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Heterogeneity in spending change at retirement

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ABSTRACT

The simple one-good model of life-cycle consumption requires that consumption be continuous over retirement; yet prior research based on partial measures of consumption or on synthetic panels indicates that spending drops at retirement, a result that has been called the retirement-consumption puzzle. Using panel data on total spending, nondurable spending and food spending, we find that spending declines at small rates at retirement, rates that could be explained by mechanisms such as the cessation of work-related expenses, unexpected retirement due to a health shock or by the substitution of time for spending. We find substantial heterogeneity in spending change at retirement: in the upper half of the wealth distribution spending increased. In the low-wealth population where spending did decline at higher rates, the main explanation for the decline appears to be early retirement due to poor health, possibly augmented by a short planning horizon by a minority of the population.

Introduction

The simple one-good model of life-cycle consumption requires "consumption smoothing:" the trajectory of consumption by an individual should be continuous in time. If the trajectory is not continuous, a reallocation of consumption so as to reduce the size of the discontinuity will increase lifetime utility without an increase in the use of resources. However, British households apparently reduce consumption at the ages associated with retirement, and the reduction cannot be explained by the life-cycle model (Banks et al., 1998). Households in the Panel Study of Income Dynamics (PSID) sharply reduced several components of consumption at retirement (Bernheim et al., 2001). Because the mechanisms underlying this observed drop in consumption at retirement are not well understood, it has been referred to as the retirement-consumption puzzle.

There are a number of interpretations or explanations for this drop. The most obvious has to do with the cessation of work-related expenses, but it appears that such expenses are not large enough to explain the observed drop in consumption at retirement (Banks, Blundell and Tanner).

A second explanation is that workers do not adequately foresee the decline in income associated with retirement (Bernheim et al., 2001). On reaching retirement they assess their financial resources, and, finding them less than anticipated, reduce consumption. This interpretation is damaging to the life-cycle model, which assumes that economic agents are forward-looking planners. For most workers, retirement is a predicable event, and workers should be assessing continuously their financial situation so that they will not be surprised. They should have saved enough so that they would not have to reduce consumption at retirement. However, at least on average, this explanation lacks empirical support: prior to retirement workers anticipate a decline in spending at retirement (Hurd and Rohwedder, 2003).

A third interpretation is that workers under-saved but they were aware they had under-saved: they were not surprised by the inadequacy of their resources. A lack of self control caused the under-saving and the decline in income forced them to reduce consumption. This interpretation is also damaging to the life-cycle model, which assumes that people are both forward-looking and that they follow through on their (optimal) plans.

A fourth interpretation is that the timing of retirement is uncertain. Some workers retire earlier than anticipated because of a health event or unemployment, resulting in an unexpected reduction in lifetime resources, and the reduction leads to a concurrent reduction in consumption. Such a reduction in consumption is well within the spirit of the life-cycle model.

A final explanation is that retired households have considerably more leisure than working households. The increased leisure can

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be used to purchase goods more efficiently or to substitute home-produced goods for purchased goods. In this interpretation, spending declines, but actual consumption does not (Aguir and Hurst, 2007). We note, however, that the increased leisure time could also lead to increases in purchased goods because of complementarities such as spending on travel. If some uses of time are substitutes for market-purchased goods and some are complements, the overall effect is ambiguous, but we would expect consumption to change at retirement, not that it be smooth.

Because of the multiplicity of explanations, heterogeneity in spending change at retirement should be expected: some identifiable groups are less forward-looking than others; some are more subject to health shocks; some are more time-constrained in spending prior to retirement; and so forth. Apparently, in the literature cited above, these disaggregated spending changes averaged to a spending decline in the population.

In this paper we use panel data on the total spending of individual households. Consequently we are able to make a number of contributions to the literature. We use a measure of total spending based on 36 categories of spending plus 6 big-ticket items in panel data. While the measure is based on fewer items than the US Consumer Expenditure Survey, it is comprehensive and so avoids the difficulties that have been identified in the literature of measures based just on food spending. Our spending measure is embedded in the HRS allowing us to study heterogeneity in spending change at retirement as a function of observable characteristics. We make use of longitudinal data on personal characteristics such as health, on expectations and on qualitative assessments such as recollections to provide evidence about causal mechanisms. We have complete measures of income and wealth in close proximity to the spending measures to assess the levels and changes in economic resources associated with retirement.

Based on panel data on spending before and after retirement, we find that, spending declines at retirement at a small rate, 1% to 6% depending on the measure. We cannot reject the hypothesis of no change in spending, and the 95% confidence intervals do not cover large changes. A change of these magnitudes could plausibly be due to the cessation of work-related expenses, a loss of earnings due to early retirement in response to a health shock, by the use of time to economize on spending, or by a combination of these factors. We conclude that these data do not support a retirement-consumption puzzle at the population level.

We analyze spending change as a function of pre-retirement wealth, of planning horizon, and of the importance of health as a factor associated with retirement. We found substantial heterogeneity across wealth quartiles showing declines in spending at retirement among low wealth households and increases in spending among those in the highest wealth quartile. In subpopulations where spending does decline at larger rates, the main explanation seems to be early retirement associated with poor health. We found some support for an explanation based on a short planning horizon, but the fraction of the population where this applies is small.

Theoretical background

In its simplest form the life-cycle model (LCM) with one consumption good specifies that individuals choose a consumption path to maximize expected lifetime utility, and that the instantaneous utility function is unchanging over time. The shape of the optimal consumption path is partially or wholly determined by utility function parameters, the interest rate and mortality risk. The level of the path is determined by the lifetime budget constraint; the difference between the level of consumption and income determines the saving rate and the equation of motion of wealth. Auxiliary assumptions, which are not controversial, are that the marginal utility is continuous in consumption and that marginal utility declines in consumption. A condition for lifetime utility maximization is that marginal utility be continuous in time: were it not continuous a reallocation of consumption across the discontinuity from the low marginal utility state to the high marginal utility state would increase total utility without a greater use of resources. Such a reallocation should continue until there no longer is a discontinuity in marginal utility. Because marginal utility is monotonic and continuous in consumption, an implication is that consumption must be continuous in time. In particular, consumption should be continuous over retirement.[1]

In a more general model, which recognizes uncertainty, individuals or households experience unanticipated windfall gains or losses to wealth, earnings or annuities, and then re-optimize to a new consumption path, causing a discontinuity in the consumption path. However, wealth, earnings or annuity changes which are foreseeable should cause no change in the consumption path because the lifetime budget constraint has not changed. In particular consumption should not change at retirement if retirement occurs as planned.[2] But if retirement occurs sooner than expected, lifetime resources will be less than expected so that consumption will have to be adjusted downward. The obvious example is a stochastic health event that causes early retirement. Negative health shocks leading to early retirement are undoubtedly empirically important, so that we should expect to observe some unanticipated declines in consumption at retirement from these shocks alone provided we can identify the population that experienced the shocks.

A second generalization of the LCM specifies that utility depends on more than one good, in particular leisure as well as consumption. If the utility function is separable, the marginal utility of consumption should be continuous in time and consumption will also be continuous. If the utility function is not separable, but retirement is gradual consumption will also change in a continuous manner. But for most workers leisure increases abruptly by about 2000 h per year. Because the marginal utility of consumption should be the same immediately before and immediately after retirement, which it would not be were consumption to be continuous, nonseparability of the utility function requires a discontinuous change in consumption.[3]

Some types of leisure are substitutes for the consumption of market purchased goods such as home repairs, some are complements with consumption such as travel, and some are neutral such as watching television. Everyday observation and introspection suggest that we have all types, and it is an empirical question which dominates. But the main point is that we would not expect consumption to be smoothed over retirement.

Because of differences in tastes and differences in economic resources we expect heterogeneity across households in whether substitution or complementarity dominates. For example, someone with high wealth may continue to purchase home repairs as before retirement, but spend more on travel with a net effect of an increase in spending. Someone with a high wage rate may have

[1] Continuity does not depend on whether retirement is given exogenously as, say, by mandatory retirement or whether it is an object of choice: regardless of retirement age consumption should be continuous in this simple model. Thus in a population with heterogeneous tastes, which will lead to differing retirement ages, consumption will be continuous for each individual, and therefore it will be continuous in the population.

[2] If some of measured consumption is, in fact, work-related expenses, consumption as measured by spending would drop at retirement, but utility-producing spending would not. This is a measurement issue.

[3] We have stated nonseparability in terms of the utility function, but the conclusions are the same in the context of home production when the inputs into home production, time and purchased goods are not separable.

purchased home repairs before retirement but will do them himself after retirement for a net reduction in spending. Thus, when leisure and consumption are not separable, it is an empirical matter as to whether spending will increase or decrease at retirement.

Prior empirical findings

Subsequent to the initial papers by Banks, Blundell and Tanner, and by Bernheim, Skinner and Weinberg, a number of empirical papers have estimated the change in consumption associated with retirement. Based on synthetic panel data, Miniaci et al. (2003) in the Italian Survey on Family Budgets, and Aguiar and Hurst (forthcoming), Fisher (2008) and Laitner and Silverman (2005), in the US Consumer Expenditure Survey (CEX) find lower spending by those of retirement age. Even though the latter three studies for the US use the same data they report estimates for the decline in spending at retirement that vary widely: Laitner and Silverman find a 16 percent drop, while Fisher et al. find a much smaller decline of 5.7 percent in median food spending, and even smaller in total spending. Aguiar and Hurst document a moderate decline in non-durable spending plus housing services. Further, once spending on food, clothing and non-durable transportation are excluded they actually show an increase in expenditures of six percent.[4] An important caveat of synthetic cohort studies is the challenge of separating out cohort and age effects from a time series of cross sections (Blau, 2008). Furthermore, synthetic panels cannot quantify the importance of heterogeneity in behavior: an average change could be due to a few households having very large declines, or it could be due to all households having approximately the average decline. Because change cannot be linked to individual households and the characteristics of those households synthetic panels are limited in their ability to support studies of causal mechanisms.

Investigations of food spending in true panel have sometimes corroborated the results of Bernheim, Skinner and Weinberg, but not universally. Smith (2006) found in the British Household Panel Survey that food consumption by those who retired as planned barely declined whereas food consumption by those who retired involuntary declined by about 11 percent. Haider and Stephens (2007) found in the PSID and in the Retirement History Survey that people reduce spending on food when they retire by about 5–10% depending on the specification. In the Health and Retirement Study they found no reduction, and there is no apparent explanation for this difference. Aguiar and Hurst (2005) used the Continuing Survey of Food Intake of Individuals, collected by the US Department of Agriculture, to study the fine details of food consumption as well as on food spending. They found that although spending on food declines at retirement, actual consumption as measured by caloric or vitamin intake, or by the quality of food did not decline.

An entirely different approach to the retirement-consumption puzzle is via simulation of a life-cycle model. If the model allows non-separability between leisure and consumption, then it will, of course, cause a discontinuous change in consumption when hours of work change discontinuously. But even when leisure and consumption are separable, uncertainty can lead to a decline in consumption at retirement as in the model of Blau (2008). For example, a negative shock to health will lead to unexpected early retirement for some and, therefore, to an unexpected decline in lifetime resources.

Christensen (2008) used Spanish panel data in which households were observed for 5 to 8 consecutive quarters. Investigating budget shares she found no evidence of a drop in consumption at retirement in any of the commodity groups. But she did not find any drop in income associated with retirement in Spain, limiting comparability with the situation in the US, where income drops substantially at retirement. Aguila et al. (2011) use the panel dimension of the CEX which interviews households for five consecutive quarters. They do not find any evidence of a consumption drop in non-durable spending, but estimate food spending to decline by about 6 percent at retirement. Battistin et al. (2009) use data on spending in Italy and find that nondurable spending declines by almost 10% due to retirement induced by the Italian pension system. Two special facts about the Italian situation limit the applicability of their results to the British and American situation: the generosity of the Italian pension system including a large lump-sum retirement bonus which effectively eliminates liquidity constraints; and a reduction in household size at retirement due to adult children (finally) leaving home.

Our overall summary is that there remains considerable controversy about the basic facts as the magnitude of a consumption decline at retirement, ranging from 14% in Bernheim, Skinner and Weinberg and 16% in Laitner and Silverman to an actual increase of 6% in Aguiar and Hurst. However, none of these studies has been based on data that are fully adequate to quantify consumption change, particularly heterogeneity, and to shed light on the importance of possible mechanisms for any decline. The ideal data are panel data on total, non-durable and food spending with a sufficient number of individuals who transition into retirement. Further, to provide direct evidence on mechanisms of potential spending changes they should have information for the same individuals on relevant covariates such as income before and after retirement, time use, health status and financial planning horizon.

Data

Our data come from the Health and Retirement Study (HRS) and from a supplemental survey to the HRS, the Consumption and Activities Mail Survey (CAMS).[5] The HRS is a biennial panel. Its first wave was conducted in 1992, and additional waves have continued to the present. The initial target population was the cohorts born in 1931–1941 (Juster and Suzman, 1995). Additional cohorts were added in 1993, 1998 and 2004 so that with the 1998 wave the HRS represented the population from the cohorts of 1947 or earlier, and with the 2004 wave the population from the cohorts of 1953 or earlier.

The HRS interviewed about 20,000 subjects in 13,100 households in the year 2000 wave. A random sample of 5,000 households (38.2 percent of all households interviewed in HRS 2000) was asked to participate in the initial wave of CAMS. CAMS is a mail survey rather than the more usual telephone survey. For the purpose of measuring consumption, a mail survey is highly advantageous because respondents can consult a spouse, examine records, and answer at their convenience.[6]

The questionnaires for CAMS wave 1 were sent out in September, 2001.[7] In married or partnered households it was sent to one of the spouses, chosen at random. There were 3866 responses in the CAMS wave 1, which corresponds to a total response rate of 77.3 percent.

[4] Clothing and transportation, and, to some extent, food are excluded because they are substantially work-related. In addition, food spending may decline because of an increase in home production of meals.

[5] The HRS is primarily funded by the National Institute of Aging (Grant No. NIA U01AG09740) with additional funding from the Social Security Administration. It is conducted by the University of Michigan.

[6] The CAMS questionnaires are accessible online at http://hrsonline.isr.umich.edu/meta/sho_meta.php?hfyle=qnaires.

[7] See Hurd and Rohwedder (2009) for a more extensive description of CAMS.

In September, 2003, CAMS wave 2 was sent to the same households.[8] The structure of the questionnaire was almost the same so as to facilitate panel analysis. The response rate in CAMS wave 2 was 78.3 percent.[9] CAMS wave 3 was fielded in October, 2005 to the same CAMS households, and to an additional 850 households representing the new cohort of 51–56 year-olds who were inducted into HRS in 2004. CAMS wave 4 was again fielded in October, 2007 to the same CAMS households.

CAMS has three main topics: Part A is about activities or uses of time; Part B collects data on spending, including anticipations and realizations about changes in spending at retirement; and Part C asks information about marital status and labor force participation.

Our primary interest is total spending or nondurable spending by households. In wave 1, the respondent was asked about spending in 26 categories of nondurables and 6 categories of durables. The categories were chosen to match published CEX aggregates, and cover all but a small percent of spending as reported in the CEX. To accommodate differing frequencies of spending, such as food on the one hand and automobile insurance on the other hand, respondents can choose a reference time period for each type of spending. For example, food spending is often reported as weekly spending whereas rent is often reported as monthly spending. Spending is annualized to produce an estimate of total annual spending (Hurd and Rohwedder, 2009).

In wave 1, the rate of item nonresponse was very low, in the single digits for most categories.[10] The maximum rate was 13.8%. For some of the categories, we imputed for item nonresponse from HRS core data. For example, spending for rent had a relatively high rate of item nonresponse (13.2%), but almost all was by households who, according to HRS core interviews, were home owners. Thus with considerable confidence we imputed zero rent to such households. Because item nonresponse was so low, total imputed spending was a small fraction of total estimated spending, just 6.0 percent.[11]

Wave 2 of CAMS had the same spending categories as wave 1, but augmented by personal care products and services, and gardening and housekeeping services. These amount to 3.1% of total spending for households age 55 and above according to the CEX. Wave 3 of CAMS had the same categories as CAMS wave 2 with the addition of household furnishings and equipment which accounts for 3.7 percent of total spending of households age 55 and above according to the CEX. Our panel comparisons will be spending change found by comparing spending prior to retirement with spending change after retirement. For this comparison we will always use just those categories that are measured in both pre- and post-retirement waves. For example, in calculating spending change for those who retired between waves 1 and 2, we will exclude personal care products and services, and gardening and housekeeping services from the wave 2 measure. Following this method, we construct panel measures of total spending, non-durable spending and food spending.

Because spending data are difficult to collect, their validity is always an issue. Hurd and Rohwedder (2009) discuss the details of various design elements of CAMS and comparisons of the first four waves of CAMS with CEX spending are presented in Hurd and Rohwedder (forthcoming). They find that in the age range 55–64 CAMS spending was 4% higher than CEX spending on average.

One section of the CAMS questionnaire asks workers about how they anticipate spending will change when they retire and asks retired persons how spending did change when they retired. The details of these questions are given in the Appendix. We use these data to address the hypothesis that the retirement-consumption puzzle is due to workers being surprised by their lack of financial resources at retirement.

Our data are on spending, but the theory is about consumption. Differences between spending and consumption occur in the case of durables where an outlay may occur at one time but the consumption of the services from that good is spread over many periods. Thus, spending on durables may decline substantially or even to zero at retirement yet consumption of services from the stock of durables will decline at the rate of depreciation at most. An implication is that total consumption will be smoother than spending. A second distinction between consumption and spending obtains when both time and purchased goods are inputs into the production of consumption as, say, in the production of meals at home. To the extent that time and purchased goods are substitutes in the production of consumption, consumption will be smoother than spending at retirement.

In practice the empirical results in the literature are based either on food spending or nondurable spending. Because spending and consumption are almost simultaneous, such spending should be closer to consumption than spending on durables. Mostly we will speak interchangeably of spending and consumption, keeping the distinction in mind.

Analysis

We will use two samples. For most of our investigations we use a sample of households where we have panel data on actual spending pre- and post-retirement, and on the anticipations of spending change prior to retirement and recollections of spending change after retirement. We call this our "panel" sample. We begin with 439 retirement transitions among 50 to 70 year-olds where the responses to the question "Are you retired?" indicate a transition from not retired to retired.[12] These responses are constructed from four waves of CAMS, 2001 to 2007, yielding three panel transitions where we observe actual spending data before and after retirement for these 439 observations.

Our second sample consists of 1521 observations on retired persons for whom we observe recollected spending change at retirement in CAMS and relevant covariates immediately prior to retirement from the HRS core. All of these respondents retired during the survey period of the HRS, but many of them retired prior to wave 1 of CAMS so that we do not observe their actual retirement transitions. We call this the "recollections" sample.

We will present three types of statistics to study the population tendency in the panel sample: average spending, median spending and the median change at the household level. The average change at the household level is not a very reliable statistic because observation error on spending can produce large outliers when spending is put in ratio form.

Main result on spending change at retirement

Table 1 shows the means and medians of total real spending before and after retirement and the median of the change in spending calculated over 439 households where retirement occurred between CAMS waves.[13] Total spending averaged $41.0 thousand be-

[8] A subset of 298 respondents were excluded from wave 2 because they were chosen to participate in another supplemental study; in wave 3 of CAMS they were included again.

[9] Response rates are lower bounds in that they are not adjusted for mortality or undeliverable questionnaires.

[10] The rates of item nonresponse are similar on other waves of CAMS.

[11] In CAMS wave 2, the fraction of total spending that was imputed amounted to 5.0 percent and to 5.5 percent in CAMS wave 3.

[12] We impose the additional restriction that the respondent remained retired in the following wave if the respondent is observed in that following wave.

[13] All spending and wealth numbers are in 2003 dollars.

Table 1
Spending levels and spending change in panel.

	Average and median real spending before and after retirement, panel			Average and median real spending without retirement transition, two-year panels		
	Retirement sample, $N = 439$			Comparison sample, $N = 1{,}993$		
	Total Spending	Nondurable	Food	Total Spending	Nondurable	Food
Means						
Pre-retirement	41,005	36,767	6,269	40,408	35,166	5,815
Post-retirement	39,342	35,138	6,093	39,143	34,391	5,880
Population Percent change	−4.1	−4.4	−2.8	−3.1	−2.2	1.1
95% confidence interval	(−9.5, 1.9)	(−9.7, 0.8)	(−11.0, 5.8)	(−6.3, 0.0)	(−5.4, 0.8)	(−3.5, 5.6)
Medians						
Pre-retirement	34,907	31,039	5,202	32,039	29,095	4,693
Post-retirement	32,313	29,765	5,096	31,261	28,485	4,800
Population Percent change	−7.4	−4.1	−2.0	−2.4	−2.1	2.3
95% confidence interval	(−14.6, −0.6)	(−10.2, 3.8)	(−10.0, 6.0)	(−6.4, 1.8)	(−5.3, 1.7)	(−1.8, 7.6)
Household-level change	−6.9	−4.5	−4.0	−2.5	−1.7	−0.4
95% confidence interval	(−9.6, −1.5)	(−7.7, −0.2)	(−9.9, 1.6)	(−4.8, 0.8)	(−3.9, 0.7)	(−4.7, 3.6)

Note: Confidence intervals are bootstrapped (BC version – bias-corrected).

fore retirement and $39.3 thousand after retirement for a decline of 4.1%. The population median spending declined from about $35 thousand to $32.3 thousand, a decline of 7.4%. The median of the changes at the household level was −6.9%. These observed declines in spending are much smaller than those reported Bernheim et al. (2001).

Non-durable spending declined between 4.1% and 4.5% depending on the measure, and spending on food declined by 2.0–4.0%. We note that our small decline in spending on food is consistent with results in Haider and Stephens (2007) based on data from the HRS core 1992–2000. Our measure is independent from their measure as it comes from CAMS 2001–2007. Furthermore the survey methods are different, HRS being a computer-assisted telephone interview and CAMS being a self-administered paper and pencil interview. Having two independent observations lends weight to the view that in more recent data food spending declines only modestly at retirement.

We cannot reject the null hypothesis that the change in mean spending is zero for total spending, for nondurable spending or for food spending, nor can we reject the similar hypothesis for changes in the medians, or in the medians of household-level changes. Despite the relatively small sample size, the 95% confidence interval does not include large changes.

Fig. 1 shows the cumulative distributions of total spending, non-durable spending and food spending before and after retirement. There is little difference in spending over most of the distributions, except in the lower part of the distribution.

Thus our first and main finding is that whether measured by total spending, nondurable spending or food spending in panel any declines in spending associated with retirement are small, and could plausibly be due to a number of causes such as the cessation of work-related expenses, the substitution of time for spending, or unexpectedly early retirement due to health shocks.

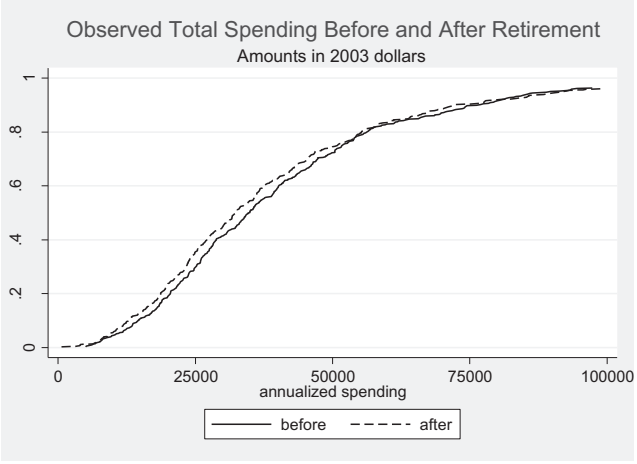
Although we have characterized the observed spending declines as small we do not have a measure of "normal" spending change, which could be either positive or negative depending on utility function parameters. Were normal spending change to be positive, however, our range of spending declines might not seem small. To investigate this possibility, we extend the basic results by comparing spending change by those retiring with spending change by those not retiring. The right three columns of Table 1 show mean and median spending change among households whose respondents reported no retirement transition between waves (retired to retired, or not retired to not retired). The comparison sample is weighted to match the composition of the retirement sample with respect to age and marital status and wave. With the exception of the mean and median spending on food, the spending changes among those not making a retirement transition are all negative. If we think of those changes as normal, the excess changes across the three spending measures (total, nondurable and food) and the three measurement statistics (mean, median and household median) varied between −0.9% and −5.0%. We conclude that any spending decline associated with retirement is small on average.

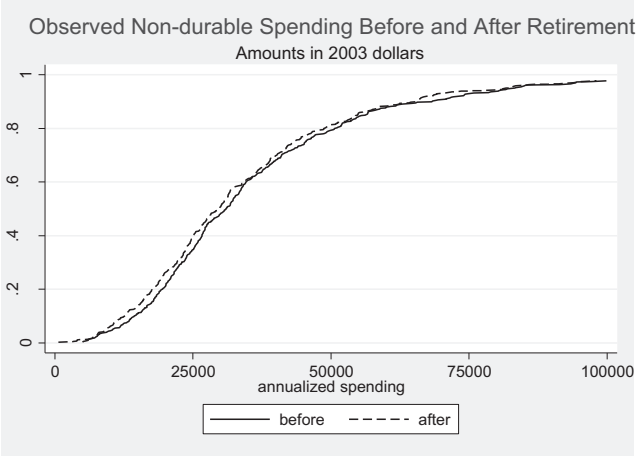
However, Fig. 1 does show differences in the lower parts of the distributions of spending before and after retirement, opening up the possibility that some groups may have experienced larger-than-average reductions in spending. In the rest of the paper we identify subpopulations that experienced spending declines at retirement, and we offer explanations for those declines. We will focus on non-durable spending rather than on total spending: non-durable spending is a large fraction of total spending and it has fewer outliers because it excludes lumpy spending on durables. Furthermore, spending on non-durables approximately equals consumption of non-durables, and it is consumption smoothing that we would like to measure.[14]

Wealth, income and spending

When earnings cease at retirement, maintaining spending requires either spending out of wealth or a complete replacement of earnings by Social Security or pensions. A monotonic relationship between wealth and spending change at retirement is not necessarily to be expected provided households – including low wealth households – realistically adjusted their spending prior to retirement. However, if households have little wealth and the replacement of earnings is incomplete, the intertemporal budget constraint will require that spending declines. Table 2 shows spending levels, both mean and median, by wealth quartile before

[14] If time-use in home production is an important input into consumption then even spending on non-durables mis-measures consumption of nondurables.





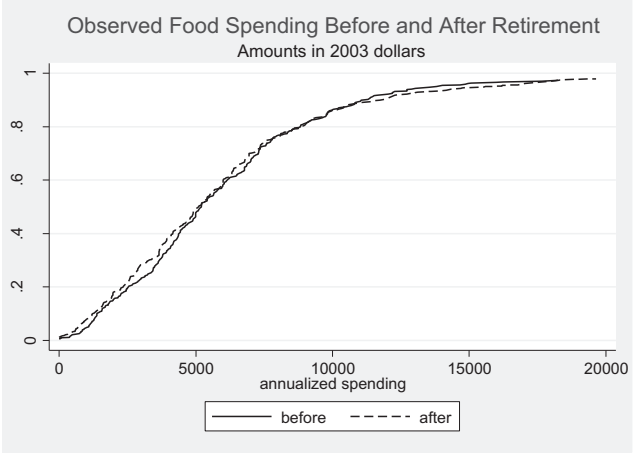


Fig. 1. Cumulative distributions of spending.

and after retirement, percent changes in them, and the median of the change at the household level.

As expected there is a substantial gradient in the level of spending by wealth quartile. Prior to retirement those in the highest quartile spent about $44 thousand while those in the lowest quartile spent about $30 thousand. Overall the change in spending accompanying retirement was small: declines in the lowest quartiles were offset by increases in the highest quartiles. In the lowest quartile, the decline in average spending was about 7.4% and in median spending it was about 9%. At the household level the median decline was 8.6%, so a large decline was not the common experience even in the lowest-wealth population. In the second wealth quartile spending fell by substantially larger amounts: mean spending declined by 18%, median spending declined by 17%, and the median household-level change was −13%. It may, perhaps, be surprising that the spending decline in the second quartile is greater than in the lowest. One possible explanation is that time spent on productive activities that may substitute for spending increased by just 14 percent in the lowest quartile compared with 30 percent in the second quartile.[15] An implication is that consumption did not decline as much as spending in the second quartile compared with the lowest quartile. In the top quartile spending increased according to the three measures. The change in the top quartile is in accord with the idea that time is required to spend money on some activities and in retirement time previously spent working becomes available to be allocated across those activities.

Table 3 shows household income before and after retirement as measured in the HRS core data. Depending on the measure, income declined by 28–38%; yet, nondurable spending declined by about 4% (Table 1). These figures provide strong evidence for consumption smoothing at the population level. The difference in the reductions in income across wealth quartiles are modest, but the sources of retirement income are likely different with larger replacement rates under Social Security among those in lower income levels and larger replacement rates from pensions and other income such as income from capital in the higher income levels.

The reduction in spending in the lowest quartile is almost required by the intertemporal budget constraint: As shown in Table 4, median nonhousing wealth in the lowest wealth quartile was just $2.2 thousand and even total wealth including housing was just $21 thousand at the median. While there might have been resources for a few households to maintain spending by drawing down assets, that option would not have been available to most households. A relevant question with respect to households in the lowest wealth quartile and possibly the second quartile is why they did not save more so as to avoid any decline. But we first ask whether the decline was anticipated.

Anticipated and recollected spending

An explanation for the decline in spending put forward by Bernheim, Skinner and Weinberg is that at retirement workers are surprised by the paucity of economic resources, and the reduction in spending is the result of that surprise. We address that hypothesis: For our CAMS panel we use anticipated changes in spending prior to retirement and recollected changes following retirement to study whether spending change was a surprise. On average recollections and anticipations are very consistent: the mean anticipated change in spending was −16.2% and the mean recollected change was −15.3% (Table 5).[16] The recollected median change was −10%.

However, both on average and at the median, quartiles 2, 3 and 4 recollect a smaller spending change than had been anticipated, by about 5 percentage points at the mean and 10 percentage points at the median. In the lowest quartile spending fell more than anticipated, 10% at the mean and 5% at the median. A comparison of the discrepancy between anticipations and recollections in the first quartile with the similar discrepancy in the other quartiles gives a difference in the discrepancies of 15 percentage points both for mean spending and for median spending, and those differences are statistically significant. Apparently most of the population

[15] See section 5.4.3 for detail on the categories of time use.

[16] The magnitudes cannot be directly compared with the observed changes in panel in Table 2: first, Table 2 has changes in average spending and changes in median spending whereas Table 5 has the average of household changes. Second, Table 2 has nondurable spending whereas Table 5 refers to total spending.

Table 2
Real nondurable spending before and after retirement, panel.

	Wealth quartiles				All
	Lowest	2nd	3rd	Highest	
Means					
Pre-retirement	29,981	35,649	37,845	43,943	36,767
Post-retirement	27,765	29,112	37,228	46,838	35,138
Percent change	−7.4	−18.3	−1.6	6.6	−4.4
Medians					
Pre-retirement	25,235	30,285	34,078	33,166	31,039
Post-retirement	22,965	25,233	31,039	39,015	29,765
Percent change	−9.0	−16.7	−8.9	17.6	−4.1
Household-level change	−8.6	−12.6	−3.9	8.6	−4.5

$N = 439$, one observation drops out when computing household-level change.

Table 3
Real income changes associated with retirement, panel.

	Wealth quartiles				All
	Lowest	2nd	3rd	Highest	
Means					
Pre-retirement	43,255	61,707	73,059	119,350	74,139
Post-retirement	30,505	40,480	45,101	80,242	48,960
Percent change	−29.5	−34.4	−38.3	−32.8	−34.0
Medians					
Pre-retirement	31,169	50,120	56,432	84,824	53,413
Post-retirement	18,529	32,278	35,057	51,556	33,161
Percent change	−40.6	−35.6	−37.9	−39.2	−37.9
Household-level change*	−23.0	−24.1	−43.7	−26.7	−28.2

$N = 430$. Using carry-forward/backward of income information from adjacent waves for 9 observations.
* $N = 425$ due to 5 observations with zero income before retirement which drop out when computing household-level change.

experienced greater-than-expected spending in retirement even as those in the lowest quartile experienced less.

Ameriks et al. (2007) analyzed responses to survey questions by TIAA-CREF participants about anticipated changes in spending at retirement among those still working and about recollected spending changes at retirement among those not working. They found that the mean anticipated change was −11.3% and that 54.6% of their sample anticipated a reduction in spending. The mean recollected change was −4.6% and that 36.2% recollected a reduction. The data in their study are cross-section so that the populations of workers and retirees are not the same people. Nonetheless one might think that anticipations and realizations should be about the same. Ameriks, Caplin and Leahy attribute the difference between anticipations and recollections to stock holdings: some of the retired would have retired during the stock boom of the late 1990's and were able to increase their spending at about the time of their retirement because of unexpectedly large gains. From this point of view the anticipations of workers would be more reflective of a steady-state situation.

Our results are qualitatively similar to Ameriks, Caplin and Leahy in that we find that workers anticipate a reduction in spending at retirement. However, we find that the discrepancy between anticipations and recollections found by Ameriks, Caplin and Leahy is likely due to their use of cross-section data: Indeed, based on cross-section the discrepancies between anticipations and recollections are similar in CAMS to those found by Ameriks, Caplin and Leahy.[17] For example among workers aged 50–69 in CAMS wave 1 the average anticipated reduction in spending at retirement was −20.1%. Among those retired the average recollected spending change was −13.8%. But these discrepancies are systematically related to the differences in the ages of workers and retirees. When looking at this issue in panel in CAMS as shown in Table 5, there is no difference between anticipations and recollections on average.[18]

Heterogeneity in spending change at retirement

We now turn to an investigation of heterogeneity in spending change, specifically along the dimensions of a lack of foresight or of a health shock associated with retirement.

Financial planning horizon

A possible indictor of a lack of foresight is an individual's financial planning horizon. It is measured in the HRS by the response to the following question:[19]

In deciding how much of their income to spend or save, people are likely to think about different financial planning periods. In planning your saving and spending, which of the following time periods is most important to you, the next few months, the next year, the next few years, the next 5–10 years, or longer than 10 years?

We code a short financial planning horizon to be a planning period of a few months or the next year, and code a long planning horizon to be the next few years or longer. One interpretation of a short planning horizon is a high subjective time rate of discount. However, even those with a high discount rate should not have a discontinuity in consumption. A more straightforward interpretation is literally a failure to look ahead for more than a year. As shown in Table 6, about 22% of the sample had such a short planning horizon.

We expected that a short planning horizon would have the greatest effect on consumption change at retirement among those with little wealth who would not be able to buffer the (unforeseen) income drop by spending out of wealth. In the lowest wealth quartile 33% had a short planning horizon versus just 14% in the highest quartile, and indeed, as shown in the table a short planning horizon in the lowest two wealth quartiles is associated with large reductions in spending at retirement. About 14% of the population had a short planning horizon and was in the lowest two wealth quartiles.

[17] See Hurd and Rohwedder, 2006.

[18] A second difference is that the HRS is population representative. The importance of having population representation comes from the strong relationship between wealth and spending change at retirement: in Ameriks, Caplin and Leahy, low wealth households have greater declines than high wealth households. Yet, the TIAA-CREF sample has much greater wealth than the population. This difference is important because any spending decline at retirement may depend on wealth in a nonlinear manner, which makes it difficult to generalize the TIAA-CREF results to the entire population.

[19] The planning horizon question is not asked in every HRS wave. If a respondent gave more than one report to the financial planning horizon question across the many waves of HRS we used the first report.

Table 4
Non-housing and total wealth prior to retirement (2003$).

		Wealth quartiles				All
		Lowest	2nd	3rd	Highest	
Non-housing	Median	2,209	35,886	114,286	436,255	56,327
	Mean	7,405	42,742	131,979	733,672	224,614
Total	Median	21,000	117,671	255,126	639,472	165,195
	Mean	25,717	119,006	256,814	994,430	343,274

$N = 439$.

Table 5
Anticipated and recollected change in spending at retirement (percent) by wealth quartile, panel.

	Wealth quartiles				All
	Lowest	2nd	3rd	Highest	
Average change					
Anticipated	−13.7	−20.9	−17.0	−12.8	−16.2
Recollected	−23.3	−13.7	−14.9	−9.1	−15.3
Recollected minus anticipated	−9.6	7.2	2.1	3.7	0.9
Median change					
Anticipated	−15.0	−20.0	−20.0	−10.0	−20.0
Recollected	−20.0	−10.0	−10.0	0.0	−10.0
Recollected minus anticipated	−5.0	10.0	10.0	10.0	−10.0

$N = 329$.

Table 6
Median of household-level change in real nondurable spending (%), panel. By financial planning horizon.

Planning horizon	Wealth quartiles				All
	Lowest	2nd	3rd	Highest*	
Short horizon	−10.4	−23.4	0.1	30.2	−8.3
Long horizon	−4.2	−7.7	−5.7	5.3	−3.9
All	−8.3	−12.6	−3.9	8.6	−4.2
Percent with short horizon	33.0	23.1	17.3	14.0	22.0

$N = 437$. A short planning horizon is a planning horizon of a year of less.
* Only 15 observations in highest wealth quartile with short planning horizon.

In contrast a short planning horizon by those in the highest wealth quartile is associated with a large increase in spending. Consequently, on average the relationship between planning horizon and spending change is weak, but it is quite strong when interacted with wealth. An implication is that a short planning horizon is associated with less consumption smoothing than a long planning horizon, but the direction of the consumption change depends on wealth.

Health and its relationship to spending change

Table 7 shows the relationship between self-rated health prior to retirement, spending before and after retirement and the change in spending. About half the sample had excellent or very good health before retirement. They experienced little spending change as measured by group means or medians or by household-level change, whereas those in good and fair or poor health did experience declines (10 to 18 percent in population medians and 6 to 12 percent in household level medians). Because those in worse health are also more likely to leave the labor force due to a health event, these results suggest an important role for health shocks. However, a more direct measure of an actual health shock is whether health was an important reason for retirement, which is asked in the core HRS in the wave following retirement. Table 8 shows the change in spending according to that classification. About 27% of retirees said that health was an important reason. Among them, spending declined by 4–15% depending on the spending measure. Among those where health was not an important factor, there was almost no spending change (declines of 3% or less).

Wealth is strongly related to whether health was an important reason for retirement: about 42% in the lowest wealth quartile reported the importance of health whereas other quartiles averaged 23% (not shown). Because of missing data on whether health was an important reason for retirement, our panel sample is too small to study interactions with wealth. Therefore we use the much larger recollections sample. That sample taken as a whole has a larger fraction where health was an important reason for retirement: 33 percent (Table 9) versus 27 percent in the smaller retirement sample. There is a strong wealth gradient with more than half of those in the lowest quartile reporting the importance of health. According to the comparison of medians, there was no overall decline in spending among those where health was not an important factor and only in the second wealth quartile was there a decline. Where health was an important factor, the three lowest wealth quartiles had declines of 20–28%. People in the highest wealth quartile are largely able to buffer the adverse effects of a health shock.[20] As measured by mean spending, the reduction in spending was about 8% greater in each wealth quartile when health was important.

Having health be an important factor in retirement suggests that retirement resulted from a health shock, and that retirement occurred earlier than anticipated. However, it is certainly possible that those in worse health anticipated early retirement and would have said prior to retirement that health would be an important factor in retirement. The importance of this distinction is that in the second case there would be no unexpected loss of earnings and, hence, no reason to reduce spending.

We have, however, an indicator that retirement was partially unexpected among those in the lowest wealth quartile: they tended to retire earlier than expected as measured by their subjective probability of working past age 62 or age 65. This question is asked of workers as follows:

> On the same scale from 0 to 100 where 0 means absolutely no chance and 100 means absolutely certain, ... (Thinking about work in general and not just your present job,) what do you think the chances are that you will be working full-time after you reach age 62?

A follow-up question also asks about the target age of 65. The subjective probability of working is predictive of actual retirement and aggregates closely to observed retirement rates (Hurd, 1999, 2009).

Those in the lowest wealth quartile reported average subjective probabilities of working past 65 that were higher than those in the other wealth quartiles; yet, their average retirement age was slightly below average (Table 10). This difference can be quantified by using a Cox proportional hazards model to estimate the difference between the expected retirement and actual retirement age. The method is to estimate the population survival curve in full-time work to the end of work life from observed labor market transitions in the HRS panel. We then normalize the survival curve to age 58, which is approximately the average age when people in our panel reported their subjective probabilities of working. This generates the population survival curve in full-time work condi-

[20] Even those with substantial wealth who experience a loss in lifetime wealth due to an unexpectedly early retirement should reduce spending. However, particularly with the wealthy, the loss may be a small fraction of total wealth, requiring just a small adjustment in annual spending which may be hard to detect, especially in small samples.

Table 7
Real nondurable spending before and after retirement, panel.

	Health status before retirement			All
	Excellent/very good	Good	Fair/poor	
Means				
Pre-retirement	41,745	33,974	29,620	36,767
Post-retirement	40,193	30,903	29,839	35,138
Percent change	−3.7	−9.0	0.7	−4.4
Medians				
Pre-retirement	33,462	32,245	26,602	31,039
Post-retirement	33,879	26,473	23,958	29,765
Percent change	1.2	−17.9	−9.9	−4.1
Household-level change*	−2.4	−5.7	−12.3	−4.5
Number of observations	211	133	95	439
Percent of total sample	48.1	30.3	21.6	100.0

Health is measured in the HRS at the wave preceding the first CAMS transition wave. For 6 cases health status before retirement was carried forward from prior wave. For 6 cases health status before retirement was carried forward from prior wave.

Table 8
Real nondurable spending before and after retirement, panel.

	Importance of health as reasons for retirement		All
	Not important	Important	
Means			
Pre-retirement	37,865	32,386	36,392
Post-retirement	38,462	28,457	35,772
Percent change	1.6	−12.1	−1.7
Medians			
Pre-retirement	32,222	27,438	31,181
Post-retirement	31,467	26,473	30,322
Percent change	−2.3	−3.5	−2.8
Household-level change*	−3.0	−14.7	−5.7
Number of observations	204	75	279

tional on working at 58. We then find the Cox proportionality factor for each wealth quartile by comparing P62 or P65 with the population probability of working at 62 or 65. Applying that factor to the population survival curve will generate the survival curve for each quartile. The resulting curves are shown in Fig. 2 for the case where we use P65 to find the proportionality factor.

The expected work life is the area under the survival curve. Those in the lowest wealth quartile retired about one year earlier than anticipated whereas those in the highest wealth quartile retired about 0.9 year later than anticipated (Table 11).

We ask whether an unexpected loss of 1.0 years of earnings could lead to a permanent reduction in spending of the amounts we have documented in Table 2. The average reduction in earnings in the lowest wealth quartile was about $17 thousand.[21] Thus retiring 1.0 years earlier than anticipated represents a loss of about $17 thousand in addition to any loss in Social Security benefits and pension income that may have accumulated had they worked longer. This amount is more than twice as much as mean nonhousing wealth in this quartile. The $17 thousand would produce a real annual annuity of about $1.3 thousand for a 62 year-old male with no survivor benefits.[22] Reference to Table 2 shows that average nondurable spending declined by about $2.2 thousand and median spending by about $2.3 thousand. These figures suggest that the unexpected early retirement contributed to the reduction in spending in an important way, particularly when juxtaposed with the low level of wealth in the first wealth quartile.

This method can shed some light on the experience of those who said health was an important factor in their retirement. Their average value of P65 was 26.8 versus 20.7 among those where health was not an important factor. This translates into an expected difference of about 0.6 year; that is, those whose health was a factor in retirement expected to work slightly longer than workers where health was not a factor in their retirement. Yet, their average retirement age was 62.0 versus 63.0 for a difference in differences of 1.6 year.

Time use as a possible explanation for variation in spending change

Hurd and Rohwedder, 2003, 2006 and Aguiar and Hurst (2005) have argued that the availability of a large amount of time that results from retirement can be used to produce more consumption from the same amount of spending. The channels for accomplishing this include more efficient shopping and home production, that is the substitution of own time for goods and services that were purchased prior to retirement. For example, rather than purchasing a prepared frozen dinner, a retiree may prepare that dinner from (cheaper) primary ingredients. Another example is home maintenance which can be accomplished either by the retiree or by hiring outside labor. Based on section A of CAMS, which measures time use, we selected seven activities that could be possible substitutes for purchased goods or services. They are house cleaning, washing and ironing, yard work and gardening, shopping, food preparation, finances, and home improvements. Comparing the time spent on these activities immediately before retirement with the time spent after retirement we found that the average increase in time spent per week was 5.0 h.[23] The substitution of those hours could account for the spending declines experienced by some households.

[21] This is greater than the reduction in income in Table 2 because of offsetting increases in other income, particularly Social Security benefits.

[22] Assuming 3% real rate of interest.

[23] Because the person filling out the time-use section should be the same as the person responding to the retirement questions in CAMS the number of observations for this analysis is reduced to 243. Only a small part of the reduction in sample is due to missing values on single categories in the time-use section.

Table 9
Recollected spending change at retirement (percent) by wealth quartile.

	Wealth quartile before retirement				All
	Lowest	2nd	3rd	Highest	
Means					
Important	−23.3	−23.2	−19.6	−13.1	−21.3
Not important	−15.9	−15.3	−12.0	−6.1	−11.7
All	−19.9	−18.1	−13.8	−7.3	−14.8
Medians					
Important	−20.0	−27.5	−20.0	0.0	−20.0
Not important	0.0	−10.0	0.0	0.0	0.0
All	−15.0	−20.0	−1.0	0.0	0.0
Percent where health important	54.6	35.5	24.4	17.3	33.0

N = 1,521.

Table 10
Subjective probability of working past 62 and past 65 and actual retirement age (averages).

Wealth Quartiles	P62	P65	Actual
Lowest	47.4	29.3	62.3
2nd	47.8	24.4	62.4
3rd	46.5	20.1	62.4
Highest	42.6	19.7	63.3
All	46.0	23.3	62.6

N = 408.
Note: P62 and P65 are the subjective probabilities of working full-time past the age of 62 and 65 respectively.

When health was an important factor in retirement the increase in hours on these activities was smaller, 3.9 h per week compared with 8.4 where health was not important. Apparently those same health problems that were an important factor in the retirement of a worker prevented him or her from substituting time for purchased goods or services following retirement.

Regression results

We have seen that wealth, time horizon and health are associated with reductions in spending at retirement. Because of sample size it is not practical to interact further these factors in cross-tabulations. So, based on the panel sample, we will present results from two median regressions whose specifications are guided by the results in the prior tables. The left-hand variable is the percent change in household spending at retirement. The right-hand variables are those that the cross-tabulations have shown to be associated with spending change with the addition in the second regression of education. Thus the regressions are generalizations of the median household-level changes in Table 2 and subsequent tables.

Table 12 has the regression results. The relationship between wealth and spending change is reduced compared with Table 2, and is not statistically significant once we control for other factors. Apparently part of the relationship that we have observed in previous tabulations comes from correlations among wealth, short planning horizon and importance of health for retirement. Wealth is associated with a spending decline among those with a short planning horizon, but not among those with a long planning horizon. In the first regression, for example, among the lowest half of the wealth distribution those with a short horizon had spending declines that were 14.2 percentage points larger than those with a long horizon. In the upper half of the wealth distribution the relationship is the opposite: those with a short horizon increased spending by 16.6 percentage points more compared to those with a long horizon. When health was an important reason for retirement, spending declined by an additional 15 percentage points

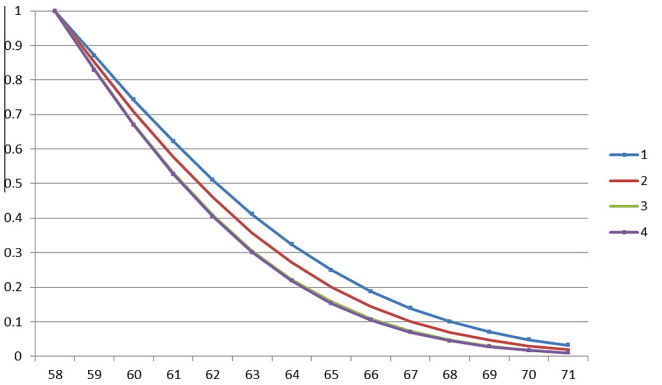


Fig. 2. Survival in employment by wealth quartile. Note: Quartile 1 (top line) refers to the lowest wealth quartile. The curves for quartiles 3 and 4 are almost identical because the P65 values are almost the same.

Table 11
Expected and actual retirement age.

	Wealth quartile				All
	Lowest	2	3	Highest	
Years of survival in employment	5.3	4.8	4.4	4.4	4.7
Expected retirement age	63.3	62.8	62.4	62.4	62.7
Actual retirement age	62.3	62.4	62.4	63.3	62.6
Actual minus anticipated	−1.0	−0.4	0.0	0.9	−0.1

compared to health not being a factor in retirement. When education is added, the relationship between wealth and spending change among those with a short horizon is reduced, and short horizon is no longer significant at the 5% level. This happens because education is strongly related to planning horizon: among those lacking a high school education (17% of the sample), 40% have a short horizon compared with 17% among those with some college or more. Those lacking a high school education and having a short horizon (6.7% of the sample) reduced spending by about 16.7 percentage points.

Based on these regressions we conclude that having a health shock that is associated with retirement leads to a decline in spending, and because retirees who experience health shocks tend to have low wealth, spending reductions are concentrated in the lowest wealth quartiles. The relationship between low wealth and spending declines in retirement is strengthened by that part of the sample that also has a short planning horizon.

Summary and conclusions

In panel data on total spending, nondurable spending or food spending, we found small declines in spending associated with

Table 12
Median regression estimates for real change in spending at retirement.

Covariates	Without education		With education	
	Coefficient	*P*-Value	Coefficient	*P*-Value
Lowest wealth quartile				
2nd	−9.0	0.087	−9.1	0.120
3rd	−5.1	0.420	−7.6	0.269
Highest	7.8	0.208	4.0	0.577
Long planning horizon	(ref)		(ref)	
Short planning horizon	−14.2	0.011	−11.9	0.087
Short planning horizon and high wealth	30.8	0.024	27.5	0.027
Health important for retirement	−14.9	0.008	−14.6	0.020
Education less than high school	(ref)		(ref)	
High school	–		5.9	0.428
Some college	–		6.8	0.331
College or greater	–		10.2	0.138
Missing health important for retirement	−2.6	0.525	−2.1	0.606
Single at baseline	0.2	0.968	0.3	0.942
Constant	1.1	0.850	−4.8	0.531
Observations	435		435	

Bootstrapped *P*-values (1000 replications). "High wealth" refers to the top two wealth quartiles.

retirement. The magnitudes of the declines could reasonably be explained by the cessation of work-related expenses or by efficiencies in shopping made possible by the greater availability of time or by the substitution of home production for market purchased goods and services. An additional explanation, which we have not yet discussed, is found in the standard life-cycle model itself. In the simplest version where the only uncertainty is mortality risk, consumption should begin to decline when mortality risk becomes important and the rate of decline should accelerate with increased aging. For example, mortality risk is 0.015 at age 65, so that for a single person where the subjective time rate of discount equals the interest rate, consumption should decline at 1.5% per year or 3% over two years. This is approximately the two-year change we observe. Thus, there are at least three explanations in conventional economic theory for the magnitude of the spending declines observed in Table 1. Our main conclusion is that according to these data there is no retirement-consumption puzzle at the population level.

Nonetheless, the population is far from homogeneous. At the household level we observe both substantial increases and substantial decreases in spending. Some of the change is observation error. Our method of addressing observation error is to look at spending changes in subpopulations using statistics that are relatively robust to observation error such as the change in population medians and means, and the median of household-level changes. We focused on the subpopulation with below average economic resources which has been the object of attention in the literature and which is important from the point of view of policy. We found declines in spending in the bottom half of the wealth distribution. Addressing the question about foresight, we found that those in the lowest quartile experienced a decline what was substantially greater than anticipated, whereas in the other quartiles, spending declined by less than anticipated. In the lowest wealth quartile, median nonhousing wealth could not finance even one year of the drop in income at retirement. Thus this group under saved *ex post*. To address the explanation of a lack of foresight, we use the HRS measure of planning horizon. While just 14% of those in the top quartile had a short planning horizon, 33% of those in the lowest quartile had a short planning horizon and, possibly, a lack of foresight. In the two lowest wealth quartiles, a short planning horizon was associated with median household spending change of −10.4 percent and −23.4 percent respectively.

When health was an important reason for retirement, spending declined at a greater rate than when it was not important. However, the largest declines were confined to the lowest wealth quartiles and a substantially greater fraction of retirees in the lowest quartile gave health as a reason for retirement. When the actual retirement age is compared with the expected retirement age as estimated from the subjective probability of working past 65, it is clear that health is associated with an unexpectedly early retirement. The amount of earnings lost was a significant amount compared with nonhousing wealth in the lowest wealth quartile. For this group at least some of the decline in spending can be explained by an unexpected reduction of lifetime wealth.

In the regressions wealth quartile *per se* was not as important, and it was not statistically significant. Rather it was a short planning horizon among those in the lowest half of the wealth distribution and whether health was an important reason for retirement. These results hold approximately whether education is included.

Our results are qualitatively similar to Bernheim, Skinner and Weinberg in that they find greater declines in the lower part of the wealth distribution as we do. Of course, theirs are quantitatively different, and that difference is important as it changes the retirement-consumption puzzle from a question about the population to a question about subpopulations. Subpopulations can have characteristics that offer explanations for the puzzle, and those explanations can help us learn about behavior. Similarly our results have an element in common with those of Smith (2006). She found a decline in food spending only among those who experienced involuntary retirement. Our major subpopulation with declining spending was the subpopulation where health was an important factor in retirement: it is likely that many in that subpopulation retired involuntarily.

Even though the change in spending at retirement does not indicate widespread suboptimal behavior, the change does not show that the spending level is optimal. To address that issue we would need to compare spending levels with available resources in a life-cycle setting. That is, conditions on the rate of change of spending are necessary conditions, but not necessary and sufficient conditions for optimality.

Because of the emphasis in the literature and in public policy on the low wealth population, we explored explanations for the decline in spending in that group. However, from the point of view of economic theory, the behavior of the top wealth quartile is certainly of interest. That group increased spending by 7–18% depending on the measure. The most obvious explanation is that it takes time to spend money. It is beyond the scope of this paper to undertake this analysis, but the variation across wealth quartiles is an

example of the substantial heterogeneity in spending change at retirement that would have to be taken into account. This variation indicates that time use is likely to be an important explanation for the heterogeneity in spending change.

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Appendix A.

Excerpt from the CAMS Questionnaire:

Question B38 in CAMS wave 1, B44 in CAMS wave 2, and B45 in CAMS wave 3.

We would like to understand more about spending in retirement.

Are you retired? Yes → Complete BOX A BOX A – Retired:	No → Complete BOX B BOX B – Not Retired:
a. How did your TOTAL spending change with retirement? _____ Stayed the same → Go to c	d. How do you expect your TOTAL spending to change with retirement? _____ Stay the same → Go to f
_____ Increased	_____ Increase
_____ Decreased	_____ Decrease
b. By how much? _____%	e. By how much? _____%
c. For the items below, check (✓) whether the spending increased, decreased or stayed the same in retirement:	f. For the items below, check (✓) whether you expect spending to increase, decrease or stay the same in retirement:

We use the responses to Bd and Be to construct anticipated changes in spending at retirement, and the responses to Ba and Bb to construct recollected changes in spending. We link the CAMS data to the rich information obtained on the same respondents in repeated HRS core interviews.[24] For example, with respect to CAMS wave 1 we obtain information on demographics and socio-economic status from HRS 2000. We also make use of the panel nature of the HRS to obtain information such as self-rated health in the wave immediately before and after a respondent's retirement, and reasons for retirement.

[24] Most HRS core variables are obtained from The RAND HRS Data file version J which is an easy to use longitudinal data set based on the HRS data. It was developed at RAND with funding from the National Institute on Aging and the Social Security Administration.

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