DO RETIREES WANT CONSTANT, INCREASING, OR DECREASING CONSUMPTION?

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Abstract

Whether households prefer a constant, increasing, or decreasing path of consumption in retirement has important implications for our understanding of retirement adequacy. Financial planners and researchers have often assumed that retirees would like to maintain their pre-retirement standard of living. However, several studies suggest that retired households decrease their consumption over time. This project builds on the existing literature by: 1) examining retirement consumption over longer periods; 2) using wealth to separate constrained and unconstrained households in order to analyze whether declines in consumption are driven by necessity or preferences; and 3) exploring whether, within unconstrained households, those with steeper mortality profiles are more likely to front-load consumption.

The paper found that:

- On average, household consumption declines about 0.7-0.8 percent a year over retirement.
- However, consumption for wealthy and healthy households is virtually flat, declining only 0.3 percent a year over their retirement.
- Thus, at least in part, wealth and health constraints help explain the observed pattern of declining consumption.

The policy implications are:

- Retirees likely prefer to enjoy constant consumption in retirement.
- The results suggest that a retirement saving shortfall exists since consumption declines are larger for households without assets.
- Social Security is an important resource for maintaining their preferred consumption.

Introduction

Whether households prefer a constant, increasing, or decreasing path of consumption in retirement has important implications for our understanding of retirement adequacy. Financial planners and researchers have often assumed that retirees would like to maintain a constant standard of living. Similarly, Social Security benefits are based on the premise that people want steady inflation-adjusted benefits. However, several studies suggest that retired households decrease their consumption over time.

Prior studies may not provide the full picture for three reasons. First, much of the work focuses on the period right around retirement rather than over longer periods. Second, observed declines in consumption may mean that retirees have not saved enough and are forced to cut back or are not healthy enough to enjoy their retirement years. Finally, differences in survival probabilities may also lead some households to spend more earlier on than others.

This project uses the *Health and Retirement Study* (HRS) *Consumption and Activities Mail Survey* (CAMS) module and the *Panel Study of Income Dynamics* (PSID) and builds on the existing literature by: 1) examining retirement consumption over longer periods; 2) using wealth to separate constrained and unconstrained households in order to analyze whether declines in consumption are driven by necessity or preferences; and 3) exploring whether, within unconstrained households, those with steeper mortality profiles have faster declines in preferred consumption.

The results show that when households have assets and their health, they keep real consumption relatively flat over their retirement. This pattern is evident when comparing wealthy and healthy households separately and when the top tercile is ranked by health status. For those with less wealth or with health issues, consumption declines more over time. As a result, looking at all types of households together produces a clear pattern of declining consumption, as reported in other studies. But the results suggest that the decline most likely reflects wealth and health constraints as opposed to true preferences.

The rest of the paper proceeds as follows. The next section summarizes the existing literature as well as the limitations of existing consumption data. The third section describes the data, and the fourth discusses the methodology. The fifth section presents the results. The final section concludes that while consumption appears relatively flat for the unconstrained, it declines noticeably for the bottom two-thirds of the wealth and health distribution. The evidence suggests that these constraints may be an important reason that observed consumption drops over time for retired households as a group.

Background

The life-cycle model is a helpful starting point in examining how household consumption might change throughout retirement. Under this model, forward-looking retirees smooth their marginal utility of consumption (Modigliani and Brumberg 1954). For certain assumptions – such as the rate of return being equal to the individual's time preference – the model predicts that retirees would prefer constant consumption (Hamermesh 1984). This result is intuitive, and financial planners and researchers have often assumed that retirees would like to maintain their pre-retirement standard of living (Palmer 2008; Munnell, Chen, and Siliciano 2021). In addition, Social Security benefits are based on the premise that people want steady consumption, as benefits are adjusted for inflation.

While maintaining steady consumption may seem intuitive, little research has focused on longer periods of consumption in retirement. Most previous studies have looked at the change at retirement, finding a sharp post-retirement drop as retirees consume less than they did while working.[1] This decline has been called the "retirement consumption puzzle," as it seemingly contradicts the lifecycle model's prediction that people smooth their consumption over predictable income changes, like retirement. Research has resolved this puzzle with three complementary explanations. First, work-related expenses decline as retirees no longer have to spend on professional attire and commuting (Fisher et al. 2008; Aguiar and Hurst 2013). Second, food expenditures decrease as retirees have more time to spend cooking and shopping for low prices (Aguiar and Hurst 2005). Third, some people have been forced into involuntary retirement due to an adverse health event or unemployment, which is an unexpected negative shock that the lifecycle model predicts would lead people to reduce their consumption (Smith 2006; Hurd and Rohwedder 2003, 2013).

While these three factors explain the change in consumption *at* retirement, they do not extend to consumption changes *during* retirement. One constraint researchers face in examining longer periods is that surveys that provide comprehensive and consistent panel data on

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[1] See Banks, Blundell, and Tanner (1998); Bernheim, Skinner, and Weinberg (2001); Haider and Stephens Jr. (2007); and Aguila, Attanasio, and Meghir (2011).

consumption, such as the *Consumer Expenditure Survey*, cover only a short period. Others, such as the HRS and the PSID, provide longer panels of data, but did not use consistent measures of consumption across years until the early to mid-2000s. The few recent studies that address preferred consumption have found declining consumption during retirement (Blanchett 2014; Guo, Skinner and Zeldes 2018).

Observed declines may not reflect household preferences but instead be due to financial constraints. Guo, Skinner and Zeldes (2018) compared the consumption paths of different "retirement adequacy" groups and found flatter paths for households who are more prepared.[2] These results suggest that declines in consumption are, at least in part, due to financial constraints. However, financial resources may not be the only constraint that affects consumption paths. Households may prefer to consume more, but are unable to due to health limitations.

Finally, differences in consumption patterns may also reflect different survival probabilities. Among the unconstrained, healthy households are more likely to live to old age and will want to have flatter consumption. Unhealthy households, on the other hand, may want to front-load their consumption to years right around retirement, reflecting their lower probability of surviving to older ages. Similarly, married households may also prefer to have flatter consumption because they have to account for joint survivor probabilities.[3]

To gain a better understanding of preferred consumption in retirement, this analysis takes advantage of the almost 20 years of consistent CAMS and PSID consumption data, examines the consumption patterns of households facing differing constraints, and examines whether survival probabilities account for differences among unconstrained households.

Data

This project uses data from the 1992-2018 HRS and the 2001-2019 CAMS, linked with SSA's administrative cross-year benefits file.[4] It also uses the consumption data from the PSID.

[2] The authors define adequacy as the difference between annuitized pre-retirement income and annuitized retirement income with some other adjustments – something close to a replacement rate. Their results found that log-income before retirement was similar across adequacy groups.

[3] Another potential reason for the decline suggested by preliminary data from Hudomiet, Hurd, and Rohwedder (forthcoming) is that retirees receive less enjoyment from consumption over time perhaps, the authors hypothesize, due to declining health, the loss of a spouse with whom to share activities, and increasing age itself.

[4] While the CAMS was first administered in 2001, consumption categories were not consistent until 2005.

Each dataset has its advantages and disadvantages. The CAMS includes more households at older ages than the PSID, but it is only given to a subset of the HRS respondents, and respondents can enter and leave the consumption panel. In the PSID, consumption questions are asked of the entire population, but the survey contains a far smaller sample of retirees than the CAMS and therefore may be limited in power.

HRS and CAMS

The HRS is a panel survey of households, in which the head is age 51 or older, that has been administered every two years since 1992. The survey collects in-depth information on income, balance sheets, pensions, and health, among many other areas. About a fifth of HRS households are given the CAMS, a consumption survey administered bi-annually from 2001-2019 to a random sample of HRS respondents. Thus, the CAMS has the advantage of being a multi-year panel and can be linked to the wealth of financial, household, and health information in the HRS.[5] For this study, we match consumption data measured in one year to the HRS core interview data from the following calendar year. For example, the 2005 consumption data are matched to the 2006 HRS. The goal of the HRS analysis is to examine consumption paths in retirement, to see whether these paths differ among constrained and unconstrained households, and to identify characteristics that determine different consumption paths.

The analysis sample consists of CAMS households in which at least one person has retired, where retirement is defined as claiming Social Security benefits. This initial sample consists of 8,118 households. Households that claim benefits before age 62 and are likely disability insurance recipients or survivors are also excluded, leaving 7,704 households. We keep only households who retired between 1980-2018 and have non-missing Social Security claiming and benefits information, leaving 3,707 households. We use administrative benefits and claiming data for individuals who can be linked and self-reported data for those who cannot be linked.[6] An additional 685 households are dropped due to data inconsistencies leaving a final sample of 3,022 households and 10,700 household wave observations.

[5] Hurd and Rohwedder (2006) show that the consumption levels are roughly comparable in the CAMS and the CEX.
[6] Thirty-eight percent of individuals could not be linked to administrative benefits and claiming data.

Panel of Study of Income Dynamics

As noted, the CAMS contains only a small subsample of HRS respondents. Even though the CAMS is administered randomly, systematic biases could still be a concern.[7] To check if the HRS results hold for a more complete sample of a nationally representative survey, we repeat the analysis in the PSID, which is also a long-running panel survey that collects in-depth information on household income, balance sheets, pensions, and health, among other factors.[8]

As with the HRS, the PSID analysis focuses only on households in which the head has claimed Social Security and the year of this claim is known, starting with a sample of 2,904 households. After we drop households who claimed before age 62, and those with inconsistent data, the final sample consists of 1,223 households and 4,186 observations. Tables 1 and 2 present the demographic and socioeconomic characteristics of both our samples. Households in the HRS and PSID are quite similar, but households in the PSID are somewhat better educated and less likely to have a defined benefit plan, likely because they are from later cohorts. One way to address sample size issues is to impute consumption data for households in years before consumption questions were introduced in the PSID and the HRS or for households in the HRS who did not respond to the CAMS. The imputations were not included because they introduced bias. The process and results from the imputation are outlined in the appendix.

Methods

The analysis involves two steps. The first step is to describe the consumption paths for all households and then for households stratified by different levels of constraints. The second step addresses the issue of survival probabilities among the "unconstrained" households.

Determining Consumption Paths

The analysis begins by using the 2001-2019 waves of the CAMS linked to the HRS and administrative Social Security benefits data to determine whether consumption is constant, increasing, or decreasing in retirement. The focus is on non-durable consumption, as the

[7] See the discussion of systematic biases in consumption surveys in Parker and Souleles (2017) and Karlan and Zinman (2008).

[8] The PSID is the longest-running U.S. household panel survey, starting in 1968, with the goal of studying the dynamics of income and poverty. Since the survey began, more than 75,000 individuals have been interviewed. Up until 1997, the data were gathered annually; the survey is now conducted biennially.

purchase of durable goods can be viewed as a form of savings.[9] The same empirical strategy is repeated in the *PSID* to ensure the results are not driven by the nature of the CAMS sample.

These data are used to estimate the following reduced-form equation:

$$c_{t,h} \equiv Log(C_{t,h}) = \alpha_h + \beta t + \gamma t^2 + \delta(n)\, N_{t,h} + \varepsilon_{t,h} \qquad (1)$$

where $c_{t,h}$ is the log real consumption for household h at time t ($t = 0$ is the time at retirement); α_h is the household fixed effect reflecting all permanent differences across households that affect the consumption level; β is the coefficient for the consumption pattern over time while γ is the coefficient for the quadratic time trend; $\delta(n)$ captures the effect of household size $N_{t,h}$; and $\varepsilon_{t,h}$ is the error term.

So far, the empirical strategy is similar to that of Guo, Skinner, and Zeldes (2018), simply applied to more recent consumption data.[10] However, our goal is to understand *preferred* consumption in retirement. How households prefer to consume may be different than observed if they, for example, have not saved enough. So, the consumption path of wealthier households might better represent preferred consumption. Guo, Skinner, and Zeldes (2018) have examined consumption paths for different adequacy groups, but other constraints may also influence households' consumption paths.[11] For example, households in poor health may prefer to consume more by traveling and dining out but are unable to due to health constraints. To assess whether these constraints affect consumption paths, the analysis re-estimates equation 1 for different wealth terciles, as follows:

$$c_{t,h} \equiv Log(C_{t,h}) = \alpha_h + \beta t \times G_{t=0} + \gamma t^2 \times G_{t=0} + \delta(n)\, N_{t,h} \times G_{t=0} + \varepsilon_{t,h} \qquad (2)$$

where the key difference between equations 1 and 2 is the interaction term $G_{t=0}$,which represents households' wealth tercile or self-reported health status. The hypothesis is that households in higher wealth terciles or in better health would have more constant consumption.

Survival Probabilities

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[9] Durables represent a small share of consumption for most households.

[10] Guo, Skinner, and Zeldes (2018) included time relative to retirement dummies. Since our interest is in the consumption paths, rather than the difference between waves in retirement, we used a time trend with a quadratic term instead.

[11] The authors' definition of adequacy groups is similar to replacement rates. Lower-income households have high replacement rates from Social Security. Since they are less likely to be able to cut back and have few outside assets to allow for consumption increases, mixing in low-income households with high-income households may make consumption paths for high adequacy groups look flatter than preferred. That is why our analysis uses wealth terciles instead. The authors also examined paths for each adequacy group separately and did not test if they were statistically different.

The fixed-effect equation above sheds light on whether financial or health constraints influence households' consumption paths. Declining consumption may also reflect survival probabilities: those who expect to live longer may consume less to stretch out their resources, while those with shorter expected longevity may want to consume more earlier when they are more likely to be alive, all else equal. Wealthier individuals, on average, tend to live longer but a question is whether longer expected lifespans may be a reason that consumption varies even among the unconstrained. To test if households who perceive they will live longer will have flatter consumption, we re-estimate equation (2) for the top wealth tercile to see whether unconstrained households behave differently based on their expected survival probabilities. Characteristics associated with longer lifespans include health status and marital status – healthier individuals tend to live longer and married households have to consider the lifespans of two people, which will undoubtedly be longer than an individual's lifespan.[12] The hypothesis is that unconstrained households that have a higher probability of being alive at older ages will have more constant consumption.

Results

Confirming prior studies, the results in Figure 1 and Tables 3-4 show that average consumption declines by around 1.5-1.6 percent every two years (0.75-0.80 percent a year).[13] This finding suggests that 20 years into retirement, consumption could be about 12-13 percent lower than at the beginning of retirement. Moreover, the concave slope from CAMS suggests that the decline slightly speeds up with more years in retirement.[14] However, as discussed above, it is unclear whether this observed decline is "preferred" or merely the result of financial or health constraints. If these constraints – rather than preferences – are driving consumption declines, then unconstrained households should see smaller or no declines.

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[12] Race is also associated with survival probabilities. But we do not observe many non-white households in our top tercile to test by race.
[13] Respondents in the HRS and PSID are surveyed every two years in the period we are examining.
[14] The results from the PSID could not indicate whether the speed of decline changed through retirement, likely due to a smaller sample size.

Unconstrained Consumption

Consumption may decline through retirement if households have not saved enough to maintain their expenditure levels. Indeed, the results show that consumption paths are much flatter for households in higher wealth terciles.[15] Consumption decreases by about 0.7 percent (-0.0207 + 0.0140) every two years (0.35 percent a year) for those in the top wealth tercile compared to 1.6 percent and 2.0 percent every two years (0.8 and 1.0 percent a year) for the middle and bottom wealth tercile respectively. And, although the slope is still somewhat negative for all households, consumption is not only flatter but the quadratic equation shows that the decline also slows down over time for households in the top two terciles (see Figure 2 and Table 5).[16] In contrast, for households at the bottom of the wealth distribution, declines in consumption speed up in later years. These results suggest that financial constraints are at least partially behind consumption declines in retirement.

Another constraint that retirees face is health status. Households may want to travel or eat out more but are simply unable to do so due to health limitations. Retirees who self-report being in better health at the beginning of retirement have flatter consumption paths, although, once again, the paths are declining for all health groups (see Figure 3 and Tables 7-8). Consumption for those in very good/excellent health decreases by about 1.3 percent every two years (0.65 percent a year) while consumption for those who self-report good health or fair/poor health decrease by 1.5 percent and 3.1 percent every two years (0.7 and 1.5 percent a year). Moreover, interestingly, the quadratic equation shows that consumption of households with poor health tends to tick up in later years, which might reflect higher late-life medical expenses. These results suggest that health constraints are also driving part of the observed declines in consumption in retirement.

Survival Probabilities

Declining consumption paths may also reflect differences in survival expectations. As noted, those who expect to live longer may want to consume slowly because they have flatter mortality profiles while those who think they have a low probability of living to old age may

[15] These results are consistent with Guo, Skinner, and Zeldes (2018).
[16] The results from the PSID did not show statistically significant paths, likely due to limited sample size. We also looked at the top 20 and top 10 percent of the wealth distribution but also did not have enough power.

want to front-load their consumption. However, longer life expectancies are highly correlated with higher wealth. So, to better understand preferred consumption, we examine whether differences in expected lifespans – indicated by health and marital status – may reveal differences among unconstrained (top-tercile) households.[17]

In terms of health status, the results are shown in Table 9 and Figure 4. Those who self-report very good/excellent health at retirement have a virtually flat consumption pattern, declining by only about 0.6 percent every two years (0.3 percent every year), whereas consumption for those who start retirement with good or fair/poor health declines by about 1.1 percent and 3.2 percent, respectively. The quadratic equation also shows increases in consumption for those in fair/poor health later in retirement. The magnitude of the decline among the wealthy and healthy looks similar to the average for wealthy households. This result is mostly because most wealthy households – 60 percent – are in very good/excellent health at retirement, while only 34 percent and 9 percent have good or fair/poor health.[18]

Married households and single-women households are also more likely to live to older ages. Across the general population, married households and single-women households have flatter consumption. This pattern likely reflects the fact that women have lower mortality so households with women reduce consumption more than those without.[19] The results within the top tercile, however, do not reveal statistically different slopes (see Table 10 and Figure 5). It is unclear whether mortality differences are less pronounced across married, single-women, and single-men households in the top tercile or if our analysis is limited by sample size.

The main point that emerges is that consumption patterns for wealthy and healthy households decline much more slowly than for other households.

Conclusion

Household consumption preferences in retirement have important implications for our understanding of retirement adequacy. Financial planners and researchers have often assumed that retirees would like to maintain their pre-retirement standard of living. Similarly, Social Security benefits are based on the premise that people want steady inflation-adjusted income.

[17] Individuals with good health also might have low discount rates if good health reflects health investments, which would also result in flatter consumption paths (see Grossman 1972).
[18] Self-reported health groups are more evenly split across the general population.
[19] See Table 11 and Figure 6.

However, many studies have found that observed consumption is declining, implying the retirement saving shortfall is overstated. This paper examined whether observed declines in retirement consumption is preferred or the result of constraints.

The results show that, for the population as a whole, consumption declines over retirement. But they also show that constraints matter. Wealthier and healthier households have relatively flat consumption paths, suggesting that constraints are at least in part driving the observed declines. Declining consumption paths may also reflect differences in survival expectations; however, these results are less clear. Healthier individuals and women, for example, have longer life expectancies, so to the extent that consumption declines reflect different mortality profiles, within the top wealth tercile, healthier and married households should also have flatter consumption paths. The results show that these healthy unconstrained households do have flatter consumption paths than less healthy households but the paths were not statistically different for households with women.

This paper shows that wealth and health are important determinants in consumption paths in retirement and preferred consumption is likely much flatter than observed in the data. However, many questions remain, including whether consumption profiles continue to get flatter for the top quintile or decile, a clearer picture of whether survival expectations matter, or whether other factors such as risk aversion or bequest motives may determine consumption paths. Hopefully, as more years of data become available, a clearer picture will emerge.

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Table 1. *Summary Statistics of CAMS Sample*

Average age at retirement	65.1
Average number of waves observed	3.4
Education	
Less than high school	18%
High school	38%
Some college or more	44%
Race	
White	88%
Black	9%
Other	3%
Married	56%
Median net wealth	$189,044
Homeowner	84%
Has a defined benefit pension plan	65%
Health status at retirement year	
Poor/Fair	20%
Good	39%
Very good/Excellent	41%

Sources: Authors' calculations using CAMS (2001-2019), HRS (2000-2018), and Administrative Social Security Benefits Data.

Table 2. *Summary Statistics of PSID Sample*

Average at retirement	65.0
Average number of waves observed	3.4
Education	
Less than high school	13%
High school	28%
Some college or more	59%
Race	
White	85%
Black	10%
Other	5%
Married	70%
Median net household wealth	$271,748
Homeowner	84%
Has a defined benefit pension plan	36%
Health status at retirement year	
Poor/Fair	18%
Good	34%
Very good/Excellent	48%

Source: Authors' calculations using PSID (2001-2019).

Table 3. *CAMS: Fixed-effect Regressions of Non-Durable Consumption*

	(1) Log non-durable consumption	(2) Log non-durable consumption
Years since retirement [a]	-0.0157*** (0.0014)	-0.00579 (0.0034)
Years since retirement ^2 [a]		-0.000560** (0.0002)
Household size = 2	0.106*** (0.0241)	0.104*** (0.0241)
Household size = 3		
Household size = 4+	0.140*** (0.0338)	0.142*** (0.0338)
Constant	0.103* (0.0418)	0.105* (0.0418)
N	10,700	10,700

[a] The coefficient represents the change for every two years.
Notes: Standard error in parentheses. * p<0.05, ** p<0.01, *** p<0.001.
Sources: Authors' calculations using CAMS (2001-2019), HRS (2000-2018), and Administrative Social Security Benefits Data.

Table 4. *PSID: Fixed-effect Regressions of Non-Durable Consumption*

	(1) Log non-durable consumption	(2) Log non-durable consumption
Years since retirement	-0.0152*** (0.00188)	-0.0155*** (0.00356)
Years since retirement ^2		0.0000223 (0.000243)
Household size = 2	0.350*** (0.0325)	0.350*** (0.0326)
Household size = 3	0.469*** (0.0486)	0.469*** (0.0486)
Household size = 4+	0.647*** (0.0554)	0.647*** (0.0554)
Constant	9.643*** (0.0263)	9.643*** (0.0263)
N	4,186	4,186

Notes: Standard error in parentheses. *** p<0.001.
Source: Authors' calculations using PSID (2001-2019).

Table 5. *CAMS: Fixed-effect Regressions of Non-Durable Consumption, by Wealth Tercile at Retirement*

	(1) Log non-durable consumption	(2) Log non-durable consumption
Years since retirement	-0.0207*** (0.0029)	-0.00887 (0.0067)
Years since retirement x Tercile 2	0.00474 (0.0037)	0.000303 (0.0090)
Years since retirement x Tercile 3	0.0140*** (0.0037)	-0.00349 (0.0089)
Years since retirement ^2		-0.000754* (0.0004)
Years since retirement ^2 x Tercile 2		0.000321 (0.0005)
Years since retirement ^2 x Tercile 3		0.00109* (0.0005)
Household size = 2	0.0271 (0.0417)	0.026 (0.0417)
Household size = 3	0.0734 (0.0591)	0.0813 (0.0592)
Household size = 4+	0.0939 (0.0684)	0.101 (0.0685)
Household size = 2 x Tercile 2	0.155* (0.0603)	0.155* (0.0603)
Household size = 2 x Tercile 3	0.0611 (0.0626)	0.0638 (0.0626)
Household size = 3 x Tercile 2	0.126 (0.0853)	0.12 (0.0853)
Household size = 3 x Tercile 3	0.0822 (0.0880)	0.0778 (0.0881)
Household size = 4+ x Tercile 2	0.0518 (0.1010)	0.0435 (0.1010)
Household size = 4+ x Tercile 3	-0.0741 (0.1060)	-0.0833 (0.1060)
Constant	9.826*** (0.0215)	9.817*** (0.0227)
N	8,859	8,859

Notes: Standard error in parentheses. * $p<0.05$, *** $p<0.001$.
Sources: Authors' calculations using CAMS (2001-2019), HRS (2000-2018), and Administrative Social Security Benefits Data.

Table 6. *PSID: Fixed-effect Regressions of Non-Durable Consumption, by Wealth Tercile at Retirement*

	(1) Log non-durable consumption	(2) Log non-durable consumption
Years since retirement	-0.0134***	-0.0142*
	(0.00361)	(0.00691)
Years since retirement x Middle	-0.00508	-0.00913
	(0.00497)	(0.00931)
Years since retirement x Highest	-0.00152	0.00437
	(0.00471)	(0.00906)
Years since retirement ^2		0.0000671
		(0.000509)
Years since retirement ^2 x Middle		0.000306
		(0.000650)
Years since retirement ^2 x Highest		-0.000484
		(0.000654)
Household size = 2	0.388***	0.389***
	(0.0521)	(0.0522)
Household size = 3	0.548***	0.548***
	(0.0732)	(0.0732)
Household size = 4+	0.593***	0.593***
	(0.0831)	(0.0833)
Household size = 2 x Middle	0.00908	0.0136
	(0.0807)	(0.0809)
Household size = 2 x Highest	-0.129	-0.134
	(0.0785)	(0.0786)
Household size = 3 x Middle	-0.0793	-0.0765
	(0.116)	(0.117)
Household size = 3 x Highest	-0.251*	-0.255*
	(0.125)	(0.125)
Household size = 4+ x Middle	0.115	0.116
	(0.153)	(0.153)
Household size = 4+ x Highest	0.0426	0.0360
	(0.132)	(0.132)
Constant	9.661***	9.661***
	(0.0284)	(0.0284)
N	4,112	4,112

Notes: Standard error in parentheses. * p<0.05, *** p<0.001.
Source: Authors' calculations using PSID (2001-2019).

Table 7. *CAMS: Fixed-effect Regressions of Non-Durable Consumption, by Self-Reported Health at Retirement*

	(1) Log non-durable consumption	(2) Log non-durable consumption
Years since retirement	-0.0310***	-0.0495***
	(0.0044)	(0.0099)
Years since retirement x Good	0.0163**	0.0577***
	(0.0052)	(0.0118)
Years since retirement x Very good/Excellent	0.0182***	0.0354**
	(0.0050)	(0.0114)
Years since retirement ^2		0.00121*
		(0.0006)
Years since retirement ^2 x Good		-0.00267***
		(0.0007)
Years since retirement ^2 x Very good/Excellent		-0.00114
		(0.0007)
Household size = 2	0.0794	0.0774
	(0.0638)	(0.0637)
Household size = 3	0.0138	0.00146
	(0.0957)	(0.0958)
Household size = 4+	-0.101	-0.121
	(0.1070)	(0.1070)
Household size = 2 x Good	0.0159	0.00257
	(0.0796)	(0.0796)
Household size = 2 x Very good/Excellent	0.0489	0.0508
	(0.0763)	(0.0762)
Household size = 3 x Good	0.0911	0.0908
	(0.1150)	(0.1150)
Household size = 3 x Very good/Excellent	0.173	0.185
	(0.1120)	(0.1120)
Household size = 4+ x Good	0.213	0.222
	(0.1280)	(0.1290)
Household size = 4+ x Very good/Excellent	0.264*	0.284*
	(0.1290)	(0.1290)
Constant	9.817***	9.811***
	(0.0231)	(0.0242)
N	7,457	7,457

Notes: Standard error in parentheses. * p<0.05, ** p<0.01, *** p<0.001.
Sources: Authors' calculations using CAMS (2001-2019), HRS (2000-2018), and Administrative Social Security Benefits Data.

Table 8. *PSID: Fixed-effect Regressions of Non-Durable Consumption, by Self-Reported Health at Retirement*

	(1) Log non-durable consumption	(2) Log non-durable consumption
Years since retirement	-0.0137**	-0.0278**
	(0.00489)	(0.00913)
Years since retirement x Good	-0.00526	0.0212
	(0.00583)	(0.0110)
Years since retirement x Very good/Excellent	0.00127	0.00974
	(0.00557)	(0.0104)
Years since retirement ^2		0.00121
		(0.000657)
Years since retirement ^2 x Good health		-0.00222**
		(0.000791)
Years since retirement ^2 x Very good/Excellent		-0.000754
		(0.000738)
Household size = 2	0.341***	0.345***
	(0.0630)	(0.0630)
Household size = 3	0.330***	0.325***
	(0.0903)	(0.0903)
Household size = 4+	0.539***	0.541***
	(0.100)	(0.100)
Household size = 2 x Good	0.0988	0.0758
	(0.0868)	(0.0871)
Household size = 2 x Very good/Excellent	-0.0362	-0.0370
	(0.0806)	(0.0806)
Household size = 3 x Good	0.261*	0.248
	(0.127)	(0.128)
Household size = 3 x Very good/Excellent	0.162	0.168
	(0.118)	(0.118)
Household size = 4+ x Good	0.290*	0.274
	(0.147)	(0.147)
Household size = 4+ x Very good/Excellent	0.0315	0.0327
	(0.132)	(0.132)
Constant	9.639***	9.642***
	(0.0274)	(0.0274)
N	4,104	4,104

Notes: Standard error in parentheses. * p<0.05, ** p<0.01, *** p<0.001.
Source: Authors' calculations using PSID (2001-2019).

Table 9. *CAMS: Fixed-effect Regressions of Non-Durable Consumption for the Top Wealth Tercile, by Self-Reported Health at Retirement*

	(1) Log non-durable consumption	(2) Log non-durable consumption
Years since retirement	-0.0317*** (0.0085)	-0.0794*** (0.0217)
Years since retirement x Good	0.0207* (0.0095)	0.0764** (0.0239)
Years since retirement x Very good/Excellent	0.0256** (0.0090)	0.0646** (0.0232)
Years since retirement ^2		0.00324* (0.0014)
Years since retirement ^2 x Good		-0.00376* (0.0015)
Years since retirement ^2 x Very good/Excellent		-0.00272 (0.0014)
Household size = 2	-0.108 (0.2330)	-0.116 (0.2330)
Household size = 3	-0.0472 (0.2500)	-0.115 (0.2510)
Household size = 4+	-0.447 (0.2680)	-0.544* (0.2710)
Household size = 2 x Good	0.194 (0.2460)	0.205 (0.2450)
Household size = 2 x V. Good/Excellent	0.236 (0.2430)	0.246 (0.2430)
Household size = 3 x Good	0.242 (0.2710)	0.304 (0.2730)
Household size = 3 x V. Good/Excellent	0.179 (0.2670)	0.254 (0.2680)
Household size = 4+ x Good	0.54 (0.3010)	0.644* (0.3030)
Household size = 4+ x V. Good/Excellent	0.483 (0.2940)	0.58 (0.2960)
Constant	10.11*** (0.0445)	10.12*** (0.0461)
N	2,216	2,216

Notes: Standard error in parentheses. * p<0.05, ** p<0.01, *** p<0.001.
Sources: Authors' calculations using CAMS (2001-2019), HRS (2000-2018), and Administrative Social Security Benefits Data.

Table 10. *CAMS: Fixed-effect Regressions of Non-Durable Consumption for The Top Wealth Tercile, by Marital Status at Retirement*

	(1) Log non-durable consumption	(2) Log non-durable consumption
Years since retirement	-0.00396	-0.0103
	(0.0026)	(0.0066)
Years since retirement x Single man	-0.0115	-0.00584
	(0.0068)	(0.0166)
Years since retirement x Single woman	-0.00885	0.00495
	(0.0068)	(0.0168)
Years since retirement ^2		0.00037
		(0.0004)
Years since retirement ^2 x Single man		-0.000327
		(0.0010)
Years since retirement ^2 x Single woman		-0.000862
		(0.0010)
Household size = 2	0.108	0.11
	(0.0600)	(0.0600)
Household size = 3	0.167*	0.170*
	(0.0747)	(0.0748)
Household size = 4+	0.0409	0.0384
	(0.1190)	(0.1200)
Household size = 2 x Single man	-0.0411	-0.0464
	(0.1170)	(0.1180)
Household size = 2 x Single woman	-0.134	-0.137
	(0.1890)	(0.1890)
Household size = 3 x Single man	-0.205	-0.209
	(0.1590)	(0.1600)
Household size = 3 x Single woman	10.07***	10.07***
	(0.0462)	(0.0475)
Household size = 4+ x Single man	0.108	0.11
	(0.0600)	(0.0600)
Household size = 4+ x Single woman	0.167*	0.170*
	(0.0747)	(0.0748)
Constant	0.0409	0.0384
	(0.1190)	(0.1200)
N	2,945	2,945

Notes: Standard error in parentheses. * p<0.05, *** p<0.001.
Source: Authors' calculations using PSID (2001-2019).

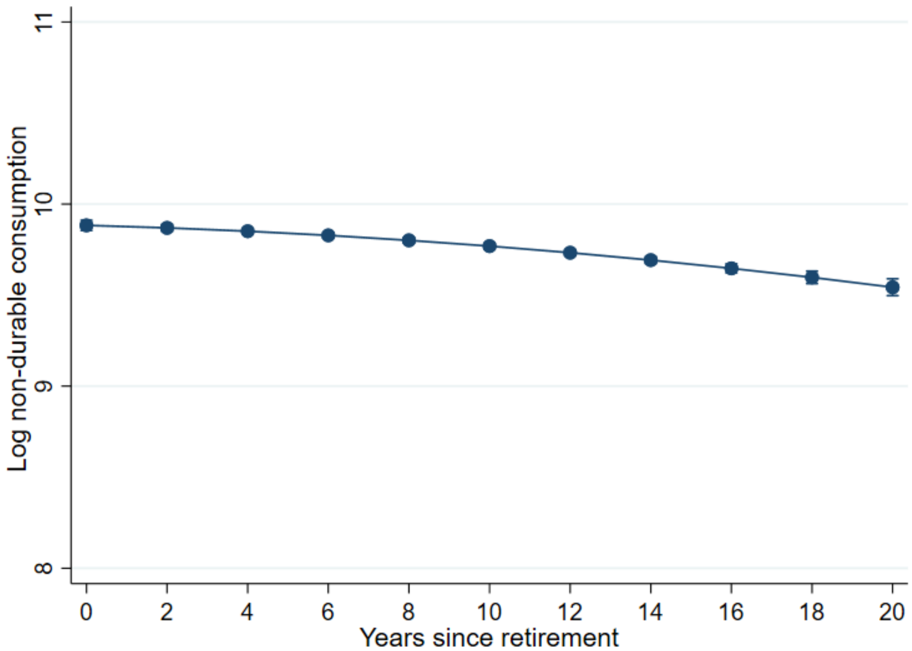
Table 11. *CAMS: Fixed-effect Regressions of Non-Durable Consumption, by Marital Status at Retirement*

	(1) Log non-durable consumption	(2) Log non-durable consumption
Years since retirement	-0.0107***	-0.00453
	(0.0018)	(0.0045)
Years since retirement x Single men	-0.0119**	-0.0154
	(0.0041)	(0.0099)
Years since retirement x Single women	-0.00896**	-0.00756
	(0.0033)	(0.0080)
Years since retirement ^2		-0.000361
		(0.0002)
Years since retirement^2 x Single men		0.000207
		(0.0005)
Years since retirement^2 x Single women		-0.0000795
		(0.0004)
Household size = 2	0.120**	0.117**
	(0.0382)	(0.0383)
Household size = 3	0.173***	0.172***
	(0.0489)	(0.0490)
Household size = 4+	0.0938	0.0944
	(0.0579)	(0.0579)
Household size = 2 x Single men	-0.0483	-0.0459
	(0.0660)	(0.0660)
Household size = 2 x Single women	-0.0501	-0.0457
	(0.0564)	(0.0564)
Household size = 3 x Single men	-0.132	-0.128
	(0.1040)	(0.1050)
Household size = 3 x Single women	-0.0608	-0.0544
	(0.0805)	(0.0806)
Household size =4+ x Single men	0.215	0.216
	(0.1290)	(0.1290)
Household size =4+ x Single women	0.00482	0.00548
	(0.0984)	(0.0984)
Constant	9.86***	9.85***
	(0.0505)	(0.0509)
N	9,602	9,602

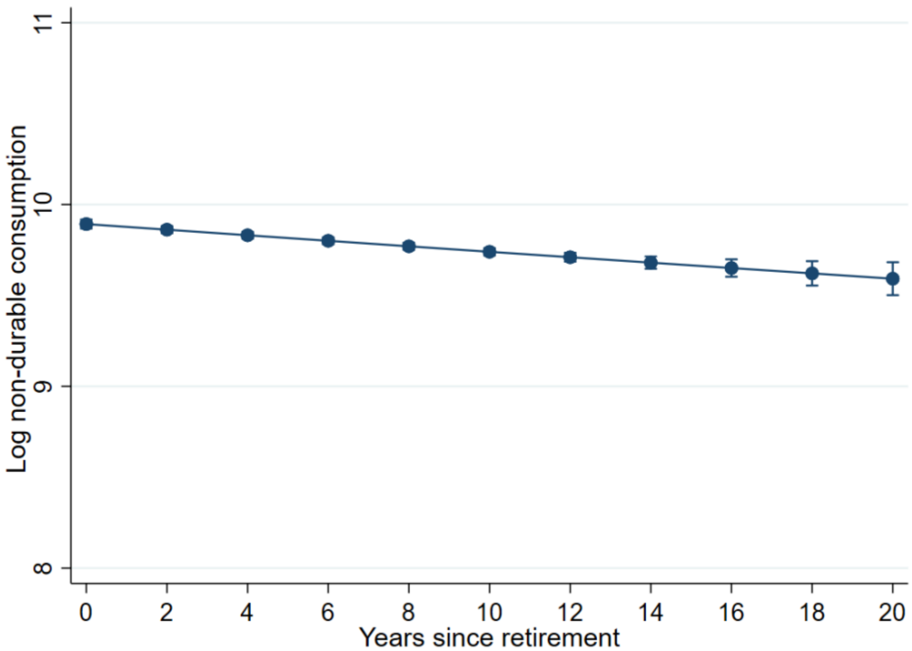
Notes: Standard error in parentheses. ** p<0.01, *** p<0.001.
Source: Authors' calculations using PSID (2001-2019).

Figure 1. *Non-durable Consumption in Retirement*

a. CAMS



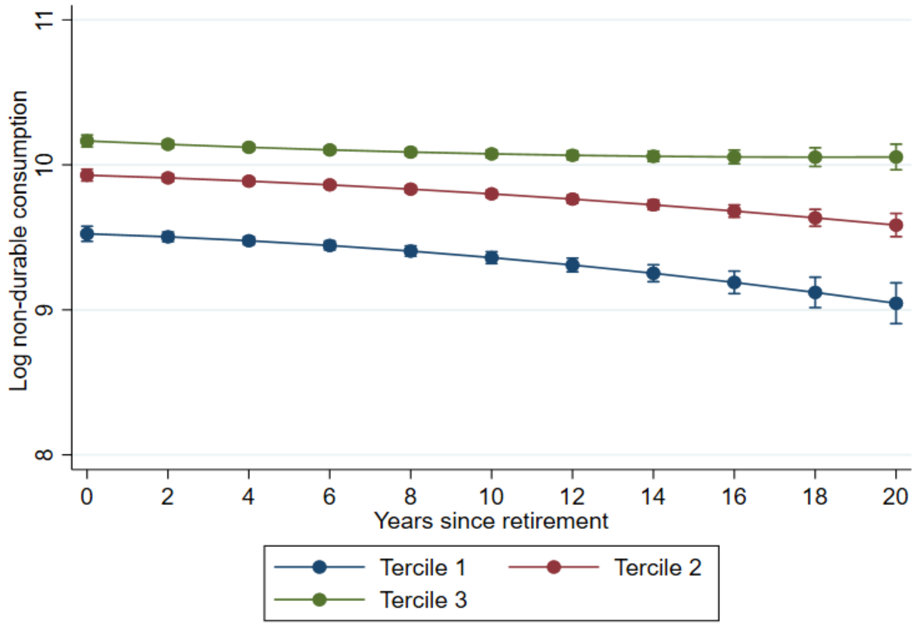
b. PSID



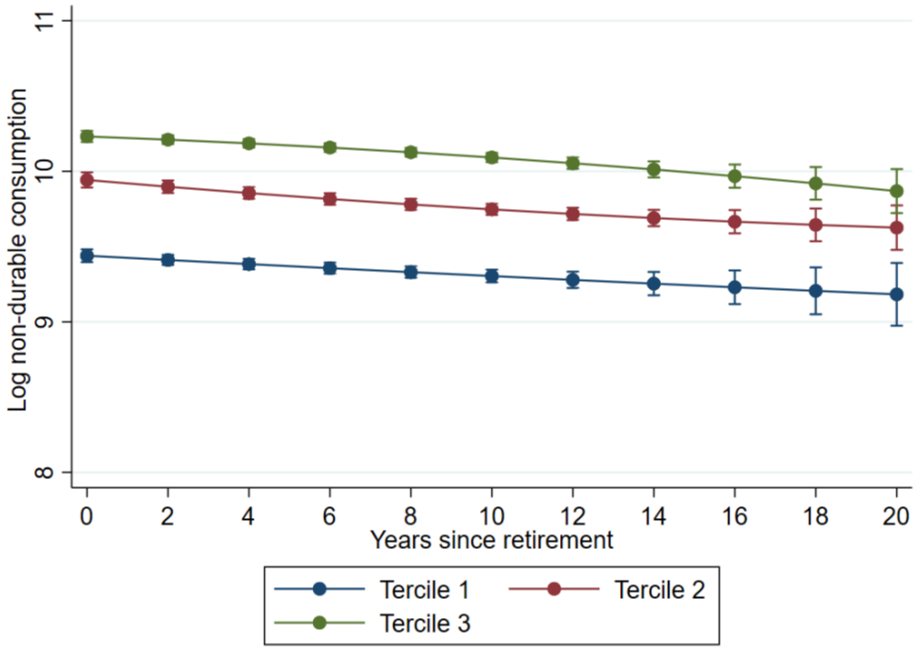
Source: Authors' calculations.

Figure 2. *Non-durable Consumption in Retirement, by Wealth Tercile at Retirement*

a. CAMS



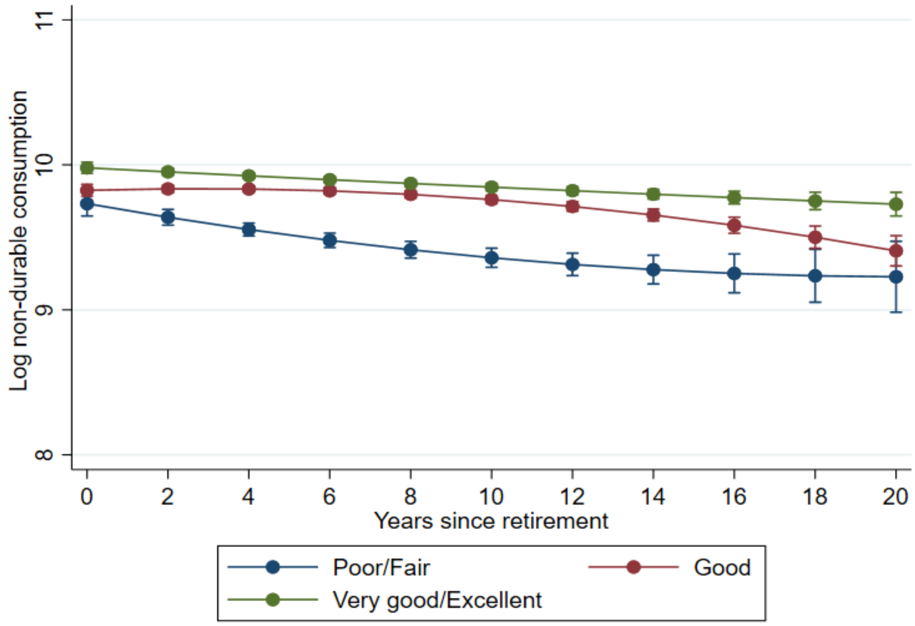
b. PSID



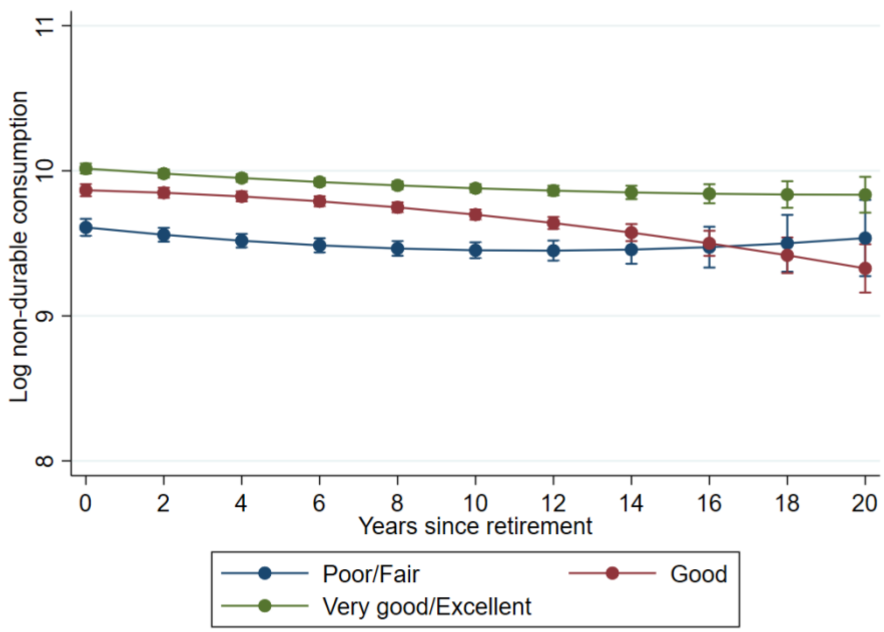
Source: Authors' calculations.

Figure 3. *Non-durable Consumption in Retirement, by Self-Reported Health at Retirement*

a. CAMS

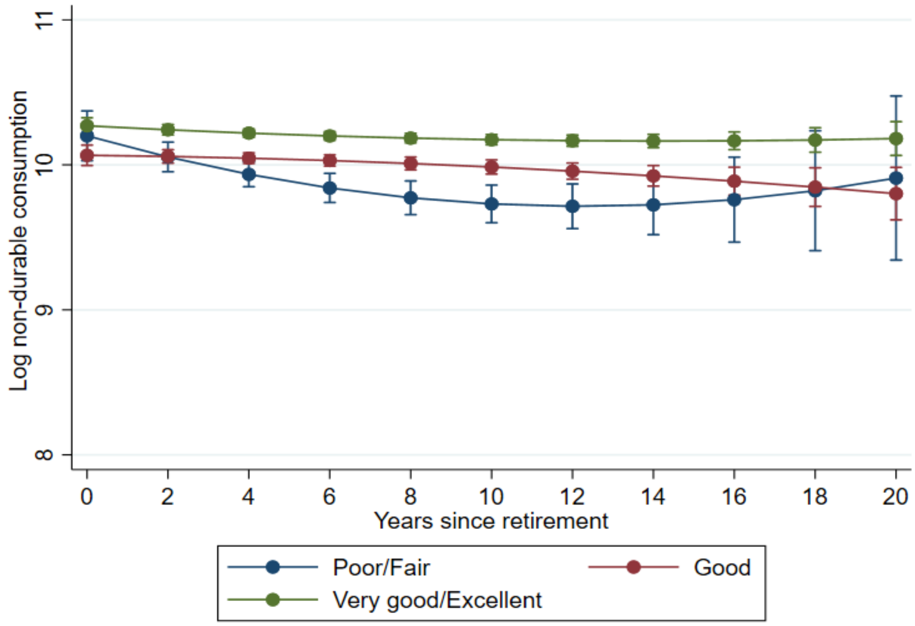


b. PSID



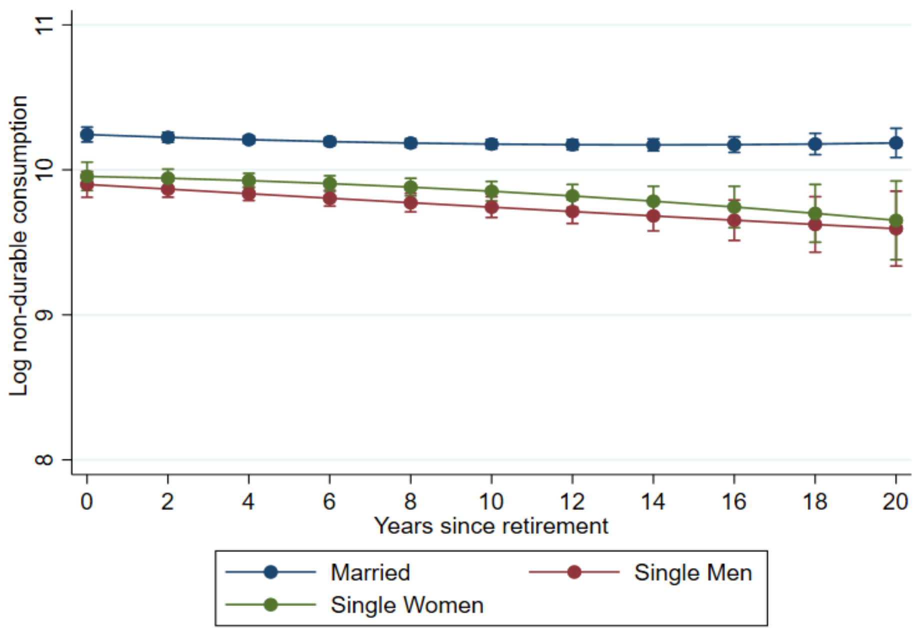
Source: Authors' calculations.

Figure 4. *CAMS: Non-durable Consumption in Retirement for the Top Wealth Tercile, by Self-reported Health at Retirement*



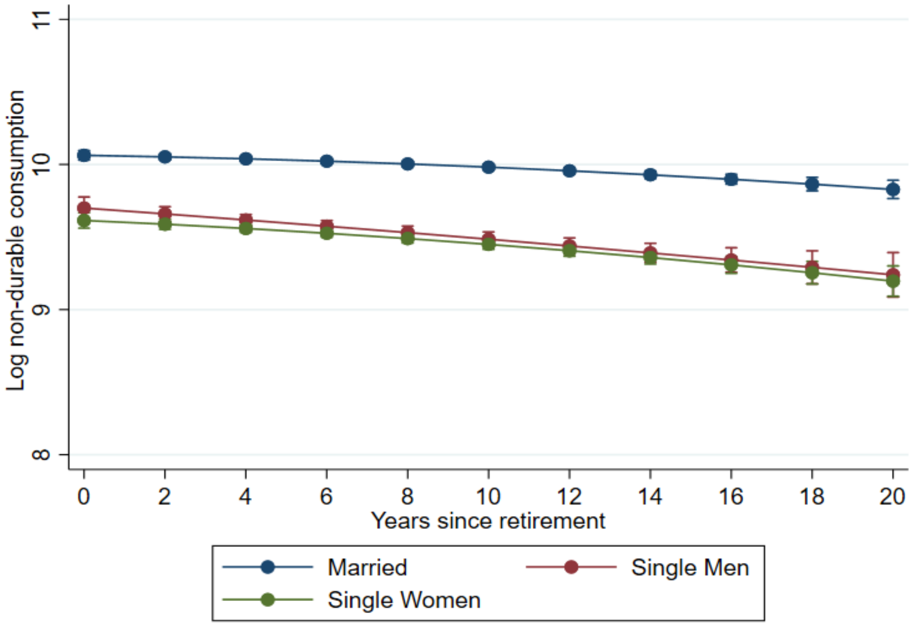
Source: Authors' calculations.

Figure 5. *CAMS: Non-durable Consumption in Retirement for the Top Wealth Tercile, by Marital Status at Retirement*



Source: Authors' calculations.

Figure 6. *CAMS: Non-durable Consumption in Retirement, by Marital Status at Retirement*



Source: Authors' calculations.

Appendix: Challenges to Imputing Consumption Data

Our original proposal included an effort to construct a longer and larger sample of consumption data from the full HRS. A long panel of consumption data would provide important insights into the spending and savings behavior of households throughout retirement.

Our efforts, however, failed to generate a dataset that could be used in the main regressions. This Appendix spells out the details of these efforts to identify the pitfalls for future researchers.

Specifically, the analysis made two requirements of the data. First, the consumption data had to be positive. Second, the data needed to accurately capture the variation of consumption *within* each household over time, because changes in consumption over time for a given household are the object of the analysis. Neither condition was met by the attempt to construct consumption from HRS data on finances and household characteristics.

Theoretically, consumption expenditures can be determined from data on income and saving. Detailed administrative datasets have had some success using the budget constraint to infer spending on consumption (Browning et al. 2014). Since saving flows are typically not measured in administrative records, data on changes in wealth over a certain period is often used instead. Specifically, spending is calculated as:

$$S_{t,h} = Y_{t,h} - \left(\Delta W_{t,h} - R_{t,h}\right) - T_{t,h} \tag{A1}$$

where $S_{t,h}$ is spending for household h in time period t; $Y_{t,h}$ is the total household income in this period; $\Delta W_{t,h}$ is the change in net wealth; $R_{t,h}$ is the unrealized capital gains from the financial and housing markets; and $T_{t,h}$ is the net transfers such as gifts to children, government transfers or donations.[20]

One major challenge with estimating consumption in survey data, rather than administrative tax records, is that self-reported wealth is subject to measurement error.[21] While this measurement error is small relative to total wealth levels, it can be large relative to the change in wealth – the proxy for net savings. As a result, estimating consumption as the residual of income and asset changes can be noisy and produce many negative values.

[20] See Baker, Meyer, and Pagel (2018) for a discussion of the difficulties in applying this method to administrative tax registries, including the fact that capital gains on wealth are unobserved. Browning et al. (2014) also discusses this issue.

[21] See Footnote 3.

Instead, this project attempted to impute consumption data using detailed wealth categories and demographic information from the HRS. Conceptually, the CAMS provides a target to fit a more flexible equation than Equation (A1), where the various wealth and income measures can be disaggregated. Figure A1 shows that income is correlated with consumption and could provide some usable information for imputing consumption on the full HRS.

This approach used the AMELIA II algorithm (Honaker and King 2010), which is based off a multivariate normal model of the data and can provide a uniform imputation on datasets with multiple missing values. When only one variable is missing on part of the sample (e.g., consumption), AMELIA II is equivalent to imputing using a linear regression with normal noise.

Unfortunately, the imputations did not provide sufficiently precise time-varying within-household predictions of consumption. Comparing the results of the imputation to the measured consumption in CAMS, as shown in Figure A2, reveals a great deal of noise.

The main problem is that the imputed consumption values were driven by demographics rather than financial variables. To see how these imputations were made, recall that AMELIA II is equivalent to a linear regression when only imputing consumption. Tables A1 and A2 show the equivalent regressions for both overall consumption and non-durable consumption. Ideally, the coefficients of the financial measures would all be close to one, as suggested by the budget identity (A1).[22] However, the significant measurement error of self-reported wealth leads to attenuation, where the best fit model largely ignores wealth variables when predicting consumption.

On the other hand, demographic variables – such as education and race – had large coefficients. Variation in consumption across households, however, is not useful for the main question of consumption changes in retirement over time, and the household fixed effect in regression (1) absorbed most of this variation. Since most of these characteristics varied little over time, they generate flat consumption paths.

The notable exception is the age variable, which generated a time-varying pattern in the imputed data. This time-varying trend would lead to an effect on the "years since retirement" coefficient in regression (1), which is the main coefficient of interest. However, because age is colinear with time since retirement (given the household fixed effect), this coefficient would

[22] For the lagged wealth variables we would expect the coefficient to deviate from 1 by a magnitude similar to the rate of return on assets.

mechanically generate the estimate in A1. Because this imputation is based solely on the CAMS sample, the inclusion of age in the imputation does not provide any additional information to the time trend of consumption beyond what was already in the non-imputed data.

In summary, attempting to construct larger and longer consumption panels from existing survey data will not help researchers address questions about consumption paths over retirement. Researchers will have to wait until more years of consumption data are available in the CAMS or PSID.

Table A1. *CAMS: Regression on Wealth and Income Components*

	(1) Consumption	(2) Non-durable consumption
Pension income	0.132***	0.0281***
	(0.0213)	(0.00661)
Capital income	0.0484***	0.0181***
	(0.0102)	(0.00503)
SS retirement income	0.308***	0.172***
	(0.0430)	(0.0208)
IRA withdrawals	0.238***	0.0721***
	(0.0437)	(0.0163)
Other income	0.0943***	0.0248***
	(0.0101)	(0.00509)
Financial wealth	0.00282	0.0000937
	(0.00172)	(0.000852)
Financial wealth last period	0.00883***	0.00607***
	(0.00254)	(0.00121)
Other non-housing wealth	-0.00548**	-0.00283**
	(0.00213)	(0.00103)
Other non-housing wealth last period	0.0126***	0.00590***
	(0.00309)	(0.00143)
DC/IRA wealth	0.000737	0.000157
	(0.00188)	(0.000993)
DC/IRA wealth last period	0.000179	0.00157
	(0.00296)	(0.00153)
Housing cost	0.0342	0.00199
	(0.0207)	(0.00979)
Housing cost last period	0.108***	0.0207*
	(0.0213)	(0.0102)
Homeownership	2112.7	2943.0***
	(1216.7)	(578.6)
Net housing purchases, sales, and improvements	-0.000118	0.00000505
	(0.000115)	(0.0000516)

Net transfers	-0.0828**	-0.0506***
	(0.0284)	(0.0138)
Household size	1274.5**	688.4**
	(476.0)	(222.3)
Married	10171.7***	5392.4***
	(1151.1)	(552.3)
Black	-1501.2	-1792.3*
	(1789.4)	(814.3)
Other non-white	-1042.5	-1681.2
	(2617.1)	(1255.1)
Age	-587.4***	-197.3 ***
	(71.06)	(34.30)
Health: Good	1684.4	247.8
	(1192.7)	(574.6)
Health: Very good, excellent	641.5	-88.80
	(1166.2)	(564.8)
Education: High school	3665.0**	1701.6 **
	(1325.8)	(627.5)
Education: More than high school	6496.3***	3569.2 ***
	(1341.5)	(634.8)
Constant	55926.9***	20844.1 ***
	(5426.8)	(2623.8)
N	6,591	8,277
adj. R-sq	0.291	0.178

Notes: Standard error in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

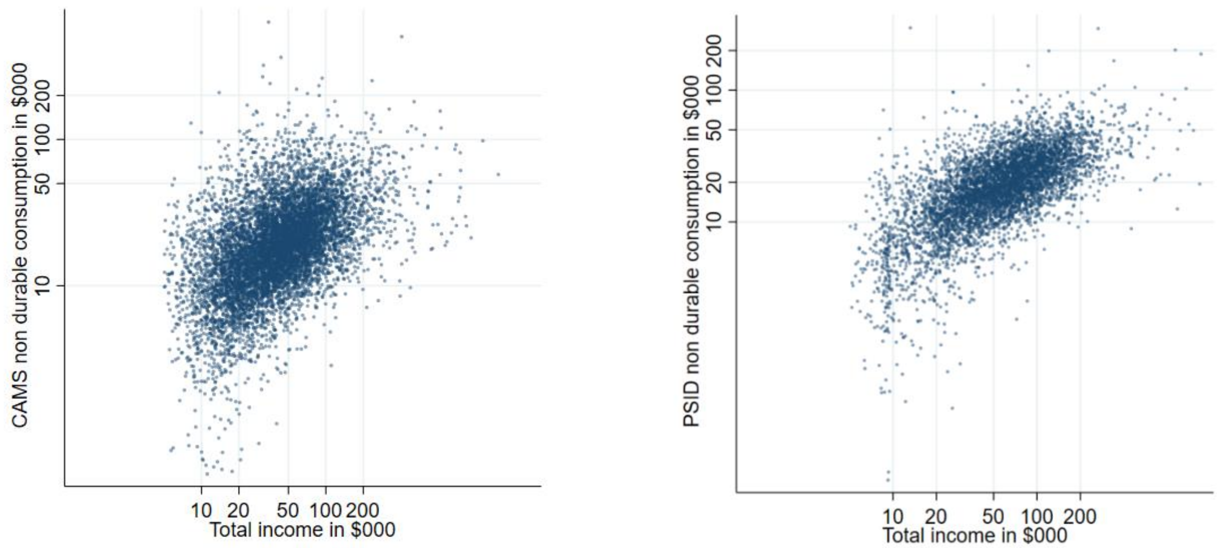
Table A2. *PSID: Regression on Wealth and Income Components*

	(1) Consumption	(2) Non-durable consumption
Income	0.120***	0.0500***
	(0.00489)	(0.00277)
Financial wealth	-0.00232*	-0.00135*
	(0.000996)	(0.000564)
financial wealth last period	0.00389***	0.00367***
	(0.00108)	(0.000614)
Other (non-financial) wealth	-0.0000349	0.000500
	(0.000583)	(0.000330)
Other wealth last period	0.00272***	0.000470
	(0.000628)	(0.000356)
DC/IRA wealth	0.000827	-0.00153
	(0.00237)	(0.00134)
DC/IRA wealth last period	0.00758**	0.00626***
	(0.00271)	(0.00154)
Homeownership	5302.3***	3239.3***
	(897.1)	(508.1)
Net transfers	-0.000147	-0.000414
	(0.000725)	(0.000410)
Household size	5514.5***	2787.4***
	(568.9)	(322.2)
Married	6088.7***	4594.6***
	(965.3)	(546.7)
Black	-1947.9	-1344.8*
	(1165.3)	(660.0)
Other non-white	-1924.1	-2165.1**
	(1449.0)	(820.7)
Age	-396.7***	-62.24*
	(43.31)	(24.53)
Health: Good	-1134.2	-1347.5**
	(859.8)	(487.0)
Health: Very good, excellent	1793.7*	-553.2
	(853.9)	(483.7)
Education: High school	1459.8	1556.6*
	(1103.8)	(625.2)
Education: More than high school	7946.9***	4688.8***
	(1066.6)	(604.1)
Constant	35927.4***	8411.0***
	(3707.3)	(2099.8)
N	5,148	5,148
adj. R-sq	0.441	0.355

Notes: Standard error in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

Figure A1. *Scatter Plot of Consumption Relative to Income*

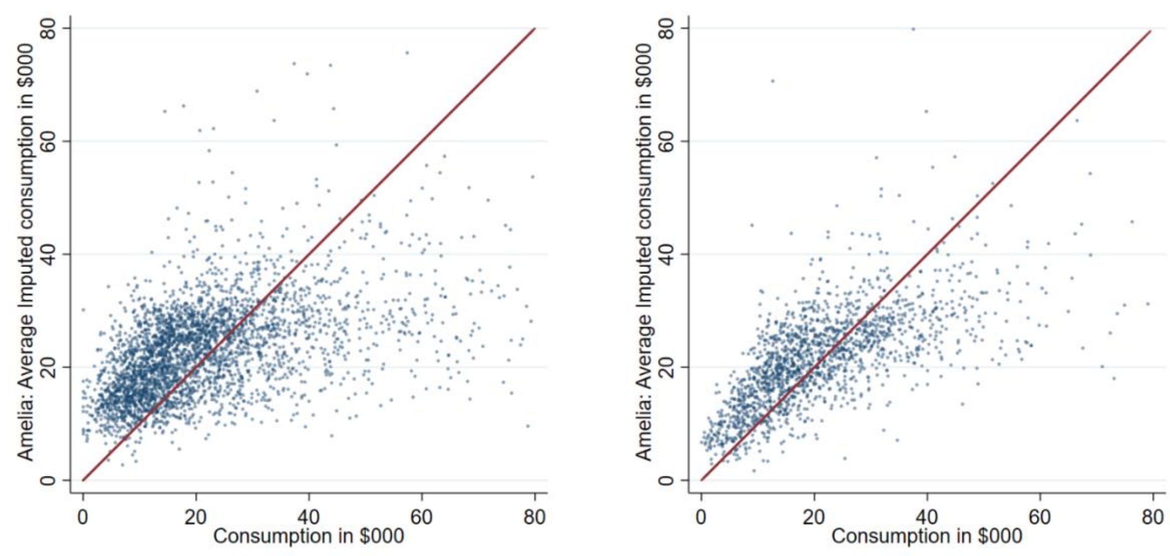
a. CAMS b. PSID



Source: Authors' calculations.

Figure A2. *Actual vs Imputations Using AMELIA*

a. HRS / CAMS b. PSID



Source: Authors' calculations.

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