for each partner (excluding interest payments)
NW_t :	Net worth = $A_t - L_t$, measured at the end of period t

Stocks are measured at the end of period t . The division of household consumption between partners is somewhat artificial; we have no knowledge from the PSID survey questions about which partner consumes what. In fact, the way consumption is assumed to divide between the individuals in a two-partner household has no effect on our results except for what happens at the end of life when demographics might imply that one partner lives longer than the other. This issue is discussed in more detail below.

Assets rise over time because they earn nominal (after-tax) returns, because household outlays (consumption plus debt service) may be less than disposable income, and because the household may take on debt to acquire assets (or prevent assets from being drawn down if outlays exceed disposable income). Nominal home values also change over time; we assume housing assets appreciate at the rate of inflation (π). Formally, the law of motion for the total value of household assets is

$$A_t + H_t = A_{t-1}(1 + r_t^A) + H_{t-1}(1 + \pi) + (Y_{1,t}^{NA} + Y_{2,t}^{NA}) - (C_{1,t} + C_{2,t}) - r_t^L L_t + (L_t - L_{t-1})$$

which leads to the following expression for financial net worth ($NW_t = A_t - L_t$)

$$NW_t + H_t = A_{t-1}(1 + r_t^A) + H_{t-1}(1 + \pi) + (Y_{1,t}^{NA} + Y_{2,t}^{NA}) - (C_{1,t} + C_{2,t}) - (1 + r_t^L)L_{t-1}. \quad (1)$$

To make the solution for sustainable consumption tractable, we impose the assumption that the nominal return on assets is the same as the nominal interest rate on debt ($r_t^A = r_t^L = r_t$).⁵ Then equation 1 reduces to a law of motion for net worth that does not depend on the values of assets and liabilities separately:

$$NW_t + H_t = NW_{t-1}(1 + r_t) + H_{t-1}(1 + \pi) + (Y_{1,t}^{NA} + Y_{2,t}^{NA}) - (C_{1,t} + C_{2,t}). \quad (2)$$

Note that debt service is implicit in equation 2. If the household is a net debtor, NW_{t-1} is negative and nominal debt service is just $r_t(-NW_{t-1})$. If households have both financial assets and debt, they net out against each other. The assumption that $r_t^A = r_t^L$ is likely conservative for the sustainability calculations because the expected rate of return on the assets of a typical household is likely lower than the interest rate assessed on the liabilities of a typical household.

Another issue arises from the treatment of owner-occupied housing: should it be included in the asset and net worth variables in equations 1 and 2? The answer to this question depends largely on what happens to households' homes in retirement and at the end of life. Some households might downsize their home later in life, converting part of their home equity into cash that can finance retirement consumption. Some households may take out a reverse mortgage that cedes ownership of the house to the lender after the terminal year. Other households may choose to live in their home throughout retirement and include the home in a bequest. It is impossible to impose a general rule about these matters in the calculation of sustainable consumption for households that have not yet reached retirement. Instead, in the empirical work to follow, we consider two different treatments of owner-occupied housing in the definition of net worth. In the first case, we treat home equity like any other kind of asset in net worth.

⁵ This is a strong assumption. If the interest rate on liabilities is different from the return on assets, however, sustainable consumption will depend on the date when liabilities are paid off and that date will depend on every variable in the model. This makes the solution for sustainable consumption highly non-linear. We hope to generalize the model to allow for a more flexible balance sheet structure in future revisions and we will consider the robustness of our results to changes in this assumption in section IV of the paper.

Effectively this approach assumes that owner-occupied homes will appreciate in real terms at the same rate as any other asset that is part of net worth and that net worth in housing can be liquidated at no cost to finance consumption in retirement. In the second case, the home is excluded from net worth and is assumed to be passed to the household's heirs without mortgage debt. Reality for most households almost certainly lies between these two extremes.

Iterate the law of motion from equation 2 backwards from the household's terminal period back to the current year. The terminal year is the latest expected death year across the two partners in the household denoted as $NM = \max(N_1, N_2)$. We assume the nominal rate of return is a constant across years without loss of generality because only the geometric average of possibly time-varying r_t affects the results.

$$\begin{aligned}
NW_{NM} + H_{NM} &= NW_{NM-1}(1+r) + H_{NM-1}(1+\pi) + (Y_{1,NM}^{NA} + Y_{2,NM}^{NA}) - (C_{1,NM} + C_{2,NM}) \\
&= [NW_{NM-2}(1+r) + (Y_{1,NM-1}^{NA} + Y_{2,NM-1}^{NA}) - (C_{1,NM-1} + C_{2,NM-1})](1+r) \\
&\quad + (Y_{1,NM}^{NA} + Y_{2,NM}^{NA}) - (C_{1,NM} + C_{2,NM}) + H_{NM-1}(1+\pi)^2 \\
&= NW_{NM-2}(1+r)^2 + H_{NM-1}(1+\pi)^2 \\
&\quad + [(Y_{1,NM-1}^{NA} + Y_{2,NM-1}^{NA}) - (C_{1,NM-1} + C_{2,NM-1})](1+r) \\
&\quad + (Y_{1,NM}^{NA} + Y_{2,NM}^{NA}) - (C_{1,NM} + C_{2,NM}) \\
&\quad \vdots \\
NW_{NM} + H_{NM} &= NW_t(1+r)^{NM-t} + H_t(1+\pi)^{NM-t} \\
&\quad + \sum_{j=t}^{N_1} (Y_{1,j}^{NA} - C_{1,j})(1+r)^{NM-j} + \sum_{j=t}^{N_2} (Y_{2,j}^{NA} - C_{2,j})(1+r)^{NM-j} \tag{3}
\end{aligned}$$

Again, the period-by-period saving or borrowing appears in the $Y_{k,j}^{NA} - C_{k,j}$ term of the sum in equation 3 with the appropriate return (if positive) or interest cost (if negative). The assumption that the return on assets is the same as the interest cost on debt allows us to derive this simple formulation.

Our objective is to find a solution for current consumption (period t) that is sustainable in the sense that the present value of the projected consumption path, during remaining working years and retirement years is equal to current net worth plus the present value of future income

flows. In other words, for some assumed consumption growth profile, we solve for the current consumption level at which terminal $NW_{NM} = 0$. To do this, we need to make assumptions about the time paths of future income and consumption that depend on current values.

We divide consumption between household partners because of different retirement and death dates for each partner. In many cases, the life expectancy of the two partners are similar, but the gap varies. Our baseline case simply assigns half of household consumption to each partner. In other words, once one spouse dies, the household consumes half of what it did immediately prior to that death, until the death of the second spouse. We also consider the possibility that a fraction γ of current consumption is independent of the number of living partners and carries on as long as the household has any members. If $\gamma > 0$ then household consumption drops by $0.5 * (1 - \gamma)$ when one partner dies. For example, if $\gamma = 0.2$, the consumption of the household drops by 40% with the death of the first partner. The reason to allow γ to take on a nonzero value (where $\gamma = 0$ corresponds to the baseline fifty-fifty split between spouses) is that some parts of consumption, such as housing costs, do not drop proportionately when one partner in the household dies.⁶

We assume that consumption grows from its period t level at nominal rate f . The baseline value of f equals the inflation rate, which implies no real growth in projected consumption over the life course (we also consider the effect of assuming positive real growth in consumption). Each partner k in the household works through period M_k that is the normal retirement year for the individual as determined by the Social Security system.⁷ During retirement periods $M_k + 1$ through N_k , we assume that real consumption for each partner drops to β times consumption

⁶ Note that the fixed component is not discounted by the fraction β in retirement.

⁷ In our baseline case, every household member who is younger than normal retirement age works, but their income level is based on a weighted-average of prior earnings, so an individual who never worked would have zero projected income, and an individual who had not worked for several years would have minimal projected income.

along the path established in working years. The parameter β represents a one-time reduction in consumption that takes place during retirement with $\beta = 1$ giving complete consumption smoothing through retirement (the baseline case). Formally,

$$C_{k,j} = \begin{cases} C_{k,t}(1+f)^{j-t} & t \leq j \leq M_k \\ \beta C_{k,t}(1+f)^{j-t} & M_k < j \leq N_k \end{cases} \quad (4)$$

For a single-individual household, $C_{k,t}$ is the current observed value of consumption at time t in the data (denoted as C_t , without the individual k subscript).

We also link the projected path of future incomes to current values. In particular, we assume that non-asset income during each partner k 's working years grows at a nominal rate $g_{k,j}$ in each future period j until retirement:

$$Y_{k,j}^{NA} = Y_{k,t}^{NA} \prod_{i=t}^j (1 + g_{k,i}) \quad t \leq j \leq M_k .$$

We assume that $g_{k,j}$ varies depending on the individual's education level and age as described below. This specification assumes that the current income variable represents "permanent income," in the sense that an additional dollar of income today implies additional income for the remaining working years. We will discuss how we link current income data from the PSID to the permanent income variable that enters the sustainability calculation in the next section.

Individuals receive income in retirement from Social Security, which we express here in present value terms and discuss in the next section and the appendix.

With these assumptions, we can compute sustainable consumption. Although we divide consumption between partners, as discussed previously, sustainable consumption is defined at the household level, denoted by C_t^* . This level of consumption is the amount that, under our assumptions about the future path of income, spending, debt service, and asset returns, will result in a terminal net worth of zero. To solve for C_t^* , we set terminal net worth to zero in equation 3 and solve for the initial value of household consumption. Specifically, substitute the assumptions

for the projected paths of income and consumption into equation 3, and express the equation in present value terms by dividing by $(1 + r)^{NM-t}$ which yields:

$$\begin{aligned}
0 = & NW_t + H_t \left(\frac{1 + \pi}{1 + r} \right)^{NM-t} + PVSS_t \\
& + Y_{1,t}^{NA} \sum_{j=t}^{M_1} \left[\prod_{i=t}^j (1 + g_{1,i}) \right] \frac{1}{(1 + r)^{j-t}} + Y_{2,t}^{NA} \sum_{j=t}^{M_2} \left[\prod_{i=t}^j (1 + g_{2,i}) \right] \frac{1}{(1 + r)^{j-t}} \\
& - C_t^* \left(\frac{1 - \gamma}{2} \right) \sum_{j=t}^{M_1} \left(\frac{1 + f}{1 + r} \right)^{j-t} - \beta C_t^* \left(\frac{1 - \gamma}{2} \right) \sum_{j=M_1+1}^{N_1} \left(\frac{1 + f}{1 + r} \right)^{j-t} \\
& - C_t^* \left(\frac{1 - \gamma}{2} \right) \sum_{j=t}^{M_2} \left(\frac{1 + f}{1 + r} \right)^{j-t} - \beta C_t^* \left(\frac{1 - \gamma}{2} \right) \sum_{j=M_2+1}^{N_2} \left(\frac{1 + f}{1 + r} \right)^{j-t} \\
& - \gamma C_t^* \sum_{j=t}^{NM} \left(\frac{1 + f}{1 + r} \right)^{j-t}
\end{aligned} \tag{5}$$

The term $PVSS_t$ represents the present value of household Social Security benefits as estimated at time t . Equation 5 has an intuitive structure. It equates the present value of the projected consumption path, during a household's remaining working years and retirement years, to current net worth plus the present value of future income flows. Current net worth is carried forward one period because we define net worth as the beginning of period stock of wealth. In the baseline case, $\gamma = 0$ and $\beta = 1$ which simplifies the equation. Note that equation 5 can be used for a single-person household even though it is derived for a two-partner household. If the household consists of just one person, set $M_1 = M_2$ and $N_1 = N_2 = NM$ and equation 5 reduces to the correct specification.

To simplify the algebra, let $\lambda = (1 + f)/(1 + r)$ and use the formula for a finite geometric sum. Define the present value of the assumed future consumption path given by a dollar of consumption at time t for partner k as:

$$\begin{aligned}
V_{k,t}^C &= \sum_{j=t}^{M_k} \lambda^{j-t} - \beta \sum_{j=M_1+1}^{N_k} \lambda^{j-t} = \sum_{j=0}^{M_k-t} \lambda^j - \beta \lambda^{M_k-t+1} \sum_{j=0}^{N_k-M_k-1} \lambda^j \\
&= \frac{1 - \lambda^{M_k-t+1}}{1 - \lambda} + (\beta \lambda^{M_k-t+1}) \frac{1 - \lambda^{N_k-M_k}}{1 - \lambda} \quad (6)
\end{aligned}$$

Similarly, the present value of a dollar of fixed consumption until the end of life for the surviving partner is:

$$V_t^C = \frac{1 - \lambda^{N-t+1}}{1 - \lambda} \quad (7)$$

The present value of a dollar of extra current income for partner k at time t is:

$$V_{k,t}^Y = \sum_{j=t}^{M_k} \left[\prod_{i=t}^j (1 + g_{k,i}) \right] \frac{1}{(1+r)^{j-t}} \quad (8)$$

The V terms are intermediate calculations that are useful in defining sustainable consumption, but they also have interesting interpretations on their own. In particular, if f , r , and $g_{h,i}$ are zero, the expressions simply reflect years of life remaining ($V_{k,t}^C$ terms) or years of work remaining ($V_{k,t}^Y$ terms). For example, $V_{k,t}^Y$ will be larger for younger people because a dollar of extra income today, which we assume implies additional income over the household's remaining working life, is more valuable for a household that has more years to work. A young household will also have larger $V_{k,t}^C$ terms because an additional dollar of consumption today implies a higher path of future consumption over more years than for an older household. Intuition suggests that the ratio of the present value of household resources to the present value of household consumption will play a central role in the sustainability condition.

Indeed, this intuition is supported by the algebra of the sustainability equations. Starting from equation 5 and substituting in the definitions from equations 6 through 8, the sustainability condition becomes:

$$\begin{aligned}
0 &= NW_t + H_t \left(\frac{1 + \pi}{1 + r} \right)^{NM-t} + Y_{1,t}^{NA} V_{1,t}^Y + Y_{2,t}^{NA} V_{2,t}^Y + PVSS_t - C_t^* \left[\left(\frac{1 - \gamma}{2} \right) (V_{1,t}^C + V_{2,t}^C) + \gamma V_t^C \right] \\
C_t^* &= \left[\left(\frac{1 - \gamma}{2} \right) (V_{1,t}^C + V_{2,t}^C) + \gamma V_t^C \right]^{-1} \left\{ NW_t + H_t \left(\frac{1 + \pi}{1 + r} \right)^{NM-t} + [Y_{1,t}^{NA} V_{1,t}^Y + Y_{2,t}^{NA} V_{2,t}^Y] \right. \\
&\quad \left. + PVSS_t \right\} \tag{9}
\end{aligned}$$

The numerator of equation 9 is the present value of lifetime resources available to the household. The denominator defines the amount of sustainable consumption over the household's remaining lifetime that a dollar of current resources can purchase.

A different, but equivalent, way to think about sustainability is to replace C_t^* with the household's current level of consumption (C_t) and then solve the sustainability condition for NW_{t-1}^* --the level of current net worth that the household would need for its current consumption to be sustainable under our assumptions.

$$\begin{aligned}
NW_t^* &= \left[\left(\frac{1 - \gamma}{2} \right) (V_{1,t}^C + V_{2,t}^C) + \gamma V_t^C \right] C_t - H_t \left(\frac{1 + \pi}{1 + r} \right)^{NM-t} - [Y_{1,t}^{NA} V_{1,t}^Y + Y_{2,t}^{NA} V_{2,t}^Y] \\
&\quad - PVSS_t \tag{10}
\end{aligned}$$

The difference between NW_{t-1}^* and actual net worth for a household with unsustainable consumption estimates the present value of the reduction in spending needed for the household to become sustainable relative to its current path. Of course, this concept depends on the expectations embodied in the assumptions about asset returns, debt costs, income growth, and household demographics.

III. Implementation and Data

To implement the sustainability calculations, we require household-level data on income, consumption, and net worth along with methods that project income, rates of return on assets, and debt service costs over the remainder of households' life times. We also need to estimate the

present value of future Social Security payments from the household's current income and demographic information.

Micro data on household income and balance sheet variables are available from several sources; the challenge is consumption. The Survey of Consumer Finances and the Current Population Survey have no consumption data. The Consumer Expenditure Survey appears to have the necessary information, but it is well known to understate total household consumption, most obviously for higher income households (Cooper (2010), Sabelhaus (2010), and Carroll, et al. (2015)).⁸ We employ information from the Panel Study of Income Dynamics (PSID). The PSID also does not include full measures of total household consumption, but its panel structure presents the opportunity to exploit income and balance sheet identities to infer total household outlays (defined as consumption plus personal transfers and debt service). We rely on the methods developed in Cooper (2010) to estimate household outlays in the PSID from the identity:

$$\text{Household Outlays} = \text{Household Income} - \text{Tax Payments} - \text{Active Change in Net Worth}$$

The panel structure is critical to compute the change in net worth within households, a variable that cannot be calculated from repeated cross sections, such as the Survey of Consumer Finances. We estimate the passive change in net worth due to capital gains or losses and remove it from the change in net worth in order to estimate outlays. The PSID does not track taxes; following the existing literature, we estimate tax payments using the NBER TAXSIM software that calculates federal and state tax liabilities from detailed household characteristics and financial data.⁹

⁸ Passero et al. (2015) estimate that the Consumer Expenditure survey understates personal consumption and that the magnitude of the understatement has increased significantly between 1992 and 2010.

⁹ The implementation of this tax estimation is similar to the procedure described in on-line appendix for Cooper, et al. (2015).

Although some variables in the PSID go back to 1969, including household income and some of its components, household balance sheet data were not collected until 1984 and then just every five years after that time. Starting in 1999, the PSID shifted to biennial surveys—each of which contain household balance sheet information. The final survey wave available as of this writing is the 2013 wave, in which respondents reported their 2012 income. Differencing the balance sheet data between survey waves yields consumption estimates for three five-year periods, 1984-1988, 1989-1993, and 1994-1998. Beginning with 1999-2000, we have consumption estimates over each two-year period through 2011-2012. We have adjusted the data to estimate the current-dollar flows of consumption and income for the final year of each period (1988, 1993, 1998, and 2000, 2002, ..., 2012).

As discussed above, differencing household balance sheet data across survey waves leads to estimates of household outlays. The primary difference between outlays and consumption for our purposes is that outlays include interest payments on debt. In the sustainable consumption definition, interest costs are inferred by the nominal rate of return on household net worth, and thus they should not be included in the consumption variable. To define consumption, we therefore remove debt service costs from outlays.¹⁰

We estimate the interest portion of households' debt service for mortgages, vehicle loans, and other debt as follows. Outstanding balances and interest rates on first and second mortgages are obtained directly from the PSID survey. Survey data on loan balances and interest rates are also available from the PSID for first, second, and third vehicle loans. The PSID provides the value of other debt (much of which is likely generated by credit cards) but does not have information about interest rates on that debt. We estimate the interest costs of other debt with the

¹⁰ Personal transfers, such as charitable contributions, are treated as consumption for our purposes. These items are likely small, they average about 1% of aggregate household disposable income in recent years according to the National Income and Product Accounts.

48-month auto loan rate. Further details about the variables we used and their sources appear in the data appendix.

The sustainability calculation further requires us to calculate the present value of households' future income. This is a two-step process where we first define a baseline non-asset income variable for each household member ($Y_{k,t}^{NA}$) in every period for which we have data. Second, we choose a dynamic path to project this income over each individual's remaining working years ($V_{k,t}^Y$) based on a set of future income growth rates, given the individual's characteristics, that are appropriately discounted back to the current period. Retirement dates are assumed to correspond with the year in which each individual is eligible for full Social Security benefits, rounded to the nearest year (age 65 to 67, depending on the birth year of the individual).¹¹

Our baseline non-asset income for each partner comes from the PSID data on individual's labor and business income.¹² An important issue for the study of household sustainability is the difference between permanent and transitory income. A negative transitory income shock could make a sustainable household look unsustainable in a given period, and vice-versa. To address this question, we implement an algorithm to estimate period-by-period permanent income for each household. The details are described in the appendix. Briefly, the calculation is done in two steps. First, we interpolate any missing income data for prior years with adjustments to index for both inflation and real income growth. The real growth estimate varies for each income observation based on the education of the individual and their age at the time of the missing

¹¹ A chart showing the relationship between birth year and normal retirement age is available from the Social Security Administration website here: <https://www.ssa.gov/oact/progdata/nra.html>.

¹² The PSID records business income separately from labor income. For 1983 through 1991, business income data is combined for household partners. We split this income between partners using the share of reported labor income for each person. We also adjust income to account for discrepancies between reported taxable income and the individual labor and business income components.

income observation. Second, we proxy permanent income for a given year as a weighted average of historical indexed data. We obtain after-tax permanent income using the household's average tax rate (assumed constant over future periods) obtained from TAXSIM.

The future growth rates for each partner's labor and business income consist of three components: overall inflation, an aggregate assumption about real wage growth, and an individual-specific component. Future income is assumed to grow at a rate that compounds these three components. For our benchmark calculations, we assume aggregate inflation is 2.0 percent and aggregate real wage growth is 1.5 percent. The individual-specific component of future income growth comes from a detailed analysis of data from the Current Population Survey (CPS). In particular, we calculate the age-specific deviation of wage growth from average growth for four different education groups, and assign this measure accordingly based on households' age and education, treating. We treat households' labor income and business income symmetrically. See the appendix for further details about these estimates.

In addition to the permanent labor and business income variables for the two primary partners in the household, we add two other income terms. The first is the household's transfer income obtained prior to normal retirement age. This item is reported by the PSID. It is zero for most observations, but can be substantial for some households. It accounts for about 6% of the total amount of income used in the sustainability calculations, a proportion that does not vary much over the periods studied. We assume that transfer income is not taxable and that it grows at the aggregate nominal rate (3.5% for the baseline results), from the current period (year t in the equations above) until the household head's normal retirement age.¹³ The second additional income item is survey responses about the taxable income of other family members, that is,

¹³ The logic of stopping transfer income at normal retirement age is that we incorporate a separate estimate of Social Security income beginning at normal retirement age. We effectively treat transfer income as permanent, which may bias the results in favor of sustainability if the transfer income is transitory.

taxable income earned by members of the household in addition to the earnings of the household head and spouse (if applicable). We do not have age and education data for these other family members so we assume that this income will continue until the household head's normal retirement age and will grow at the aggregate nominal growth rate assumed for other calculations. This component is zero for most households but constitutes about 6% of the total sample income.¹⁴ Taxes on this component are assumed to be levied at the household's average tax rate.

The discount rate used in all the V terms in equation 9 is the nominal, after-tax rate of return on assets. For the baseline results, we assume that the pre-tax rate of return is two percentage points above inflation. The after-tax rate is the pre-tax rate multiplied by one minus the household's average tax rate.

Net worth is a central variable for household financial sustainability. The PSID survey includes nominal financial asset values for cash, stocks, bonds, and IRA accounts. There are also data on the value of the household's residence (if the household is a homeowner) and other real estate. Liabilities consist of the remaining principle on mortgages, vehicle debt, and an other debt variable (which includes credit card and student loan debt). We use two definitions of net worth (assets less liabilities), one that includes and one excludes the value of owner-occupied housing, as discussed earlier.

The details about how we estimate the present value of Social Security benefits ($PVSS_t$) are described in the appendix. The basic idea is to use Social Security benefit formulas to estimate individual benefits from information about a household's structure and each partner's income. An individual's income record consists of two parts. First, historical data from the

¹⁴ These assumptions are also likely to bias the results in favor of sustainability. The most likely sources of other family member income would be from children of the primary partners or older relatives. In either case, one would expect the income to end prior to normal retirement age of the household head.

earliest recorded observation in the PSID through the current time period t . Second a projection of income up to the individual's retirement age (M_k), which equals the full retirement age for that individual determined by the Social Security system based on his/her birth year (between the age of 65 and 67 for individuals in our study). We consider various options for spousal benefits and implement an algorithm that chooses the plan that maximizes the present value of Social Security benefits for the household.¹⁵

IV. Sample Characteristics: Evidence of Rising Household Financial Fragility

Our analysis sample from the PSID contains roughly 54,000 observations between 1983 to 2012. Due to data availability, the frequency is lower in 1988, 1993, and 1998 than in 2000 through 2012. The analysis sample is restricted by imposing several rules to assure a consistent data set for all of the empirical exercises reported here. The details of these rules are given in the appendix.¹⁶ The financial data for our PSID household sample are similar to data from other information for the U.S. household sector, although there are some modest differences compared to other data sources as we discuss below.¹⁷

¹⁵ We do not include income from private defined-benefit pensions. The prevalence of these pension plans has decreased markedly in recent years.

¹⁶ Our approach is most relevant for working-age households following the period of full-time education, which we define as age greater or equal to 25 and less than or equal to Social Security full retirement age. For a household to be included in a given year, it must have survey balance sheet data in the survey waves that both precede and follow the year so that its net worth can be differenced to estimate its outlay flow over the period. The annual number of observations range from 3,822 to 4,433 for 1988, 1993, and 1998, and 5269 to 6868 for 2000 through 2012. See the appendix for further details about sample restriction rules.

¹⁷ The data presented here are compiled using PSID sample weights designed to make the sample more representative of the US population. That said, the weights have not been adjusted to account for the sample restrictions based on age and data availability needed for this study.

Table 1
Sample Pre-Tax Income Distribution (Thousands of Current Dollars)

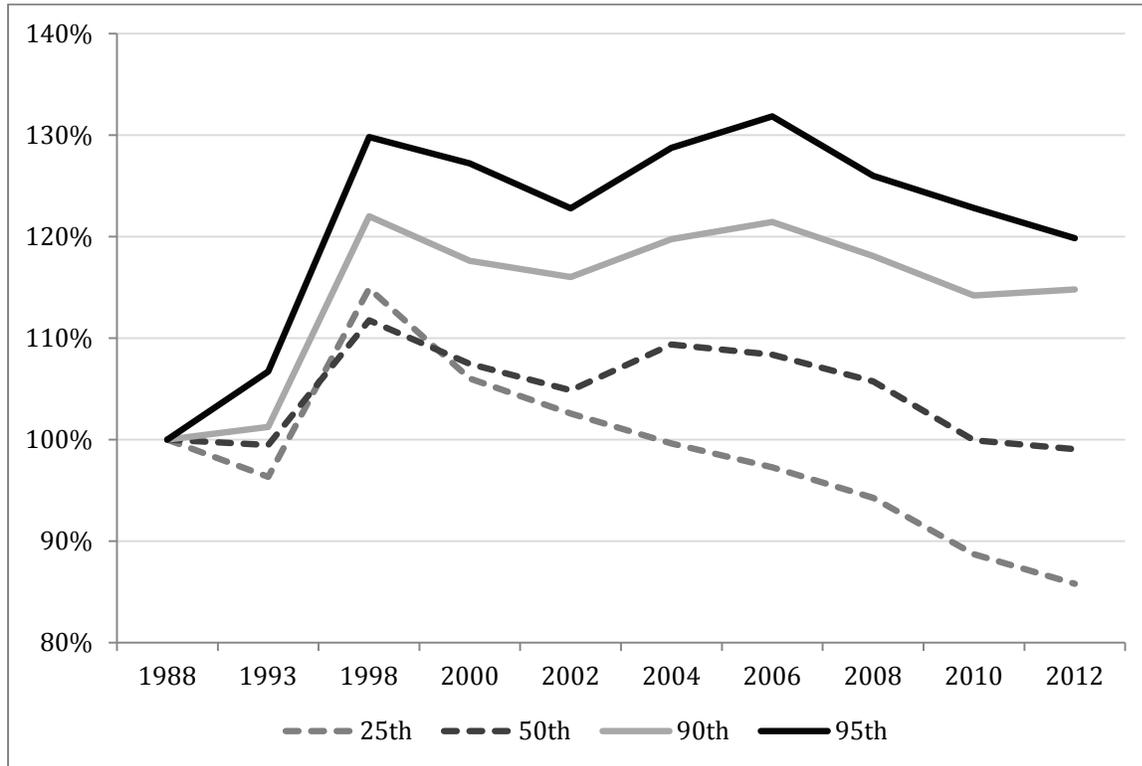
Year	Upper Limit of Family Income Percentile			
	25 th	50 th	90 th	95 th
1988	21.1	35.4	80.3	99.3
1993	24.0	41.6	96.1	125.3
1998	31.3	51.0	126.3	166.2
2000	30.0	51.0	126.6	169.4
2002	30.0	51.4	129.0	168.9
2004	30.4	56.0	139.1	185.0
2006	31.4	58.6	149.0	200.1
2008	32.1	60.4	153.0	201.9
2010	30.7	58.0	150.4	200.0
2012	31.0	60.0	157.8	203.7

Table 1 presents data on the distribution of pre-tax household income from our analysis sample. Data for median income are somewhat higher than statistics for all U.S. households. This outcome is not surprising considering that our sample excludes households with the head younger than 25 or older than normal retirement age. The upper limit of family income percentiles for the affluent correspond well reasonably with other measures of the 90th and 95th, percentiles of the income distribution.

Figure 1 presents the evolution of household income for select percentiles of the income distribution. The data are plotted relative to their value in 1988 so each point on the graph can be interpreted as the cumulative growth in income relative to 1988 for a household at that percentile of the income distribution. The data are adjusted for inflation using the PCE chain-weighted price index. The figure shows that, over the full sample, real income declined for the lower income households in our sample and remained roughly constant at the median. In contrast, higher income groups experienced real income growth over the sample period. There was a

noticeable drop in real earnings for all groups in the Great Recession and its immediate aftermath.¹⁸

**Figure 1 – Cumulative Real Household Income Growth Profiles
Selected Percentiles**

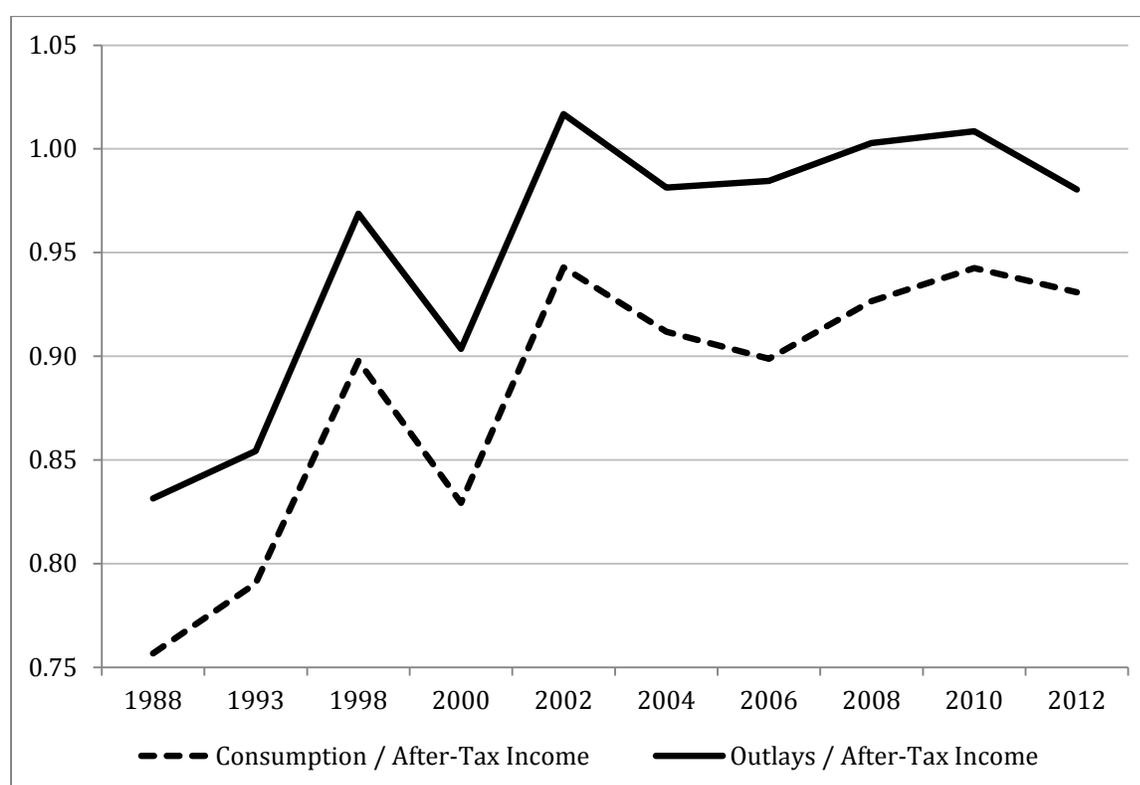


Consumption and outlays relative to income follow similar trajectories. Figure 2 plots the ratio of both estimated outlays and consumption to estimated after-tax income. Although there is some volatility, the ratios show a clear upward trend from 1988 through 2002. The spending ratios remain at a high level through the mid 2000s before declining modestly post-crisis in 2012. Since, the personal saving rate equals one minus the outlay-income ratio, the rise in the ratio corresponds to the decline in the personal saving rate. The data suggest that, on average, the personal saving rate moved slightly into negative territory (outlay rate greater than one) for several years between 2002 and 2010. This difference from the personal saving rate series

¹⁸ The data are also broadly consistent with the well documented rise in income inequality over this time horizon—higher income households experienced income gains while incomes for households in the lower part of the distribution stagnated or even fell.

reported in the National Income and Product Accounts can be explained by the fact that household surveys measure only cash income. Households do not report significant income flows that the Bureau of Economic Analysis assigns to households such as housing services. Cynamon and Fazzari (2015a) show that when the aggregate data are adjusted to correspond to the kind of cash flow accounting relevant for household survey data, the cash flow saving rate falls below zero.¹⁹

Figure 2 – Outlays and Consumption Relative to After-Tax Income
(Ratios of summed values within sample periods)



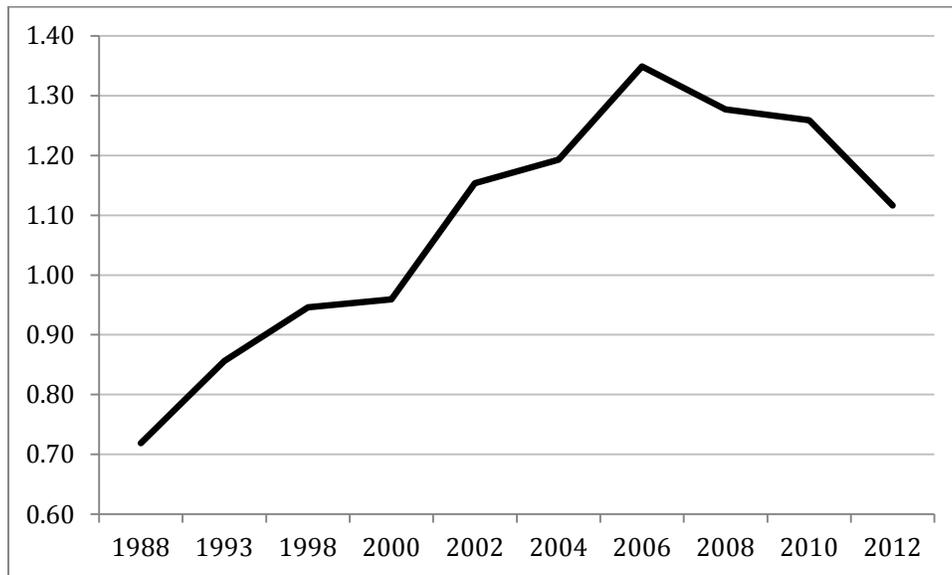
Outlay rates that average about 100 percent for a decade highlight the potential unsustainability of household finances. There is also some evidence of a modest cutback in household outlays following the crisis between 2010 and 2012. We provide more systematic

¹⁹ The relevant concept from Cynamon and Fazzari (2015a) is the adjusted gross household saving rate that includes new residential construction as saving but does not subtract depreciation on the housing stock. In updated data since publication of that study, this saving rate goes negative in 1997 and remains negative most of the time until becoming slightly positive in 2009. The minimum of this rate is -2.6 percent, roughly consistent with the minimum cash saving rate from Figure 2 of -1.5 percent in 2002.

evidence on the state of household finances below when we document results from our sustainability calculations.²⁰

Figure 3 shows that households in our sample took on much more debt relative to their after-tax income up until the eve of the Great Recession. Indeed, the debt-to-income ratio (DYR) nearly doubled from the mid 1980s to its peak in 2006. Aggregate household debt data from the Federal Reserve’s Flow of Funds accounts relative to NIPA aggregate disposable income rose by a similar amount over the same period. (The ratios in Figure 3 are calculated by adding up total sample debt and total sample income in each period, using the PSID sampling weights, and then dividing.) Like in the aggregate data, household debt relative to income in our sample declines following its pre-crisis peak.

Figure 3 – Household Financial Liabilities to After-Tax Income
(Ratios of summed values within sample periods)



²⁰ The peak in the ratios in 2010, rather than 2008, may seem inconsistent with the timing of the financial crisis. However, a detailed analysis of the components of the ratios in Figure 2 shows that while consumption and outlay growth did indeed decline between the 2008 and 2010 periods, the income decline was larger, pushing the ratio in Figure 2 upward. The decline in consumption and outlays accelerates in the 2012 period, while income is roughly flat between 2010 and 2012.

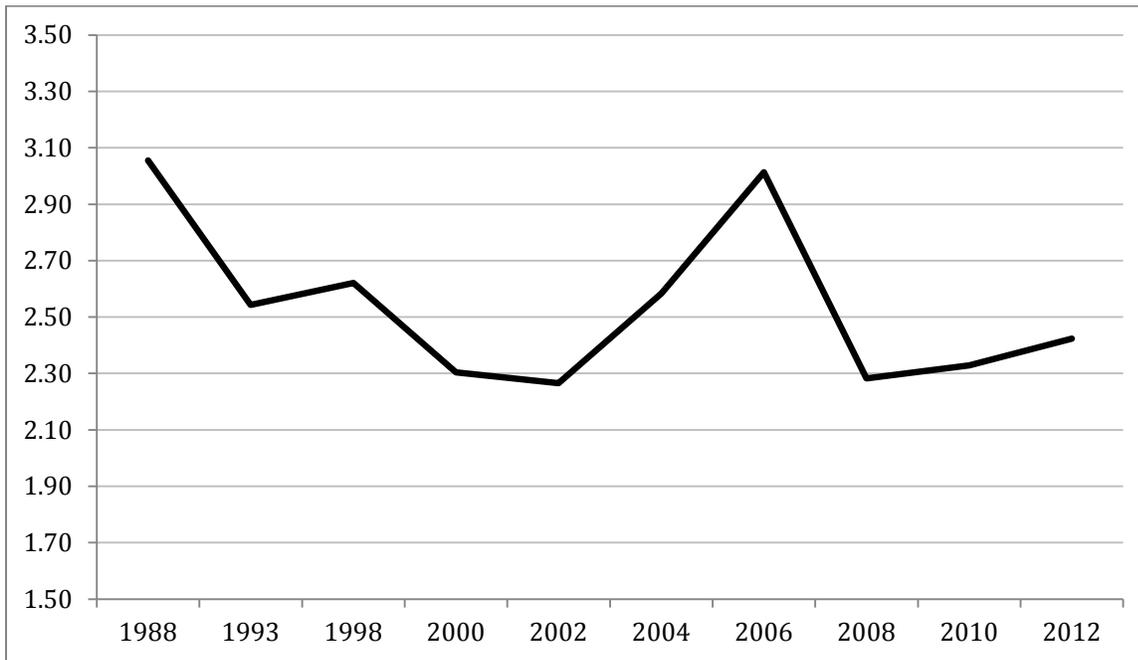
The aggregate trend in household debt relative to income masks substantial heterogeneity in debt across households. Table 2 shows the evolution of selected percentiles of the household DYR in our sample. About 24 percent of all households in the sample have no financial liabilities at all. The median DYR seems fairly modest at 0.46, especially considering that the ratio is much higher when we aggregate debt and income by year across households. Clearly, the distribution of household debt-to-income is highly skewed. But even the modest median ratio nearly doubles from 1988 to 2006. The DYR also increases significantly at higher percentiles of the distribution. Indeed, most households in our sample were taking on much more debt relative to income in the years leading up to the financial crisis.

Table 2 – Distribution of Household-Level Debt to After-Tax Income Ratio

Year	Percentiles			
	25	50	75	95
1988	0.00	0.26	1.06	2.45
1993	0.00	0.34	1.27	2.74
1998	0.05	0.58	1.47	2.98
2000	0.04	0.57	1.51	3.17
2002	0.06	0.66	1.76	3.62
2004	0.05	0.70	1.83	3.89
2006	0.07	0.72	1.96	4.28
2008	0.04	0.63	1.88	4.11
2010	0.02	0.60	1.85	3.95
2012	0.00	0.51	1.68	3.91

Figure 4 plots to measures of net worth to after-tax income from our analysis sample with the numerator and denominator of the ratio aggregated by period. The trend toward weaker household balance sheets is also evident in the household net worth data from the beginning of our sample until the early 2000s. The upward spike in 2004 and 2006 is due almost entirely to the increase in home values, which reverses in 2008.

Figure 4 – Household Net Worth to After-Tax Income
(Ratios of summed values within sample periods)



The household-level net worth distribution also provides useful information. In the early part of the sample, net worth is positive for about 80 percent of households in our analysis sample. By 2012, however, only 60 percent of households have positive net worth. Table 3 provides detailed information on the households' net worth relative to after-tax income (NWY) and shows that median net worth plummeted in the aftermath of the financial crisis.²¹ High net worth households (90th and 95th percentiles) also experienced falling NWY in 2008, before recovering post-crisis. However, there is little or no rebound in NWY in 2010 and 2012 in the lower parts of the NWY distribution.

²¹ With our timing conventions, stocks are measured in the year of the survey wave following the period over which flows are measured. Therefore, the 2008 net worth data are surveyed at some point in 2009, likely after the largest crisis-induced decline in asset prices.

Table 3 – Distribution of Household Net Worth relative to After-Tax Income

Year	Total Net Worth to After-Tax Income				
	Percentiles				
	10 th	25 th	50 th	90 th	95 th
1988	-0.08	0.27	1.19	5.76	8.46
1993	-0.21	0.21	1.14	5.07	7.93
1998	-0.28	0.15	1.12	5.57	8.33
2000	-0.36	-0.01	0.85	4.82	6.96
2002	-0.40	-0.01	0.90	5.25	7.70
2004	-0.42	-0.01	0.95	6.11	8.83
2006	-0.50	-0.04	0.99	6.29	9.35
2008	-0.69	-0.13	0.65	4.99	7.33
2010	-0.77	-0.16	0.59	5.47	8.61
2012	-0.79	-0.15	0.57	5.50	7.86

Overall, the characteristics presented in the analysis sample portray a consistent picture of rising household financial fragility prior to the financial crisis—with the fragility continuing for some during the recovery. The data seem broadly consistent with a now-common narrative for the pre-crisis period that many households sharply increased their debt, often to unsustainable levels (barring continued rapid increases in house prices). As house prices dropped and job losses mounted, the debt for many households became unmanageable and added to the severity of the downturn. But while the above evidence is suggestive of households' financial troubles, it does not *directly* measure changes in household financial sustainability in the years leading up to the crisis. It is tempting to look at trends in household debt and asset holdings and claim that they were unsustainable, but one cannot definitely draw such conclusions without a formal measure of households' financial sustainability.

V. Household Financial Sustainability

In this section we employ our measure of household financial stability presented in section II to investigate the share of U.S. households that are financially sustainable and how the

share has changed in recent years. In addition, we use our results to consider how much of aggregate consumption could be classified as unsustainable?

Figure 5 plots the baseline share of sustainable households using the benchmark parameters and implementation assumptions discussed in section III. In 1988, the consumption of just under 70 percent of households in our sample is sustainable. However, the share of sustainable households declines quickly over the next 10 years, dropping about 14 percentage points. There is some recovery in 2000, but then the sustainable share declines again to its low in 2008 when our measure shows that almost half of American households are financially unsustainable. Sustainability improves very little in the years following the financial crisis.

Figure 5 – Share of Financially Sustainable Households

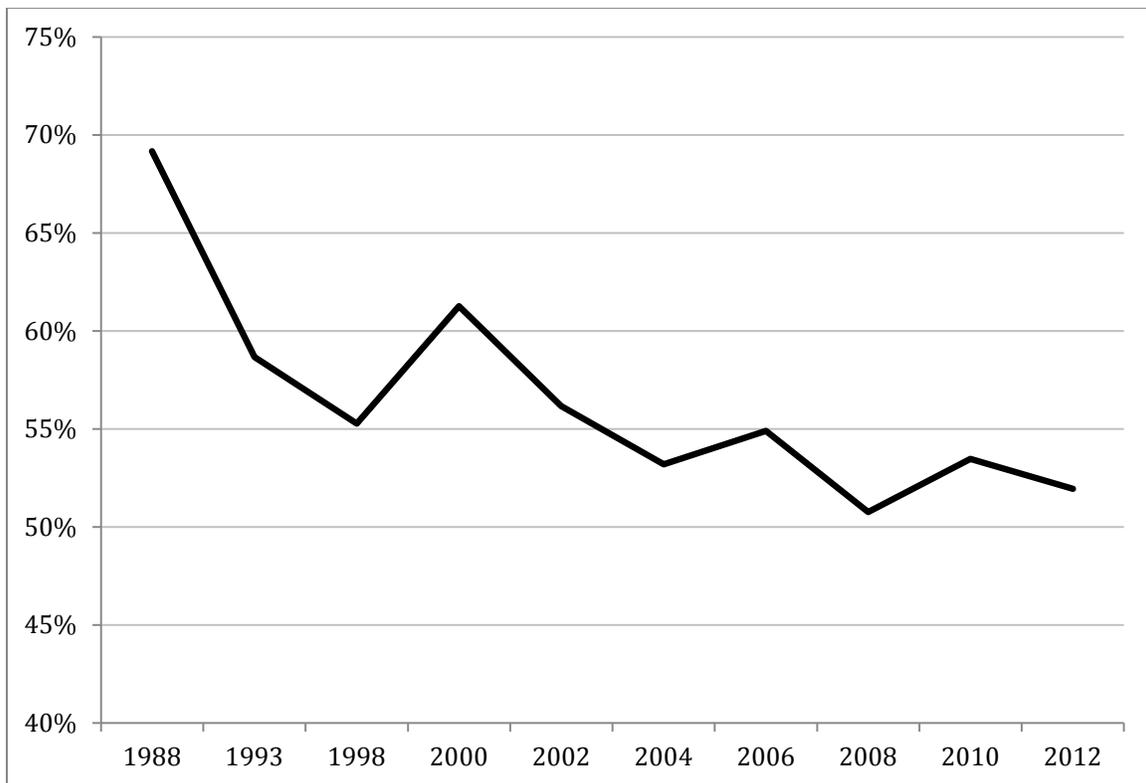
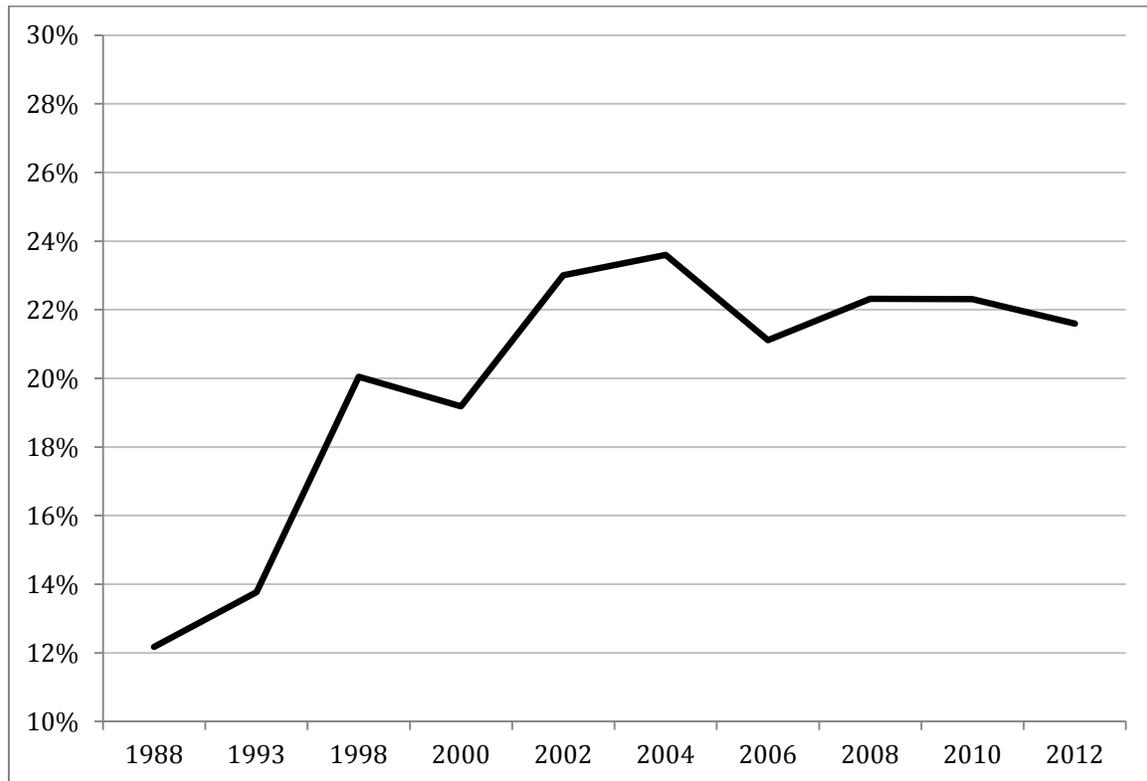


Figure 6 – Consumption at Risk (CAR) as Percentage of Total Sample Consumption



Continuing with our baseline assumptions, Figure 6 shows the percentage of total consumption in the sample that we define as “at risk” in the sense that this consumption would be lost if unsustainable households were forced onto sustainable spending paths. In particular, we define “consumption at risk” (CAR) as actual consumption less sustainable consumption (equation 9) for households we determine have unsustainable spending. (CAR is equal to zero for households who are not flagged as unsustainable.)²² The share of CAR approximately doubles between 1988 and 2004,. The share of CAR is little changed after 2006 even during the financial crisis and its initial aftermath.

²² The data in figure 6 are computed by adding up CAR over all unsustainable households in each period and then dividing that sum by the total sample consumption for that period.

The timing of the major decline in sustainability and the subsequent increase in CAR may be somewhat surprising in the context of the narratives that suggest that unsustainable household finances helped cause the Great Recession. Indeed, the DYR peaks in 2006, and the period from 2002 through 2006 is considered the heyday of the housing bubble when credit flowed freely and many consumers took on ill-advised amounts of housing and other debt. Yet, most of the change in financial sustainability occurs from the early 1990s through the early 2000s—suggesting that the dynamics that moved the household sector toward financial fragility began earlier than is often recognized. Note that this timing is also broadly consistent with the behavior of the debt-income ratio. Once a household’s spending becomes unsustainable, it may finance its given amount of spending in excess of the sustainable level by taking on more debt each year. Indeed, for a household spending beyond the sustainable level, debt rises even as consumption remains constant; that is, the rate of *change* of debt is a signal of the *level* of unsustainable consumption and outlays.²³

The data in our analysis sample support an explanation for the Great Recession based on the idea that the economy was fueled to some extent by unsustainable household spending prior to the recession and that the end of this spending contributed to the downturn, although the timing, again, may be somewhat different from the usual story. Mean household consumption in the analysis sample (adjusted for inflation and weighted by PSID population weights) grew a robust 15.0% from 2000 through 2004, but from 2004 to 2008 average household consumption fell 3.9%, and it fell another 2.8% between 2008 and 2012. Considering the timing uncertainties inherent in the biennial survey waves, one should not focus too much on the exact timing of

²³ Cynamon and Fazzari (2015) develop this idea for the aggregate DYR ratio more formally. The authors also point out that this outcome is possible, but not necessary, at the household level. For example, an unsustainable household may not take on any debt but may not be saving adequately for retirement. This example shows the benefit of the encompassing definition of financial sustainability that we develop here as opposed to relying on a single proxy measure like the DYR.

these changes, but note that unsustainable household spending behavior peaked somewhat earlier than one might expect.

One counterfactual result that can be obtained only with our approach is an assessment of where household sustainability stands in the aftermath of the crisis compared to an earlier benchmark. Despite a modest bump up in the sustainability share from its low point in 2008, household financial sustainability in 2012 is nowhere near where it was at the beginning of the sample. To put this result into perspective, we ran a version of our sustainability calculations under the assumption that households consume just 50% of their working-year spending in retirement (this is accomplished by setting the parameter β to 0.5 in equation 9). With this change, the 2012 period the share of sustainable households is roughly the level of 1988 in the baseline case. That is, for the sustainability share in 2012 to be the same as in 1988, households that planned to smooth their consumption through retirement in 1988 would need to plan to cut their retirement consumption in half by 2012. These calculations show that household financial sustainability remains far lower than it was prior to the acceleration of household sector spending and borrowing two decades ago.

These findings also make several assumptions that are favorable to sustainability. We have assumed 1.5 percent real aggregate growth in households' future labor income. This aggregate wage growth assumption is consistent with the historical experience over our sample. But it is optimistic relative to recent wage stagnation.²⁴ Furthermore, we assume no real growth in consumption. It would be reasonable to assume that households who experience real wage

²⁴ This growth rate is adjusted at the household level for age and education as described in section II and the appendix. Also note that this future growth assumption is constant across all periods. For example, we assume 1.5% aggregate income growth until retirement for all households in the 1988 period as well as for households in the 2012 period. If expected real income growth declined over the sample years, as may be reasonable especially for households outside the top income groups, the decline in sustainability would be even more severe. We will explore this issue in upcoming versions of this paper.

growth would anticipate a corresponding path of real consumption growth. If we assume a 1% annual real consumption growth rate in the model, which is still less than the assumed real wage growth, the share of sustainable households in 2012 falls by more than 14 percentage points (so that just over a third of households are sustainable by the end of the sample) and the CAR percentage rises to 30 percent. In addition, our assumption that the nominal interest rate on debt is the same as the nominal rate of return on assets makes debtor households look more sustainable than they would be if we incorporated more realistic debt costs into our forward-looking calculations, particularly for households with credit card debt. We plan to explore these and other robustness issues further in future versions of this paper.

Finally, we consider how sustainability differs across different demographic groups by tracing the evolution of sustainability across cohorts of similar-aged households of similar ages. This type of analysis further exploits the panel structure of our data. Investigating the baby boom generation as part of this exercise is particularly interesting because the working years of people born between 1948 and 1963 overlaps with our sample period.

**Figure 7 – Sustainability in the Baby Boom Cohort
(Household Head Birth Year between 1948 and 1963)**

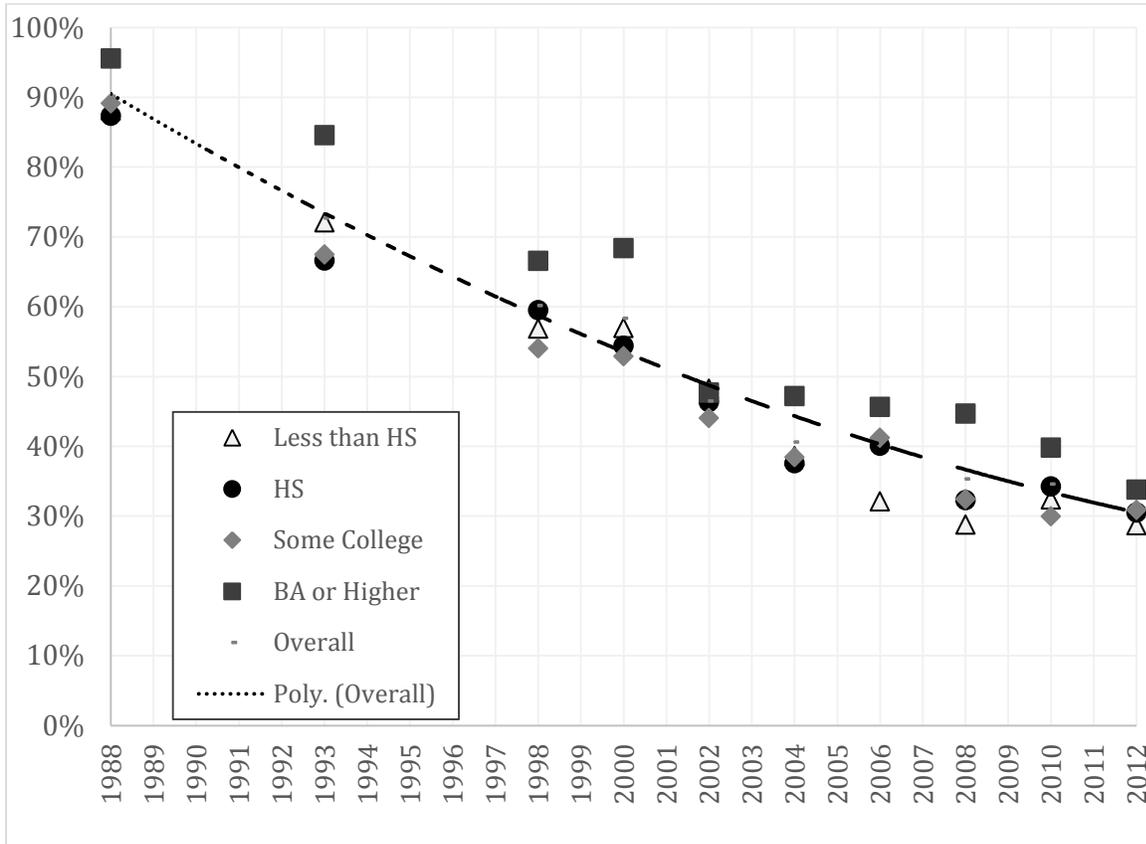


Figure 7 shows the percentage of sustainable households in a given year for households in the baby-boom cohort only. We further divide these households by educational attainment of the household head to see whether sustainability varies based on one’s ability (proxied for by education). As in the full sample data, sustainability declines substantially over the sample period—a decline that is much larger than for the full sample. In particular, the share of sustainable households drops from a high value of about 90 percent in 1988, when most baby boomers are in the early stages of careers, to about 31 percent in 2012, as the leading edge of this generation approaches normal retirement age. The fact that the decline in the sustainable share is more than triple the value for all households combined (compare to figure 5) suggests that there is an important age component to our measure of sustainability.

One interpretation of this outcome is that this generation of households is systematically under-saving. When a household is relatively young, one expects net worth to be low. If the expected income profile is rising, then a young household could be sustainable if its current consumption is equal to, or even greater than, its current disposable income. But as the household ages, one would expect more saving and asset accumulation to finance retirement. If this asset accumulation does not occur, the household is pushed toward unsustainability as it ages, exactly as the trend in Figure 7 demonstrates. In addition, Figure 7 shows, perhaps somewhat surprisingly, that there does not appear to be much systematic difference across education levels. We plan to address this heterogeneity further in future analysis.

VI. Conclusion: Responses and Consequences of Unsustainability

The late economist Herbert Stein once wrote “If something cannot go on forever, it will stop.” This research explores the idea that unsustainable household consumption and the associated rise in financial fragility triggered a decline in consumption that contributed to the Great Recession. Our results provide some support for this interpretation of recent U.S. macro history. Household financial sustainability did indeed decline dramatically in the years leading up to the crisis. And there was a sharp drop in household consumption in the final two biennial periods of our sample. But if a drop in consumption occurs at the same time as a decline in income, the net effect on sustainability is ambiguous. Our results show no significant change in the financial sustainability of the U.S. household sector in the aftermath of the crisis (as of 2012). Our data suggest, for the first time to our knowledge, that a large share of American households, nearly half, remains financially unsustainable.

What will be the next shoe to drop, especially if there is no acceleration in income growth? Perhaps the severity of the next recession will be magnified by a further decline of consumption “at risk.” Another possibility includes a large drop in household spending at retirement. This effect would be less dramatic than a recession-induced collapse, but it would create a drag on demand growth consistent with the “secular stagnation” predictions that have emerged in the slow growth period following the Great Recession,²⁵ especially as the large baby-boom generation moves into retirement. Another possibility is that household members delay retirement. It is interesting to see that a significant, four-decade decline in the civilian labor force participation rate for people 55 years of age and older bottomed out in the late 1980s and began to rise sharply about 1996. The Great Recession, which saw the *overall* participation rate drop, halted but did not reverse the big increase in the participation rate for older workers that occurred from 1995 through 2009.²⁶ There are likely multiple reasons why Americans are working longer, but the inability to maintain the consumption established in their “prime” working years is likely one of them. The rise in the labor force participation rate of older Americans certainly correlates with the drop of our measure of household financial sustainability that assumes retirement at the Social Security full retirement age.

Further exploration of the significance and implications of our results will include an analysis of the relation between household characteristics and unsustainability. What characteristics predict unsustainability and how did those factors change over time? We also plan to study the extent to which the CAR measure predicts future spending behavior. In particular,

²⁵ See Summers (2015) and Cynamon and Fazzari (2015b), for example.

²⁶ Bureau of Labor Statistics data show that the participation rate for individuals 55 and older rate averaged 43.3% in 1948. It declined almost monotonically to an average of 29.9% from 1986 through 1995, a period during which the monthly rate was never less than 29.2% or higher than 30.5%. After 1995, the rate rose, again almost monotonically, until the Great Recession, and it then stabilized at an average of 40.2% from 2009 through 2015, again staying within a narrow monthly range of 39.7% to 40.7% since 2009.

does a high CAR at a point in time help explain future reductions in spending—a question that can be answered by further exploiting the unique panel structure of the PSID.

References

- Auerbach, A.J., L.J. Kotlikoff, and D.R. Koehler (2016). U.S. inequality, fiscal progressivity, and work disincentives: an intergenerational accounting, working paper no. 2232, National Bureau of Economic Research.
- Bakker, B.B. and J. Felman (2014). The rich and the Great Recession, working paper no. 14/225, International Monetary Fund.
- Carroll, C.D., T.F. Crossley, and J. Sabelhaus, eds. (2015). *Improving the Measurement of Consumer Expenditures* (Vol. 74). University of Chicago Press.
- Cooper, D. (2010). Imputing household spending in the Panel Study of Income Dynamics: a comparison of approaches, working paper no. 10-12, Federal Reserve Bank of Boston.
- Cooper, D.H., B.F. Lutz, and M.G. Palumbo (2015). The role of taxes in mitigating income inequality across the U.S. states, *National Tax Journal*, 68(4), 943-974.
- Cynamon, B.Z. and S.M. Fazzari (2008). Household debt in the consumer age: source of growth—risk of collapse, *Capitalism and Society*, 3(2).
- _____ and _____ (2015a). Household income, demand, and saving: deriving macro data with micro data concepts, *Review of Income and Wealth*.
- _____ and _____ (2015b). Inequality, the Great Recession, and slow recovery, *Cambridge Journal of Economics*, 40(2), 373-400
- _____ and _____ (2015c). Rising inequality and stagnation in the US economy, *European Journal of Economics and Economic Policy*, 12(2), 170-182.
- Dynan, K., J. Skinner, and S.P. Zeldes (2004): Do the rich save more? *Journal of Political Economy*, 112(2), 397–444.
- Godley, W. and I. Izureta (2002). The case for a severe recession, *Challenge*, 45 (March/April), 27-51.
- Guidolin, M. and E.A. La Jeunesse (2007). The decline in the U.S. personal saving rate: is it real and is it a puzzle? *Federal Reserve Bank of St. Louis Review*, November/December 2007, 491-514.
- Johnson, D.S., J.A. Parker, and N.S. Souleles (2006). Household expenditure and the income tax rebates of 2001, *American Economic Review*, 96(5), 1589–1610.
- Palley, T.I. (2002). Economic contradictions coming home to roost, *Journal of Post Keynesian Economics*, 25, 9-32.
- Passero, W., T.I. Garner, and C. McCully (2015). Understanding the Relationship: CE Survey and PCE, *Improving the Measurement of Consumer Expenditures*, 74, 181.
- Petev, I., L. Pistaferri, and I.S. Eksten (2011) An analysis of trends, perceptions, and distributional effects in consumption, In *The Great Recession*, eds. D.B. Grusky, B. Western, and C. Wimer, chap. 6, 161-195. New York, NY: Russell Sage Foundation.

- Sablehaus, J. (2010). The joint distribution of consumption and income, working paper, University of Maryland.
- Setterfield, M. (2008). Balancing the macroeconomic books on the backs of workers: a simple analytical political economy model of contemporary US capitalism, *International Journal of Political Economy*, 37(4), 104.
- Scholz, J.K., A. Seshadri, and S. Khitatrakun (2006). Are Americans saving 'optimally' for retirement, *Journal of Political Economy*, 114(4), 607-643.
- Skinner, J. (2007). Are you sure you're saving enough for retirement? working paper no. 12981, National Bureau of Economic Research.
- Summers, L.H. (2015). U.S. economic prospects: secular stagnation, hysteresis, and the zero lower bound, *Business Economics*, 49(2), 65-73.
- Wray, L.R. (2007). Lessons from the subprime meltdown, working paper no. 522, The Levy Economics Institute.

Appendix

Data Restrictions to Determine Analysis Sample

The PSID data set is restricted as follows to assure a consistent analysis sample across different empirical calculations and tests and to reduce the influence of outliers or inconsistent survey data.

- We are interested in studying households during their working years, following the years of full-time education. To meet this objective we delete observations for which the household head is younger than 25. We also delete observations if the household head is older than normal retirement age as determined by the age at which the head is eligible for full Social Security benefits.
- Some observations in the PSID come from over-samples in the mid 1990s designed to increase the coverage of under-represented groups. These observations are identified by a sample weight of zero and they are dropped from our analysis sample.
- Observations with missing, negative, or bottom-coded family income are deleted. Bottom-coded observations for some early sample years are identified by family income set equal to 1.
- Observations with negative after-tax income are deleted.
- Observations are included only if we can obtain an estimate of outlays and consumption. This requires that the household have balance sheet and income data in at least two adjacent survey wave so that outlays can be estimated by differencing balance sheet variables, as indicated in the main text.
- Some observations have negative estimated outlay values which is not possible in practice. These observations arise most likely from inconsistencies in reported balance sheet variables across survey years. (For example, if an asset value was substantially under-reported in year 1 and then corrected to a much higher value in year 2, the asset accumulation inferred from the reporting error could lead to a negative outlay figure.) Such errors are also likely to affect adjacent observations in time for a household in the opposite direction. We delete observations if (1) the outlay estimate is negative and (2) an outlay estimate for a year before or after the negative outlay year is large enough to generate an a ratio of outlays to after-tax income that exceeds 1.5. This rule prevents inconsistent balance sheet data from creating erroneous signals of unsustainability.
- Some households have estimated outlays that appear inconsistent with their income, most likely due to reporting errors. A household is dropped if its total outlays for all years it is in the survey are more than three times its after-tax income.
- An observation is deleted if family income is less than estimated asset income.
- Interest rates on mortgages reported by the survey are capped at a maximum of 20 percent.

Estimation of Interest Payments

Interest expenses are subtracted from household outlays estimated according to the methods described in Cooper (2010) to measure household consumption expenditure. Interest cost is the product of an interest rate and a reported debt stock.

Debt stocks are measured as of the time of the survey wave, which will be some months after the year for flows (which is the year referred to in the discussion of the results). Interest rates are measured for the year that corresponds to income, outlay, and consumption flows.

The survey begins collecting household-specific mortgage interest rates in 1996. For earlier years, the interest rate is obtained from the Freddie Mac primary mortgage market survey data (accessed from the FRED database on March 11, 2016). Mortgage debt stocks are available for every year covered by our sample.

Vehicle debt and the associated interest rate is available from 1998 onward.

We have data on the value of other household debt, but no interest rate information. The other debt interest rate is set at a 48-month auto loan rate.

Estimation of Income Growth Profiles

The sustainability calculation requires the projection of current labor income through the remaining working years. We do this by applying growth rates estimated from the Current Population Survey (CPS) wage data stratified by age and educational group.

Suppose an individual in a given household is a member of education group j and is of age a (measured in years). The individual is assumed to retire at age M . We decompose the growth in the person's real income (w) between the sample year t and some future year $t+k$ into two parts. The first part is an aggregate assumption about real wage growth (g), while the second part depends on the person's education and age ($z_{j,a}$):

$$w_{t+k} = w_{t+k-1}(1 + g_{t+k})(1 + z_{j,a}) \text{ for } k = 1, \dots, M - a$$

We need estimates of the g and z variables. Note that the z values are assumed constant across time.²⁷

The CPS survey provides the necessary information. We use four education groups: (1) less than high school, (2) high school diploma, (3) associate degree or some college, and (4) bachelor's degree or above. Because the education question on the CPS was changed in 1991, we consider years between 1991 and 2011 (the final year in our CPS sample). We also restricted the data to include observations for people that have jobs or are in the military to avoid fluctuations in unemployment from affecting the results. Real incomes are estimated by dividing the nominal income data by the chain-weighted deflator for personal consumption expenditure.

To isolate the growth components, first define g_t as

$$g_t = \overline{w}_t / \overline{w}_{t-1} - 1$$

²⁷ We considered whether the z estimates varied across time by comparing results from several subsamples of the CPS. The age-education components seemed reasonably stable over the sample period.

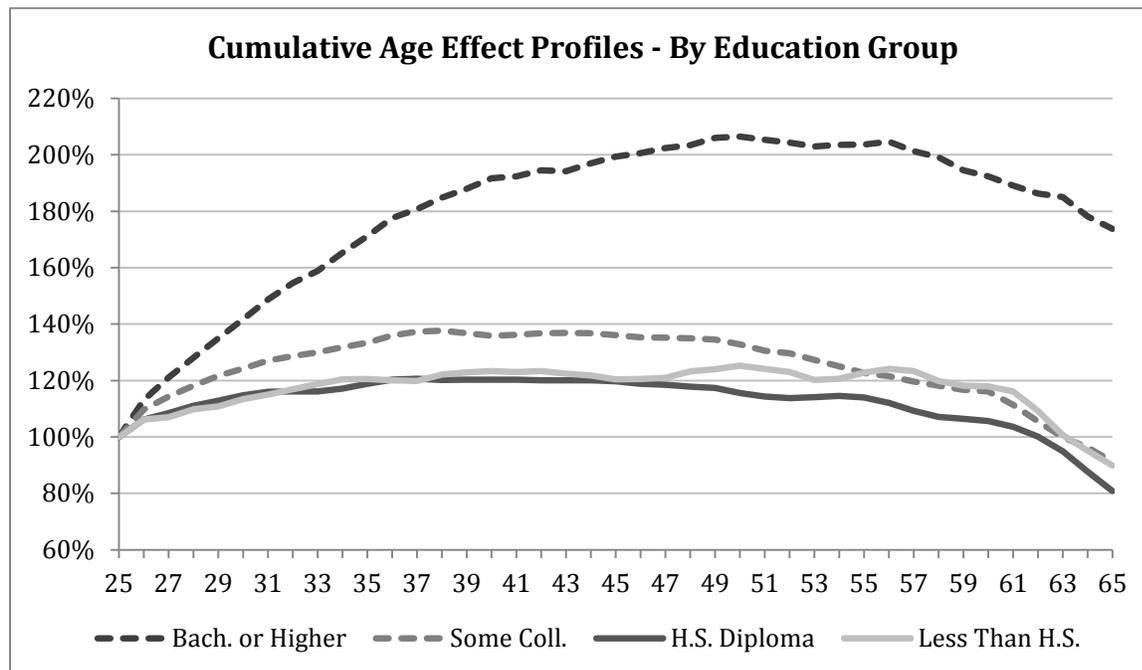
where \bar{w}_t represents the average real income over the entire year t CPS sample. The values for g_t vary from -1.7% (2010) to 7.6% (1995) with an average of 1.5%.

To estimate the z variables, we begin by averaging real incomes within each education (j) and age group (a) for each year to obtain $\bar{w}_{t,j,a}$. Define the intermediate variable $x_{t,j,a}$ as

$$x_{t,j,a} = \frac{\bar{w}_{t,j,a}}{\bar{w}_{t-1,j,a-1}} - 1.$$

That is, x is average income growth between age $a-1$ and a for education group j between time $t-1$ and t . The value of $z_{j,a}$ is the average over the time periods in the CPS sample of $x_{t,j,a} - g_t$. The year-by-year values of $z_{j,a}$ are smoothed with a three-year moving average.

The age-education effect is interesting in its own right. The figure below shows the estimated cumulative profiles of predicted wages by education group and age. These figures should be interpreted as the cumulative change in wages from age 25 to the age on the horizontal axis, relative to average growth. All education groups show greater growth than the aggregate from age 25 through the early 30s (rising profiles in the figure), although that growth is much faster for people with college degrees. For all education groups except those with college degrees, wage growth largely tracks the aggregate (no increase in the profile shown in the figure) from the early 30s until about 50, when wage growth falls below the aggregate (a declining profile in the figure). Individuals with college degrees have wage growth that exceeds the aggregate until their early 50s, and do not fall below the aggregate until their later 50s. Note that the fact that the profile for individuals with a high-school diploma falls somewhat below the profile for people with less than high school does not imply that the high-school diploma reduces wages because all profiles are indexed to 1.0 at age 25. Rather, the results suggest that any advantage from obtaining a high-school diploma for wage *growth* is exhausted by age 25.



The projection of labor incomes beyond the sample year t for an individual of age a and education group j is

$$w_{t+k} = w_t \prod_{i=1}^k (1 + g_{t+i})(1 + z_{j,a+i}) \text{ for } k = 1, \dots, M - a$$

The z values are determined as discussed above. The g values use the actual empirical aggregate year effects for time periods within the sample. For projected incomes beyond the sample period, g is fixed at an assumed value (equal to the sample average of the aggregate year effect of 1.5% for our benchmark calculations).

Social Security Benefit Estimation

The objective is to estimate the present value of lifetime Social Security benefits for a household. We account for the rules that determine spousal benefits as a function of the income records of both partners.

Basic Social Security Data

The following data are obtained from the Social Security Administration unless otherwise noted:

- Normal retirement age, rounded to the nearest integer. This is 65 for individuals born before 1941, 66 for birth years between 1941 and 1957, and 67 for birth years after 1957.
- Life expectancy by sex and retirement age, 2011 values. This is 83 for all men, 85 for women retiring at age 65 or 66 and 86 for women retiring at age 67.
- Cost of living adjustments for Social Security benefits. Historical figures come from Social Security data through 2014. Projections for future years are assumed to follow our aggregate inflation projection (baseline of 2%).
- Wage indexing. Historical income estimates are indexed to retirement age for computation of benefits. We obtain the indexes for years through 2013 from the Social Security average wage index data. Indexes for future years are determined by projected aggregate real wage growth and inflation assumptions.
- Benefit “bend points.” Social Security payments are computed from a formula that generates decreasing marginal payments as a function of historical income. The marginal effect of income on benefits is piecewise linear with two breaks called “bend points.” We obtain the historical bend points from Social Security and project them forward for future retirement years with projected aggregate real wage growth and inflation assumptions.

Establishing the Income Record

The monthly Social Security benefit for an individual, called the “primary insurance amount” (PIA) is calculated from a formula based on the highest 35 years of indexed earnings. We use individuals’ survey income values (excluding asset and transfer income) when they are available. But we will not have the full record necessary for an individual’s PIA computation for several reasons:

- After 1997, the PSID survey was taken every second year.

- Some individuals have holes in their survey records. Many individuals enter the survey at older ages and do not have income records going back to the beginning of their likely working years.
- The PSID provides income data starting in 1969. Older workers in our sample will have part of their 35-year record prior to this date.
- We are estimating the PIA at normal retirement age, which means we need to include future earning years as part of the income record for individuals who have not reached retirement age by their final observation in the sample (which may be earlier than the final survey wave available if an individual dropped out of the sample).

To estimate incomes for individuals' full working life, we apply income growth factors by age and education group forward and backward in time from survey observations. The growth factor for household j between survey year $t-1$ and t is:

$$(1 + \pi_t)(1 + g_t)(1 + z_{j,a})$$

where $z_{j,a}$ denotes the education-age component of income growth estimated from the CPS (discussed above), g_t is aggregate real-wage growth, and π_t is inflation. To determine g_t for 1968 through 2011 we have CPS data and use the aggregate real wage growth as defined above. For 1952 through 1967 and 2012 through 2013, we use the growth in the aggregate wage index from Social Security less the growth of the PCE deflator. For historical years with no other information (1930 through 1951) and for projected future wages we use our baseline real wage growth assumption of 1.5%. Note that very few of the historical values before 1952 will have any effects of the results because the vast majority of the relevant working years for individuals in our sample are after 1952. Inflation is the rate of change of the PCE deflator for historical years and is projected for future years at 2%.

Income projections are made step by step from survey data observations so that each individual has an estimated income value for all ages between 18 and normal retirement age. In the case of a hole in the individual's survey data (most obviously because the survey is biennial after 1997), the forward and backward projections are averaged to obtain our income estimate.

The key income variable that determines Social Security benefits is "average indexed monthly earnings" (AIME) estimated as follows. First, all income variables (actual and estimated) for an individuals' working years are capped at the Social Security maximum for the relevant year. The capped incomes for ages less than 60 are indexed to the year in which the individual turns 60, using Social Security's average wage index figures. Working years beyond age 60 are not indexed for the AIME calculation.) Following the Social Security rules, we then average the highest 35 years of capped and indexed income. This is the AIME estimate. An individual needs 40 quarters of positive Social Security earnings to qualify for any benefit. We proxy this requirement by setting an individual's AIME to zero if they have fewer than 10 years of positive income estimates.

To compute the monthly benefit (PIA), the individual's AIME estimate is plugged into the benefit formula that generates higher PIA for lower values of the AIME. The three benefit tiers

generate marginal increases to PIA of 0.90, 0.32, and 0.15 for each dollar of AIME. The break points between marginal benefit rates are the bend points discussed earlier.

For a single individual, the present value of the Social Security benefit is determined in a straightforward way. First, inflation adjust the PIA from the age 62 calculation to normal retirement age (NRA) as defined above. Denote this amount as PIA_{NRA} . For historical years, we use the actual COLA values from Social Security. For future year, the inflation adjustment comes from our aggregate inflation assumption (baseline value of 2%). Second, compute the present value as:

$$PVSS = (12 * PIA_{NRA}) * \sum_{i=NRA}^N \frac{(1 + \pi)^{i-NRA}}{(1 + r)^{i-Age}}$$

where π is the inflation rate, r is the nominal discount rate, and N is the individual's demographically determined expected death age.

For a couple, the simple approach would be to compute $PVSS$ for each partner in isolation and add them together. But this approach ignores the possibility of spousal benefits that could have a large impact on the household $PVSS$ if the individual earnings of the spouses are significantly different. Qualifying partners are entitled to 50 percent of their spouses benefit if that amount is larger than the benefit they would obtain based on their own record. In addition, a surviving spouse may take the deceased spouse's full benefit after the one spouse dies, again if that amount is greater than the surviving spouses own benefit.

To account for spousal benefits, we compute the $PVSS$ for a couple under all possible combinations and assign the benefit that maximizes $PVSS$ for the sustainability calculations. The table below documents the possibilities considered for both the household head (as defined by the PSID survey) and the spouse. There are three survivorship scenarios for which partner lives longer. Within the relevant scenario for the couple, we choose the maximum $PVSS$ from among three cases: (1) both partners take their own benefit, (2) the head takes his/her own benefit and the spouse takes the spousal benefit based on the head's PIA, and (3) the spouse takes his/her own benefit and the head takes the spousal benefit based on the spouse's PIA. If individuals take their own benefits, payments start at the NRA and end at the individuals demographically determined death age (DA). In cases where individuals take spousal benefits, payments begin at either the individual's NRA or the individual's age when the spouse reaches NRA, whichever is later.

Permanent Income Estimation

To be added ...

Consumption in the PSID

To be added ...