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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 over retirement, at 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. In the low-wealth population where spending did decline at higher rates, the main explanation for the decline appears to be a high rate of early retirement due to poor health. We conclude that at the population level there is no retirement consumption puzzle in our data, and that in subpopulations where there were substantial declines, conventional economic theory can provide the main explanation.

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1. 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, Blundell and Tanner, 1998). Households in the Panel Study of Income Dynamics (PSID) sharply reduced several components of consumption at retirement (Bernheim, Skinner and Weinberg, 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, which is emphasized by Bernheim, Skinner and Weinberg, is that workers do not adequately foresee the decline in income associated with retirement. 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.

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 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. 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 an empirical matter, but we would expect consumption to change at retirement, not that it be smooth.

The ideal data to study the retirement consumption puzzle are panel data on total, non-durable and food spending with a sufficient number of individuals who transition into retirement. Further, to shed direct evidence on mechanisms of potential spending changes one would need information for the same individuals on relevant covariates such as income before and after retirement, time use, health status and financial planning

horizon. To our knowledge this paper is the first to provide evidence about the retirement-consumption puzzle based on such data.

Our main finding, based on panel data on spending before and after retirement, is that as calculated by the difference between pre- and post-retirement spending, spending declines at a small rate, 1% to 6% depending on the measure.[1] 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 analyze spending change as a function of pre-retirement wealth. In the upper half of the distribution spending was either constant or it increased. In the low wealth population a lack of wealth may require a decline in spending to meet the intratemporal budget constraint and, indeed, we found declines in the lower half of the wealth distribution. However, the decline was a surprise only in the lowest wealth quartile: in the second quartile it was fully anticipated. The apparent explanation for most of the decline in the lowest quartile was unanticipated early retirement associated with poor health. A lack of forward planning made a relatively minor contribution to the decline. The number of hours spent in activities that could be complementary to spending, and, hence, reduce spending increased substantially. However, the increase was small in the lowest wealth quartile apparently because of health limitations, and apparently those

[1] While we recognize the distinction between consumption and spending, mostly we will use them interchangeably. In practice the empirical results in the literature are based either on food spending or nondurable spending, both of which should be approximately the same as consumption of those items because spending and consumption are almost simultaneous.

limitations put restrictions on the types of activities that could be performed after retirement.

We conclude that these data do not support a retirement-consumption puzzle at the population level. In subpopulations where spending does decline at larger rates, the main explanation seems to be early retirement associated with poor health. We found little support for an explanation based on a lack of forward-looking planning.

An increase in available time could, in principle, lead to an increase in spending, and we found that spending did increase substantially in the highest wealth quartile. An unanswered research question concerns the complementarity or substitutability between time and categories of spending.

2. Prior Literature

The literature on this topic began with Banks, Blundell and Tanner (1998) who found that at ages associated with retirement spending declined more rapidly than could be explained by a simple life-cycle model.[2] Their study is based on nondurable consumption in synthetic panel in the U.K. Family Expenditure Survey. They interpret the drop to be the result of "unanticipated shocks occurring around the time of retirement (p. 784)" such as an over-estimate of pension income. According to Bernheim, Skinner and Weinberg spending on consumption as approximated by spending on food and the rental value of the residence declined sharply at retirement in the Panel Study of Income Dynamics (PSID): the two-year change in log consumption following retirement averaged –0.14 with the greatest decline among households in the lowest income or wealth quartile. Bernheim, Skinner and Weinberg interpret the decline in those two

[2] See Hurst (2008) for a detailed review of the literature on this topic.

spending categories (as well as patterns of wealth holdings) to be evidence against models of behavior in which agents are rational and forward-looking. "If households follow heuristic rules of thumb to determine saving prior to retirement, and if they take stock of their financial situation and make adjustments at retirement (so that the adequacy of saving is "news"), then one would expect to observe the patterns documented in this paper (p. 855)." If these interpretations of the retirement-consumption puzzle are correct, they cast doubt on models of rational forward-looking economic behavior such as the life-cycle model.

Lower spending by those of retirement age in synthetic panel is also found by Miniaci et al. (2007) and Battistin et al. (2007) in the Italian Survey on Family Budgets, and for the U.S. by Aguiar and Hurst (2007a), Fisher et al. (2005) and Laitner and Silverman (2005), all based on the Consumer Expenditure Survey (CEX). Even though the latter three studies for the U.S. 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 5.9 percent in median food spending, and even smaller in total spending (2.5 percent, Table 6 of Fisher *et al*.)). Aguiar and Hurst also document a more moderate decline in non-durable spending plus housing services and stress that once spending on food, clothing and non-durable transportation are excluded they actually show an increase in expenditures of six percent.[3] 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, 2007).

[3] Aguiar and Hurst compare spending of people in their early 60s with that of people of the same cohort in their late 60s. Over a period of five to seven years consumption is predicted to change due to two additional factors over and beyond retirement, which are differential mortality and life-cycle effects from having lived additional periods.

However, more importantly for this paper is that synthetic cohort studies do not allow the investigation of the distribution of spending changes, and the discovery of the households that experienced the greatest declines in spending.

Investigations of food spending in true panel have sometimes corroborated the results of Bernheim, Skinner and Weinberg, but not universally. Smith (2006) divided retirees as observed in the British Household Panel Survey into two groups: voluntary and involuntary retirees where the latter group comprises about 20 percent of the analytical sample and whose retirement was often associated with unemployment or poor health. For them Smith estimated a decline in food spending of about 11 percent at retirement while the effect for those who retired as planned was small and not significant. The involuntary retirees likely suffered a wealth shock due to early retirement and so would be expected to reduce spending within the framework of the life-cycle model. These findings suggest that any unexplained decline in food spending at retirement is fairly small and not the norm in the U.K. population.

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. Haider and Stephens address the issue of the effect of unexpected retirement on food spending by asking whether the decline could be explained by the difference between expected and actual retirement. Controlling for the difference between them, they find that the decline in food spending is reduced by about one third, still leaving an unexplained reduction.

Aguiar and Hurst (2005) used the Continuing Survey of Food Intake of Individuals, collected by the U.S. 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. Their interpretation is that the extra leisure associated with retirement is used to produce the same food consumption levels but using smaller inputs of market purchased goods. To validate this interpretation, they used scanner data and found that actual prices paid are indeed lower among those aged 65 or over than among those 40-65 (Aguiar and Hurst, 2007b).[4] Apparently, retirees use time to shop more effectively, permitting a reduction in actual spending for the same purchases.

An entirely different approach to the retirement-consumption puzzle is via simulation of a life-cycle model. If the model allows nonseparability between leisure and consumption, then it will, of course, cause a discontinuous change in consumption when hours of work change discontinuously.[5] But even when leisure and consumption are separable, uncertainty can lead to a decline in consumption at retirement as in the model of Blau (2007). The explanation is that a negative shock, say, to health will lead to unexpected early retirement for some and, therefore, to an unexpected decline in lifetime resources. The discontinuous decline in resources causes a discontinuous decline in consumption. Blau studies the resulting distribution of consumption changes in a model

[4] Scanner data are records of actual purchases by households. The purchase codes are linked to price information at the store of purchase. The households are surveyed about demographics and income among other data items.

[5] See French (2005) for a demonstration of the importance of non-separability of consumption and leisure in explaining the drop in consumption at retirement in a model with uncertainty when hours of work are continuous.

calibrated to HRS data and finds that the median change in consumption is zero and the "mean change in log consumption associated with exit from employment is negative at almost all ages, and is between zero and -.03 at the typical ages of retirement in the early 60s." (p.21)

Our summary of these papers is that, as assessed in synthetic panels, there is a decline on average in spending at retirement. But the magnitude of the estimated decline for the U.S. varies between very small as in Fisher *et al*. (2005) to much larger as in Laitner and Silverman (2005) and others. Thus the decline needs to be validated in actual panel data.

The interpretation of the decline in synthetic panel depends on the distribution of the declines in the population: at the extremes, the average could be due to a few households having very large declines, or it could be due to all households having approximately the average decline. The explanation for the latter could be a widespread lack of forward-looking behavior, work-related expenses, substitution of leisure for spending or similar mechanisms, whereas the former would suggest costly low probability risks. However synthetic panel cannot shed light on this issue because it does not track individuals and it cannot associate any decline with personal and financial characteristics such as health and wealth. Finally, these papers do not address the issue of whether any spending changes were anticipated, which could be an important part of the retirement-consumption puzzle.

Food spending as observed in panel declines at retirement but not over all populations at all times. An unanswered question is what causes the difference in measurement. This question is particularly relevant for the comparison between the HRS

and PSID in Haider and Stephens (2007). In one comparison, the sample period is approximately the same: 1991-1999 for the PSID and 1992-1996 for the HRS. The question formats are similar in both surveys and both surveys are said to be population representative. Yet the log change in food spending at retirement is –0.089 (with standard error of 0.043) in the PSID and 0.005 (0.024) in the HRS.[6]

In this paper we will present evidence on the retirement consumption puzzle based on panel data using a comprehensive measure of spending for the same people observed retiring during the survey period. Two studies have performed a similar exercise. Christensen (2004) 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, so there would be no reason to expect a consumption drop.[7] Aguila, Attansio and Meghir (2007) 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. While suggestive, the study is limited because the CEX lacks the richness of the HRS, preventing investigation of heterogeneity in spending change which may shed light on the mechanisms behind any change.

What sets our paper apart from these panel studies is that we link the spending data to the extensive information of the long-running panel the Health and Retirement

[6] Table 3 in Haider and Stephens (2007).
[7] Note that the analytical sample of this study is small consisting of only 209 observations.

Study, allowing us to investigate directly multiple mechanisms that have been put forward in the literature.

3. 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 consumption is monotonic and continuous in marginal utility, an implication is that consumption must be continuous in time. That is, consumption must be smooth over time in a model where utility only depends on consumption. In particular, consumption should be continuous over retirement.

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.

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.[8] 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. Suppose that the within-period utility function is $u(c,l)$. The implications for consumption at retirement depend on whether the utility function is separable; that is, whether the marginal utility of consumption u_c depends on l.

[8] 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.

If the utility function is separable, u_c should be continuous in time and consumption will also be continuous. If the utility function is not separable, but retirement is gradual so that l increases slowly, consumption will also change in a continuous manner. But for most workers l increases abruptly by about 2,000 hours per year. A condition of utility maximization is that the marginal utility of consumption be the same immediately before and immediately after retirement: the argument is the same as we gave earlier in the context of a single good model of the LCM. Now, however, because of nonseparability and because of the sudden change in l, the LCM *requires* a discontinuous change in consumption.

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 purchased home repairs before retirement but will do them himself after retirement for a net reduction in spending.

This can be illustrated with a three good model. Suppose that utility is given by $u(x, y, l)$, where *x* and *y* are composite goods and *l* is leisure. The optimal path of x will

equate u_x before and after retirement and the optimal path of y will equate u_y before and after retirement. If $u_{xl} = 0$ and $u_{yl} = 0$ both x and y will be continuous across retirement. But if x is a substitute for leisure ($u_{xl} < 0$) and y is a complement to leisure ($u_{yl} > 0$), then a discontinuous but anticipated reduction in l will require a decrease in x and an increase in y. Whether total spending increases or decreases would depend on utility function parameters, prices and the levels of spending on each. Even with identical preferences workers facing differing wage rates would change total spending differently at retirement.

We have stated nonseparability in terms of the utility function, but the conclusions are the same in the context of home production. For example, suppose that instantaneous utility is given by $u(f(c,l))$ where f is a production function that uses inputs of purchased goods c and of time l to produce actual consumption which produces utility. Then nonseparability of f will cause a discontinuous change in c when l changes discontinuously at retirement.

In this discussion we have simplified the problem by assuming that retirement is given exogenously. Whether retirement is chosen does not affect the discontinuity in consumption when leisure and consumption are not separable provided the increase in leisure is discontinuous. As an empirical matter a substantial majority of retirement is from full-time to completely out of the labor force (Rust, 1990) and there are good reasons for such a sharp transition.[9]

[9] For example, a defined benefit pension plan can have such strong incentives to retire that workers within a wide range of tastes for retirement will all retire. Most firms will not allow a gradual reduction in work

4. 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).[10] 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.[11]

The questionnaires for CAMS wave 1 were sent out in September, 2001.[12] In married or partnered households it was sent to one of the spouses, chosen at random. There were 3,866 responses in the CAMS wave 1, which corresponds to a total response rate of 77.3 percent.

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hours, so that a worker who would like to retire gradually will be forced to change employers and possibly occupations (Hurd, 1996).

[10] The HRS is primarily funded by the National Institute of Aging (grant number NIA U01AG09740) with additional funding from the Social Security Administration. It is conducted by the University of Michigan.

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

[12] See Hurd and Rohwedder (2005) for a more extensive description of CAMS.

In September, 2003, CAMS wave 2 was sent to the same households.[13] 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.[14] 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.[15]

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.[16]

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. The rate of item nonresponse was very low, in the single digits for most categories.[17] 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, were home owners. Thus with considerable confidence we imputed zero rent to such households. Because

[13] 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.
[14] Response rates are lower bounds in that they are not adjusted for mortality or undeliverable questionnaires.
[15] We do not use these new households in the analysis of this paper because we do not yet have panel data on them: their second wave is CAMS 2007, which is not yet available.
[16] In wave 1 of CAMS section C included in addition questions about prescription drug usage.
[17] The rates of item nonresponse are similar on other waves of CAMS.

item nonresponse was so low, total imputed spending was a small fraction of total estimated spending, just 6.0 percent.[18]

Because spending data are difficult to collect, their validity is always an issue. Hurd and Rohwedder (2005) compared CAMS wave 1 spending with CEX spending. They find that in the age range 55-64 CAMS spending was 6% higher than CEX spending. However, because of possible differences in the population covered and differences in the unit of observation we do not place too much weight on this comparison.[19] A better comparison is with HRS after-tax income and what it implies about saving rates and, therefore, wealth change in panel. As averaged over five waves of HRS, the annual change in median wealth among couples was 2.0 percent. Active saving is the difference between after-tax income and spending. We estimate the active saving rate from three waves of CAMS data and the corresponding HRS waves to be 2.5% per year expressed as a fraction of wealth. That is, the active saving rate would predict an annual change in wealth of 2.5% per year. Among singles the annual change in median wealth was -2.7%, and the active saving rate was also -2.7%. Thus the levels of spending are consistent with observed rates of change of wealth, lending validity to our measure of total spending.

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.

[18] 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.

[19] One example of the difficulty in comparing CEX spending with CAMS spending is the definition of age: CEX defines "age" to be the age of the householder; HRS does not identify a householder. For the comparison in the text we have taken the age of the husband in classifying by age. In some cases that will correspond to the CEX householder but in some cases it will not.

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.

We will also use data on retirement and on anticipated and recollected spending changes at retirement. These data come from the following question sequence in the CAMS questionnaire:

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** No ➔ **Complete BOX B**

BOX A – Retired:	**BOX B – Not Retired**:
a. How did your TOTAL spending change with retirement? _____ Stayed the same ➔ **Go to c** _____ Increased _____ Decreased	**d**. How do you expect your TOTAL spending to change with retirement? _____ Stay the same ➔ **Go to f** _____ Increase _____ 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.[20] 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.

5. Analysis

[20] Most HRS core variables are obtained from The RAND HRS Data file version H 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.

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 451 retirement transitions where the responses to the question "Are you retired?" indicate a transition from not retired to retired. These responses are constructed from three waves of CAMS: 2001 to 2003; 2003 to 2005 and if the 2003 report is missing from 2001 to 2005. We excluded 66 observations because we restricted the retirement age to be from 50 to 70 inclusive. Thus our analysis sample consists of 385 retirement transitions where we observe actual spending data before and after retirement.

Our second sample consists of 1,303 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.[21]

[21] The average of household-level spending change was +8.9%. This large value is mostly due to a few very large outliers. For example the largest change was 347%, which by itself accounts for almost one percentage point of the 8.9%.

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 385 households where retirement occurred between CAMS waves.[22] Total spending averaged $40.5 thousand before retirement and $38.6 thousand after retirement for a decline of 4.7%. The population median spending declined from about $34 thousand to $32 thousand, a decline of 5.9%. The median of the changes at the household level was -5.7%. These observed declines in spending are much smaller than those reported Bernheim, Skinner and Weinberg (2001) or in Banks, Blundell and Tanner (1998).

Non-durable spending declined between 0.5% and 3.1% depending on the measure and spending on food declined by 3.0% to 3.6%. 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 – 2005. 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 small sample size, the 95% confidence interval does not include large changes.

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

Figure 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.

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.[23]

Wealth, income and spending

When earnings cease at retirement, maintaining spending requires either wealth or a complete replacement of earnings by Social Security or pensions. If households have little wealth and the replacement of earnings is incomplete, the intratemporal budget constraint will require that spending declines. Table 2 shows spending levels, both mean and median, by wealth quartile before and after retirement, percent changes in them, and the median of the change at the household level.

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

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 $45 thousand while those in the lowest quartile spent about $28 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 10% and in median spending 22%. At the household level the median decline was 7.8%, so a large decline was not the common experience even in the lowest-wealth population. In the second wealth quartile average spending fell by about 14%, but only by 4% at the median. In the top quartile spending increased (and possibly substantially increased) by 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 21% to 31%; yet, nondurable spending declined by just 0.5% to 3.1% (Table 1). These figures provide strong evidence for consumption smoothing at the population level. There were smaller reductions in income in the first wealth quartile than in the second. This difference reflects larger replacement rates under Social Security among those in lower income levels. In the lowest quartile the median of household-level changes in income was -5.0% which is very close to the median change in household spending: -7.8% (Table 2). This relationship is almost required by the intertemporal budget constraint: As shown in Table 4, median nonhousing wealth in the lowest wealth quartile was just $2.1 thousand

and even total wealth including housing was just $16.2 thousand at the median.[24] 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

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. The recollections are in close temporal proximity to retirement, and less susceptible to recall error than in the "recollections' sample where retirement could have occurred many years earlier. On average recollections and anticipations are very consistent: the mean anticipated change in spending was -14.7% and the mean recollected change was -14.3% (Table 5).[25] The recollected median change was zero: fewer than half experienced a decline.

However, both on average and at the median, quartiles 2, 3 and 4 recollect more spending than had been anticipated, about 5% more at the mean and 10% more at the

[24] Wealth is measured in the HRS at the wave preceding the first CAMS transition wave. For example, if a respondent was not retired in CAMS wave 1 (2001) but was retired in CAMS wave 2 (2003) wealth would be measured in HRS 2000. Because some wealth could have been accumulated after the 2000 interview but prior to retirement via active saving and capital gains, the numbers in Table 4 are likely to be an underestimate of actual wealth at retirement. Indeed if we measure wealth in HRS in the year following retirement, median total wealth is about 26% higher and median non-housing wealth is 53% higher than the figures given in Table 4. However, these changes are substantially confined to the upper wealth quartiles where capital gains play a role. For example, in the first wealth quartile, the median of post-retirement nonhousing wealth is $2.7 thousand, about the same as the median of pre-retirement nonhousing wealth. This similarity is to be expected: in the first quartile the change in spending approximately equaled the change in income, and households in that quartile had few variably priced assets

[25] 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.

median. In the lowest quartile spending fell much more than anticipated, 12% at the mean and 15% 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 17% for mean spending and 25% for median spending, and those differences are statistically significant. Apparently most of the population experienced greater-than-expected spending even as those in the lowest quartile experienced less.

Ameriks, Caplin and Leahy (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 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, but we extend their results in a number of ways. First, 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, wealth is the only covariate that consistently predicts an anticipated decline in spending, with low wealth households having greater declines than high wealth households. Yet, the TIAA-CREF sample has much greater wealth than the population. For example, in the sample of retired TIAA-CREF households mean financial assets is $824 thousand whereas in our HRS sample, which is representative of the population retiring between 50 and 70, it is $249 thousand.[26] Furthermore, wealth holdings in the lower part of the distributions are very different: the 10th percentile of the distribution of financial assets in the TIAA-CREF sample of retired households is $126 thousand whereas it is zero in our HRS sample. 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. Indeed, Table 5 shows that only in the lowest wealth quartile were recollected realizations worse than anticipated.

A second difference is that we have true panel data. Thus we can study anticipations and recollections of the same individuals. Based on cross-section the discrepancies between anticipations and recollections are similar to those found by Ameriks, Caplin and Leahy.[27] 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. In panel as

[26] Comparisons between the working populations are not valid because of large age differences: the TIAA-CREF sample has workers of all ages whereas HRS sample only has workers age 50 or older. Wealth would differ substantially for this reason alone.
[27] See Hurd and Rohwedder, 2006.

shown in Table 5, there is no difference between anticipations and recollections on average.

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:

```
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 one-fourth of the sample had such a short planning horizon. But 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 41% had a short planning horizon versus just 9% in the highest quartile.

A short planning horizon is associated with large changes in spending that vary substantially across wealth quartiles. In fact the observed decline in spending in the lowest quartile is concentrated among those with a short planning horizon. The table also

shows that having a short planning horizon by itself does not necessarily lead to reductions in spending: rather it is the combination of a short horizon and few economic resources. Although 24% of the population had a short horizon, it is only among those in the lowest quartiles that spending declined. These constitute 16% of the population.

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 did not experience spending declines as measured by group means or medians or by household-level change, whereas those in good and fair or poor health did experience declines (12 percent in population medians and 7 percent in household level median). 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 24% of retirees said that health was an important reason. Among them, spending declined by 9% to 17% depending on the spending measure. Among those where health was not an important factor, there was almost no spending change.

Wealth is strongly related to whether health was an important reason for retirement: about 44% in the lowest wealth quartile reported the importance of health whereas other quartiles averaged about 20% (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 has a larger fraction where health was an important reason for retirement: 32 percent versus 24 percent (Table 9). 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 decline in spending in any of the wealth quartiles among those where health was not an important factor. Where health was important, the two lowest wealth quartiles had declines of about 25%. People in highest wealth quartile are largely able to buffer the adverse effects of a health shock.[28]

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 62 or 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, …

[28] 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.

> (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).

Those in the lowest wealth quartile reported average subjective probabilities of working past 62 or 65 that were higher than those in the third and fourth quartiles; yet, their average retirement age was lower (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 conditional on working at 58. We then find the 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 Figure 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 1.3 years earlier than anticipated whereas those in the highest wealth quartile retired about 0.8 year later than anticipated.

We ask whether an unexpected loss of 1.3 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 $10.6 thousand. Thus retiring 1.3 years earlier than anticipated represents a loss of about $13.8 thousand in addition to any loss in Social Security benefits and pension income that may have accumulated had they worked longer. This amount is about twice as much as mean nonhousing wealth in this quartile. The $13.8 thousand would produce an annual annuity of about $1 thousand for a 62 year-old male with no survivor benefits. Reference to Table 2 shows that average nondurable spending declined by about $2.8 thousand and median spending by about $5.5 thousand. These figures suggest that the unexpected early retirement contributed to the reduction in spending, but it was not the only cause.

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 23.3 versus 19.7 among those where health was not an important factor. This translates into an expected difference of about 0.3 year; that is, those whose health was a factor in retirement expected to work slightly longer than other workers. Yet, their average retirement age was 62.2 versus 62.7 for a difference in differences of 0.8 year. Among those workers in the lowest wealth quartile who said health was an important factor in retirement, the difference was greater: according to this method they retired about 1.3 years earlier than anticipated.

Regression results

Based on the panel sample, we will present results from two median regressions. 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 change in Table 2 and subsequent tables.

Table 12 has the regression results. There is no systematic or statistically significant relationship between wealth and spending change once we control for other factors. 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 planing horizion, but not among those with a long planning horizon. In the first regression, for example, among those in the first two wealth quartiles and with a short horizon, spending dropped by about 4.2% whereas it increased by 28.8% among those in the top two quartiles and with a short horizon. When health was an important reason for retirement, spending declined by about 22%. 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. This happens because education is strongly related to planning horizon: among those lacking a high school education (20% of the sample), 43% have a short horizon compared with 16% among those with some college or more. Those lacking a high school education and having a short horizon (8.6% of the sample) reduced spending by about 12.7%.

Based on these regressions we conclude that the relationship between low wealth and spending declines in retirement comes from that part of the sample that also has a short planning horizon with an additional effect coming from those lacking a high school education. When health was an important reason for retirement, spending also declined,

and because such retirees tend to have low wealth, spending reductions are further concentrated in the lowest quartiles.

Time use

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 use to produced 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 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 5.2 hours. The substitution of those hours could account for the spending declines experienced by a large fraction of households.

However, when health was an important factor in retirement the increase in hours was just one hour per week. 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 good or services. Because those in the lowest wealth quartile are more likely to have retired because of health, the increase in time spent in the seven activities

in that quartile was just 2.8 hours. These results have two implications. First, the decline in spending by those in the lowest quartile where health was an important factor in retirement can be explained less well by a substitution toward more hours spent on home production, at least as measured by the activities we have tabulated. The second is a welfare implication. A simultaneous decline in spending and an increase in time spent in home production could indicate that the marginal utility of consumption was maintained after retirement. But that was not the case in this group: as indicted by a drop in spending and by a relatively small increase in home production, the marginal utility of spending likely increased after retirement. Thus, their welfare could have been increased by a reallocation of spending from pre-retirement to post-retirement.

5. Summary and conclusions

In panel data on total spending, nondurable spending or food spending, we found small declines in spending associated with 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 for a retirement-consumption puzzle 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 second wealth quartile did anticipate a decline which, in fact, was actually somewhat smaller than anticipated. Furthermore, income in that quartile declined by 35 to 41% while spending declined by only 4 to 14%, showing a remarkable amount of consumption smoothing. Those in the lowest quartile experienced a decline what was substantially greater than anticipated. Although the income decline was smaller than in the other wealth quartiles, median nonhousing wealth could not finance even one year of the income shortfall. 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 8% of those in the top quartile had a short planning horizon, 41% of those in the lowest quartile had a

short planning horizon and, possibly, a lack of foresight. In the low wealth group with short planning horizon median household spending change was -17.7%.

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 important. 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 (2007). 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.

We would like to quantify the importance in the population of short planning horizon as an indicator of the lack of forward-looking behavior. We will do this by finding the fraction of the population that occupied cells indexed by short planning horizon but not by importance of health in retirement, and where the predicted median decline in the cell was substantial, say above 10%. We use the regression results for this calculation. For example, those with less than a high school education and with a short planning horizon but not in the upper half of the wealth distribution occupy a cell with predicted median spending decline of 12.7%. For this we will ignore the additive wealth quartile indicators which are not statistically significant. Similarly we will find cells where health was an important factor in retirement as an indicator of the importance in the population of health shocks leading to earlier than expected retirement. We will use the regression results that include education which indicate large and significant differences by education level

The following table shows the percentage of the panel sample and the percentage of the recollections sample that are in such cells. For example, 2.8% of the panel sample had a short planning horizon, had wealth and education such that spending declined by more than 10%, and did not state that health was an important factor in retirement. This is almost the same percentage as in the recollections sample. Similarly 16-18% had a large spending decline at retirement associated with health, but not with a short planning

horizon. Where a respondent has both a short planning horizon and stated that health was important, the two samples differ by 5.5 percentage points.

Percent of sample in cells with median spending change less than -10%		
	Panel sample	Recollections sample
Short planning horizon only (1)	2.8	2.6
Health important in retirement only (2)	16.4	18.4
Short planning horizon and health important in retirement (3)	3.3	8.8
N	*214*	*1293*

Notes: (1) Also restricted to education < high school and wealth quartiles 1 and 2; (2) Also restricted to education = some college or less; (3) Also restricted to wealth quartiles 1 and 2.

According to these results, a very small percentage of people are in cells that experienced a large decline and where a lack of foresight as measured by a short planning horizon is a plausible explanation. A larger percentage of people (3.3 to 8.8%) were in cells where, in addition, health was an important reason for retirement. But the largest number of people had declines in spending associated with health. Our conclusion is that lack of foresight as measured here does not play a large role in spending declines; rather, health and health shocks are likely to be the main explanations in subpopulations that exhibit a retirement-consumption puzzle.

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 to 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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Table 1
Average and median real spending before and after retirement, panel. N = 385

	Total spending	Nondurable	Food
Means			
Pre-retirement	40,465	35,749	6,188
Post-retirement	38,552	34,635	5,998
Percent change	-4.7	-3.1	-3.1
95% confidence interval	(-10.9, 1.9)	(-9.0, 3.5)	(-12.0, 6.5)
Medians			
Pre-retirement	34,130	29,438	5,146
Post-retirement	32,109	29,282	4,960
Percent change	-5.9	-0.5	-3.6
95% confidence interval	(-13.2, 2.6)	(-8.8, 7.6)	(-15.4, 4.6)
Household-level change	-5.7	-2.4	-3.0
95% confidence interval	(-11.8, 0.6)	(-5.6, 2.9)	(-8.8, 6.9)

Note: confidence intervals are bootstrapped.

Table 2
Real nondurable spending before and after retirement, panel.
N = 385

	Wealth quartiles				
	lowest	2	3	highest	All
Means					
Pre-retirement	28,207	33,223	36,697	45,125	35,749
Post-retirement	25,405	28,632	36,571	48,268	34,635
Percent change	-9.9	-13.8	-0.3	7.0	-3.1
Medians					
Pre-retirement	25,336	27,619	32,822	34,288	29,438
Post-retirement	19,848	26,420	31,085	40,369	29,282
Percent change	-21.7	-4.3	-5.3	17.7	-0.5
Household-level change	-7.8	-6.9	-0.5	8.6	-2.4

Table 3
Real income changes associated with retirement, panel
N = 375

	Wealth quartiles				
	1	2	3	4	All
Means					
Pre-retirement	36,908	51,726	68,270	128,285	71,150
Post-retirement	30,198	33,392	47,878	109,347	55,090
Percent change	-18.2	-35.4	-29.9	-14.8	-22.6
Medians					
Pre-retirement	22,857	47,792	50,036	99,296	48,900
Post-retirement	17,479	28,386	38,080	58,912	33,804
Percent change	-23.5	-40.6	-23.9	-40.7	-30.9
Household-level change	-5.0	-36.0	-32.0	-16.6	-21.3

Note: Pre- and post-retirement income are measured in HRS. Most CAMS questionnaires are filled out in October or November, so to match pre-retirement spending in year t we take income from HRS year t+1. For example, income in 2001 is measured in HRS 2002, and it would be matched to pre-retirement spending of someone not retired in CAMS 2001. Similarly if someone is retired in CAMS 2003 we use income measured in HRS 2004 which covers the year 2003.

Table 4
Non-housing and total wealth prior to retirement (2003$)
N=381

		Wealth quartile				
		1	2	3	4	All
Non-housing	Median	2,078	27,611	122,593	457,239	55,222
	Mean	5,994	37,300	126,167	828,325	248,643
Total	Median	16,235	102,713	229,610	661,561	158,961
	Mean	26,116	104,655	241,332	1,082,256	362,292

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

	Wealth quartile before retirement				
	Lowest	2	3	Highest	All
Average change					
Anticipated	-11.2	-18.9	-14.9	-13.8	-14.7
Recollected	-23.0	-12.3	-12.2	- 9.4	-14.3
Recollected minus anticipated	-12.4	6.9	3.0	4.4	0.4
Median change					
Anticipated	0.0	-20.0	-5.0	-10.0	-10.0
Recollected	-15.0	-10.0	0.0	0.0	0.0
Recollected minus anticipated	-15.0	10.0	10.0	10.0	10.0

Source: Authors' calculations. N = 304.

Table 6
Median of household-level change in real nondurable spending (percent), panel: Planning horizon

	Wealth quartile				
Planning horizon	lowest	2	3	highest	All
Short horizon	-17.7	-15.4	8.3	14.7	-10.0
Long horizon	-1.1	-0.8	-3.3	6.1	-0.1
All	-7.8	-6.9	-0.5	8.9	-2.7
Percent with short horizon	*40.8*	*24.0*	*22.9*	*8.5*	*24.2*

Note: N = 384. A short planning horizon is a planning horizon of a year or less.

Table 7
Real nondurable spending before and after retirement, panel

	Health status before retirement			
	excellent/very good	good	fair/poor	Total
Means				
Pre-retirement	39,361	34,437	29,258	35,749
Post-retirement	39,665	29,519	29,776	34,635
Percent change	0.8	-14.3	1.8	-3.1
Medians				
Pre-retirement	31,865	28,032	25,585	29,438
Post-retirement	31,837	24,776	22,529	29,282
Percent change	-0.1	-11.6	-11.9	-0.5
Household-level change	2.5	-7.1	-6.9	-2.4
Number of observations	*192*	*108*	*85*	*385*

Note: Health is measured in the HRS at the wave preceding the first CAMS transition wave.

Table 8
Real nondurable spending before and after retirement, panel: Importance of health as a reason for retirement

	Not important	Important	All
Means			
Pre-retirement	36,957	33,419	36,101
Post-retirement	39,054	30,541	36,995
Percent change	5.7	-8.6	2.5
Medians			
Pre-retirement	30,670	31,216	30,681
Post-retirement	30,780	27,945	30,048
Percent change	0.4	-10.5	-2.1
Household-level change	-3.0	-17.0	-0.4
Number of observations	*163*	*52*	*215*

Note: Reasons for retirement is taken from various waves of HRS. Sample size reduced due to missing values.

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

Importance of health for retirement	Wealth quartile before retirement: Lowest	2	3	Highest	All
Means					
Important	-24.0	-24.6	-17.7	-12.2	-21.6
Not important	-14.9	-15.6	-11.5	-6.4	-11.5
All	-19.9	-18.6	-13.1	-7.2	-14.7
Medians					
Important	-25.0	-25.0	-20.0	0.0	-20.0
Not important	0.0	-10.0	0.0	0.0	0.0
All	-15.0	-20.0	0.0	0.0	0.0
Percent where health important	*54.2*	*33.8*	*25.4*	*15.0*	*32.3*

N=1,302

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

Wealth Quartiles	P62	P65	Actual
Lowest	46.8	28.7	62.0
2	47.8	23.6	62.2
3	43.6	21.3	62.2
Highest	39.1	18.9	63.1
All	44.3	23.0	62.4

Note: P62 and P65 are the subjective probabilities of working full-time past the age of 62 and 65 respectively. N=358

Table 11
Expected and actual retirement age

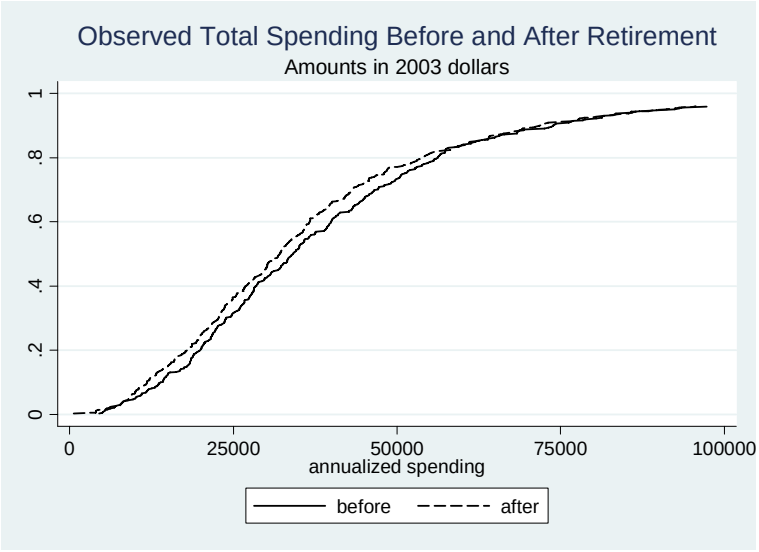
	Wealth quartile: lowest	2	3	highest	All
Years of survival in employment	5.3	4.8	4.6	4.3	4.7
Expected retirement age	63.3	62.8	62.6	62.3	62.7
Actual retirement age	62	62.2	62.2	63.1	62.4
Actual minus anticipated	-1.3	-0.6	-0.4	0.8	-0.3

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

	Coeff	p-value	Coeff	p-value
lowest wealth quartile	--	--	--	--
2	-4.6	0.484	-4.2	0.559
3	-7.4	0.324	-7.6	0.351
highest	-1.0	0.899	-5.5	0.525
long planning horizon	--	--	--	--
short planning horizon	-14.6	0.032	-9.1	0.251
short planning horizon and high wealth	33.0	0.004	24.5	0.025
health important for retirement	-22.3	0.002	-20.7	0.008
education less than high school	--	--	--	--
high school	--	--	12.2	0.138
some college	--	--	12.3	0.091
college or greater	--	--	21.8	0.005
missing health important for retirement	-6.5	0.205	-4.2	0.411
single at baseline	-6.9	0.157	-4.1	0.431
constant	10.4	0.167	-3.6	0.704
Number of observations	*384*		*383*	

Note: N = 383. Bootstrapped p-values (1000 replications).

Figure 1


Observed Total Spending Before and After Retirement
Amounts in 2003 dollars
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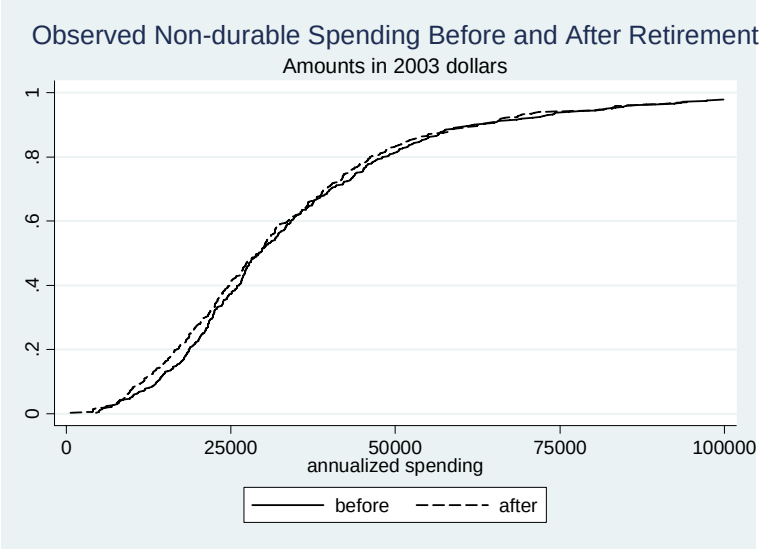
.2
.4
.6
.8
1
0
25000
50000
75000
100000
annualized spending
before
after


Observed Non-durable Spending Before and After Retirement
Amounts in 2003 dollars
0
.2
.4
.6
.8
1
0
25000
50000
75000
100000
annualized spending
before
after

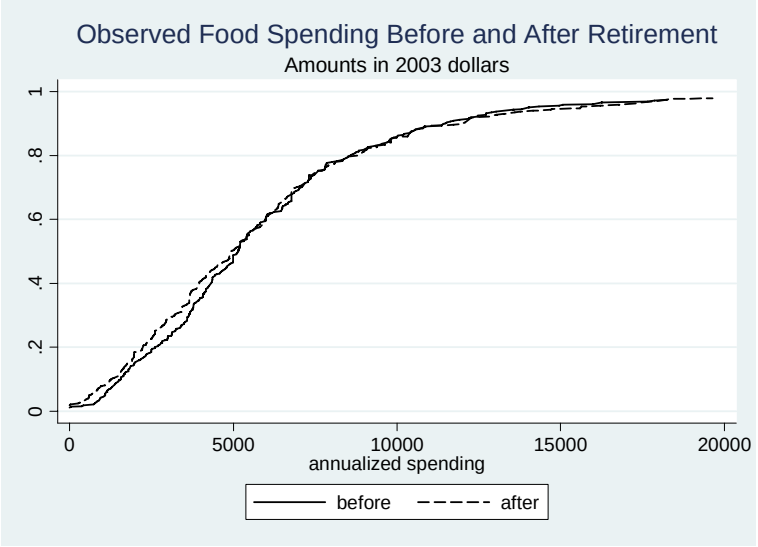

Observed Food Spending Before and After Retirement
Amounts in 2003 dollars
0
.2
.4
.6
.8
1
0
5000
10000
15000
20000
annualized spending
before
after

Figure 2. Survival in employment