Wealth Dynamics and Active Saving at Older Ages

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ABSTRACT

According to the simple lifecycle model single persons are predicted to decumulate assets at advanced age, when mortality risk is high to reduce the risk of dying with substantial wealth. Empirically it has been difficult to show this prediction in micro data. In this paper we discuss the most common limitations in existing data. We provide empirical evidence of dissaving at older ages by single persons using data from the Health and Retirement Study. We present lifecycle patterns of dissaving based on two very different kinds of data: those that are derived from wealth change, and those derived from measures of active saving defined as disposable income minus consumption. Based on wealth change we find evidence of dissaving for singles and limited evidence for couples: couples preserve wealth longer to provide for the surviving spouse. However, rates of active saving imply much smaller wealth decumulation for singles and no decumulation at all for couples. We discuss possible reasons for the discrepancy including under-estimation of consumption, mis-measurement of taxes and capital gains.

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1. Introduction

One of the fundamental predictions of the simple life-cycle model of single persons is that, having saved when young, they will spend more than their income in old age. In the absence of a bequest motive they aim to run down their assets to zero. However, the timing of the end of life is uncertain. Households will therefore begin to decumulate their assets when the risk of dying becomes large, while at the same time they hold on to sufficient resources so as to not run out too early. In a simple lifecycle model, saving turns negative when the sum of mortality risk and the time rate of discount exceed the interest rate (Yaari, 1965). Mortality risk is rather small until the late 50s but it increases approximately exponentially, becoming large late in life. For common utility function parameter values, we would expect saving to turn negative some time after age 65. The exact timing is an empirical matter. A considerable body of work has investigated the empirical age pattern of saving in micro-data, but many studies did not find any evidence of dissaving. With the life-cycle model having become a work-horse model in the economic analysis of household behavior the wide-spread failure of observing one of its central predictions in the data has raised doubts about the model's validity.

The most direct way of finding whether households are saving or dis-saving is to study their active saving, which we define as the difference between after-tax income and spending. However, until recently no general-purpose survey collected a measure of total spending because it was thought infeasible to obtain a reliable measure of total spending without excessive burden for respondents. The Consumer Expenditure Survey (CEX), which focuses on collecting spending data, asks about some 300 categories as part of its recall interviews. Until recently the income data in the CEX were not useful for this purpose because income was calculated only for households that had no missing data in any of the income components. This selection made it difficult to extrapolate to the complete population. An additional barrier is that in the published data, taxes appear to be substantially under-estimated; yet it is the comparison of spending with after-tax income that is the relevant comparison.

An indirect method of finding whether households dissave is to study wealth change. Over long periods of time, where macro shocks should average out, households should be able to manage their spending so that wealth will decline. Because of the greater availability of wealth data, researchers have relied on studying wealth change either in panel data or in synthetic cohorts rather than active saving. Here we present results on both wealth change and active saving as complementary ways of studying the problem. An important advantage of our approach is that the data for active saving and for wealth change come from the same survey, eliminating many sources of potential differences that would arise if using data from different surveys for comparing the two approaches.

We discuss the caveats and challenges of trying to find empirical evidence of dissaving based on wealth change and contrast this with the data requirements when using data on consumption and after-tax income. We present results based on two different kinds of data from the Health and Retirement Study (HRS), a general-purpose survey that is representative of the U.S. population age 51 and over. We first present life cycle saving patterns based on wealth change exploiting the panel nature of the HRS data spanning 12 years (1996 to 2008). In addition we use data on consumption and after-tax income collected in the Health and Retirement Study. The consumption data come from

a mail supplement, the Consumption and Activities Mail Survey (CAMS), which is collected separately from the HRS core data.

2. Challenges in the Empirical Analysis of Saving in Micro-data

2.1 Wealth Change in Panel Data

According to the life-cycle model of consumption, individuals save during their working lives and use their savings to finance consumption following retirement (Modigliani & Brumberg, 1954). One could think of testing this prediction by finding wealth change as people age. An important difficulty with this approach is that wealth is measured with considerable observation error: even if the observation error is white noise, the first-difference of a variable that may have little systematic change over a short time period can consist largely of white noise (Browning & Lusardi, 1996). Furthermore, wealth change incorporates capital gains, which can dominate wealth change in panel data. Thus, for example, if assets increase over several years due to an unexpected increase in their valuation, it will appear that elderly individuals engage in active saving unless the capital gains are eliminated. Both of these problems can be potentially overcome with long panels where noise and macro shocks can be averaged out. That is the approach in this paper where we use panel wealth data over six two-year transitions.

2.2 Wealth Change in Synthetic Panel Data

Synthetic panel data on wealth change cover longer periods of time, hence allowing the averaging of macro shocks.[1] However, for synthetic panel results to be a valid representation of a life-cycle wealth path, a fundamental necessary condition needs to be satisfied: the composition of the sample with respect to household characteristics that are correlated with wealth must stay the same over time. At older ages this is not the case in synthetic panels because persons with lower socioeconomic status (SES) tend to die earlier than those with higher socioeconomic status. As a result population statistics computed for older ages in synthetic panel are based on samples with higher SES than those computed for younger ages. Thus wealth can appear to increase as the cohort ages simply because those in the lower part of the wealth distribution die. All individuals and couples could be dissaving, yet cohort wealth could be flat or even increasing.

2.3 Consumption and After-Tax Income

Good measures of both consumption and after-tax income could be used to form a direct measure of active saving or dissaving by households. Furthermore, because of observation error and because dissaving takes place at older ages, we need fairly large sample of the older population for this method to produce reliable estimates.

In this paper we provide empirical evidence on this approach using data on total spending to estimate directly the saving rate over household-level observations. CAMS has complete measures of spending by a random sample of about 3,800 HRS households in 2001, 2003, 2005 and 2007. We use linked income data from the HRS and a calculation of taxes to find after-tax income. We compare evidence about life-cycle

[1] For example the Survey of Consumer Finances

models based on the active saving rate with evidence based on wealth change calculated over the same populations.

3. Theoretical Background

Our thinking about saving and wealth change is guided by a life-cycle model that has these features and assumptions: life-time utility is based on time-separable utility from consumption (Yaari, 1965); the only uncertainty is the date of death; resources are initial bequeathable wealth and a predetermined stream of annuities such as Social Security; bequeathable wealth cannot become negative, and, therefore, borrowing against future annuities is not allowed. As specified by Yaari, there is only one economic agent so the model is only appropriate for single people.

If a single person has no bequest motive, she will have wasted money should she die with assets: spending could have been higher earlier in life leading to higher lifetime utility. However, had spending been higher she may have been at risk of impoverishment should she have lived unexpectedly long. The theoretical solution to the problem is to spend at a high level earlier in life (to guard against dying with too much money), but then to reduce spending later in life to guard against outliving resources. Thus the theoretical prediction is that consumption will decline at advanced age as mortality risk becomes large. An implication is that the spending level should be high enough when spending is declining that wealth will also decline: If wealth does not initially decline, it will not decline in the future because consumption in the future will be even lower.[2] The result will be that the individual will die with positive wealth should she survive to the greatest age possible, violating a terminal condition of the theoretical model.

If the single person has a bequest motive, consumption will be reduced and more wealth held. Whether wealth will decline at advanced old age will depend on the details of the bequest motive.

The corresponding model for couples is considerably more complex. A couple chooses a consumption path to maximize expected lifetime utility, which includes the utility from consumption while both are alive, and the utility from the wealth that a surviving spouse would inherit.[3] Because the value of a "bequest" to a surviving spouse depends on the economic status, mortality risk and other characteristics of the surviving spouse, it is difficult to quantify its effect on the slope of the consumption path. For example, even if the couple does not have a bequest motive (to others outside of their household) wealth may not necessarily decline except at advanced old age. Nonetheless, a few comparative predictions are possible. For example, every thing else held constant, the marginal utility of wealth is greater among the young than among the old. Thus, the value of a "bequest" is greater to a younger spouse than to an older spouse. The greater value causes spending to be lower so that wealth should decline more slowly among couples where one spouse is substantially younger than the other.

[2] This statement requires that annuity income not decline rapidly with age, which is the case for people who rely on the public pension system for annuity income.
[3] See Hurd (1999) for a derivation and discussion of the couples' model.

4. Data

Our data come from the Health and Retirement Study. The HRS is a multipurpose household survey of the elderly population in the United States. It is collected by the Institute for Social Research at the University of Michigan. At baseline, respondents were selected from the community-dwelling population (including retirement homes but not nursing homes). In subsequent waves, respondents were followed even if they entered an institution. The initial HRS wave took place in 1992. The sample consisted of individuals born in 1931-41 (age 51-61 in 1992), plus their spouses (of any age). In 1993, a companion survey ("Assets and Health Dynamics Among the Oldest-Old," AHEAD) interviewed respondents born in or before 1923 (age 70+ in 1993), plus their spouses of any age. Barring attrition or death, the 1992 respondents were re-interviewed in 1994 and 1996; the 1993 respondents were re-interviewed in 1995. The two cohorts were merged into a single sample with a single questionnaire in 1998, at which time the sample was augmented with respondents born in 1924-30 ("Children of the Depression Age," CODA) in 1942-47 ("War Babies," WB). With provided sampling weights, the resulting 1998 sample was representative of the non-institutionalized American population born in or before 1947 (age 51 or older in 1998). The HRS was re-interviewed in 2000, 2002 and 2004, and in 2004 a new cohort (1948-53) was added to the sample to make it again representative of the population 51 or over. In 2006 and 2008 all survivors were reinterviewed. They were again reinterviewed in 2010 and a new cohort of 51-56 year-olds was added. The total sample size in a wave is around 20,000 individuals.

The HRS queries a wide range of topics: *demographics* (age, education, education of parents, marital status and history, veteran status); *family structure* (lots of information on household members, children, siblings, and parents); *health conditions* (whether the respondent has ever seen doctor for various conditions, vision and hearing, pain, smoking, drinking, weight, height, depression); *cognition* (self-assessment of memory, cognitive test questions); *health care utilization and costs* (health insurance, out-of-pocket expenses, other expenses with varying detail across waves, whether anyone helped pay, Medicare number); *health status* (ADLs/IADLs, whether gets help; for each helper, gender, frequency, hours, whether paid, out-of-pocket costs, whether anyone helped pay); *housing* (type, cost, special services); *job status* (employment status/history, earnings, hours, pension coverage, type, expected benefits, rights from previous jobs); *expectations* (chances of giving/receiving major financial assistance, inheritance, entering nursing home; major medical expenses; inflation; longevity); *income* (many sources and total, assistance from others, will); *net worth* (many asset types, IRA/Keogh, stocks, bonds, bank, trusts); *insurance* (Medicare, Medicaid, other, whether managed, coverage and payments for long term care, life insurance, beneficiaries), etc. In addition to these core questions, asked of the entire sample, there were additional topical modules asked of randomly assigned sub-samples.

Consumption and Activities Mail Survey

The HRS has high-quality income and wealth measures, but the core survey has just a partial measure of total consumption.[4] In October 2001 the Consumption and Activities Mail Survey (CAMS), a self-administered mail survey of consumption and time-use, was sent to 5,000 respondents randomly chosen from the entire age range of the HRS.[5] Only one person per household was chosen. About 3,800 HRS households responded, so CAMS 2001 is a survey of the spending of 3,800 households.[6]

CAMS asks about the purchase of six large durables during the past year and 26 categories of nondurables. With a few minor exceptions the categories were chosen to match CEX categories so as to facilitate a comparison with CEX.[7] An innovation in the CAMS questionnaire was to allow the respondent to choose the time frame for reporting on the purchases in many of the categories. For example, rent is typically paid monthly. Automobile insurance may be paid quarterly, semi-annually, or annually. Clothing purchases may be made monthly by some but only rarely by others. Food is purchased weekly or monthly.

A beneficial consequence of this questionnaire design is that item nonresponse is much lower than it is for typical financial variables such as the components of wealth or income where it can be as high as 40%. Furthermore, in the spending categories with the highest rate of nonresponse, we have information from the HRS core that we can use for imputation. For example, rent has almost the highest rate of nonresponse. However, we have responses in the HRS about homeownership which we can use to impute rent. Thus, in CAMS 2001, of the 506 who were nonrespondents to the rent query, 420 owned a home in HRS 2000.[8] We believe we can confidently impute zero rent to these households. Based on these and similar imputations that use HRS core data to provide household-level information, in 2001 64% of CAMS respondents were complete reporters over all 32 categories of spending.[9]

We imputed the remaining missing data to account for the partial reports by assigning means within categories. Because of the low rates of item nonresponse, the amount of consumption data imputed as a fraction of the total is considerably lower than in measures of income or wealth in the HRS.

In October 2003 the same 5,000 households were sent wave 2 of CAMS.[10] It has substantially the same structure as CAMS wave 1. In October 2005 CAMS wave 3 was sent to the surviving households and to an additional 850 households to represent the new cohorts that were recruited into HRS in 2004. Item nonresponse in CAMS 2003 and 2005 was even lower than in CAMS 2001, and other indicators of data quality such as

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[4]Food purchases, food consumed outside the home or delivered to the home, rent, utilities, real estate taxes and out-of-pocket medical expenses in several major categories. These total about 40-50% of total consumption as measured in the CEX.

[5] When referring to the HRS we mean all cohorts, including what was formerly called AHEAD, CODA and WB (and 2004 onwards also the Early Boomers (EB)). In 2001 the age range was approximately 54 or older.

[6] The only discernable pattern of unit nonresponse is slightly higher nonresponse among the very old.

[7] Several small categories were dropped and a few were merged to reduce respondent burden.

[8] We also used HRS 2002 to check for change in homeownership.

[9] All of these imputations converted nonresponses to zero values as in the example of rent.

[10] With the following exceptions: the respondent refused an interview in the HRS 2002 core; the respondent died; the respondent had diabetes and was part of a subset that was randomly allocated to a mail questionnaire about compliance with diabetes treatment. The HRS has generated weights to account for the diabetes allocation.

outliers were similarly improved. Additional waves of CAMS were fielded in 2007 and 2009, but we will use only CAMS data up to and including the 2007 data. Because of the financial crisis and Great Recession, consumption dropped between 2007 and 2009. In our view spending in 2009 is the result of different economic conditions and expectations than those that produced the wealth change in earlier waves of HRS. That is, we would not expect that the active saving observed in CAMS 2009 would match the wealth change that was observed in previous HRS waves.

We note that the life-cycle model concerns consumption whereas CAMS data record spending. The difference between the two mainly stems from expenditures on durables that may be purchased in one period, but whose consumption services may be enjoyed over multiple periods. We construct for our analyses a measure of consumption that makes adjustments to the recorded spending on durables to approximate the consumption value that households draw from these in a year. For items like refrigerators, washing machines, dryers, dishwashers, televisions and computers we approximate the annual consumption value by multiplying the probability of purchasing the item in that year with the purchase price, conditional on buying one. The purchase probability and the purchase price are each predicted from a regression with a number of explanatory variables (number of household residents, gender, age, marital status, work status, education, wealth quartiles, and income quartiles). This is to allow for the fact that both the probability of purchase and the purchase price tend to be higher for households with certain characteristics such as high wealth and income, for example. For transportation, like cars, we approximate the annual consumption value as the sum of the following components: the depreciation of the vehicles the household owns (10% of the total current value), the opportunity cost of capital (5% of the total current value) plus the amount paid for vehicle insurance.[11,12]

A common approach to approximate the consumption value of owner-occupied housing is to compute the rent equivalent as a function of the value of the home (that is the only characteristic of the home we observe). In this study we do not do that, because one of our objectives is to assess how saving derived from wealth change compares to saving derived from the difference between income and consumption. Including the rent-equivalent of owner-occupied housing in total household consumption would impute variation in spending across households according to geographical variation in housing prices. For example, households living in areas with high housing prices would be imputed a high level of spending, leading in some cases to substantial dissaving when measured as the difference between after-tax income and spending. Yet, that level of dissaving would not match wealth change. An accounting solution would be to add into income the imputed income from housing, leaving as the difference between income

[11] We obtain the total value of the vehicles the household owns at the time of a CAMS survey as the average of the total net value reported in the two adjacent HRS core surveys (e.g. HRS 2004 and HRS 2006 for CAMS 2005 observations). The amount paid for vehicle insurance is observed in CAMS.

[12] These adjustments can make sizeable differences at the household-level. However, when averaging across the population the consumption value measure and the outlay measure for these categories are about the same (by construction). At the household level the difference between consumption and spending for durables could be substantial, but at the population level the flow of new purchases of durables will average to the flow of consumption in steady-state. For example, the average consumption of durables by age will be approximately the same as average spending on durables by age. A lengthening of the time between purchases leading to a decline by age in quality-adjusted consumption will show up in the data as an age decline in spending on durables.

from housing and spending on housing, what the household actually spent. But what the household actually spent is what enters our measure of total spending on housing. It has the following components for homeowners and renters: spending on home repairs, mortgage interest, property taxes, rent, homeowners' and renters' insurance, house keeping supplies and services, and yard supplies and services.

In summary, our measure of total consumption is the sum of annualized spending on nondurables and services, annual spending on housing, and the consumption value derived from other durables.

Comparison with the CEX

In Table 1 we compare CAMS totals with published totals from the Consumer Expenditure Survey (CEX). We have classified by age band because CAMS does not cover the entire population. In the case of couples, the age comparison is not exact because "age" in the CEX is the age of the household head. HRS does not have that concept so we use the age of the husband in the case of couples as an approximation.

In 2001 spending among those 55-64 years old was about $3,000 or 5% higher in CAMS than in the CEX. But it is notable that spending declines much more rapidly with age in the CEX than in CAMS. In CAMS spending by those 75 or older was 73% of spending by those 55-64, but it was just 60% in CEX. While this discrepancy in the age pattern occurs in other years, it has declined. For example in CAMS 2007, spending by those 75 or older was 65% of spending by those 55-64 whereas it was 61% in CEX.

When the percentage discrepancy is averaged over the four survey years as shown in the last row, spending in the 55-64 age band is almost identical in the two surveys, but spending in CAMS is higher at older ages. As we discuss below, the CAMS measure comes closer to matching observed wealth change than the CEX measure.

5. Results

In this paper we will use wealth data from HRS 1996 through 2008 to find panel wealth changes, and from CAMS waves 2001, 2003, 2005 and 2007 to find spending levels. We use the longer time period for wealth change to increase sample size and to further the aim of averaging out macro shocks. The relevant interview schedule of HRS and CAMS is shown in Table 2 along with the lowest age among the age-eligible cohorts. Thus in CAMS 2001 the age-eligible respondents were 54 or older.[13] Spending in CAMS approximately refers to the same time period as income in the following HRS wave. For example, CAMS 2001 queries about spending in the previous 12 months backward from October; HRS 2002 queries about income in 2001.

5.1 Wealth Dynamics

[13] The variation in youngest age is due to the aging of the HRS respondents and the addition of a new six-year cohort every six years.

We first present results for singles because the life-cycle model makes simple predictions about consumption levels and changes for singles in the absence of a bequest motive. We present three measures of wealth change:

1. $\Delta\bar{w}_t = \frac{\sum w_{i,t+1}}{\sum w_{i,t}}$ where the summation is over individuals observed in two adjacent waves. Thus this is the ratio of mean wealth for the population surviving and interviewed in two adjacent waves. We call this the "population mean" measure.

2. $\Delta w_t^{med} = \frac{w_{t+1}^{med}}{w_t^{med}}$ where again the summation is over individuals observed in two adjacent waves This is the ratio of population median wealth in two adjacent waves. We call this the "population median" measure.

3. $(\Delta w_{i,t})^{med}$, which is the median of household wealth ratios in two adjacent waves. We call this the "individual or household median" change.

These ratios are calculated over adjacent waves between 1996 and 2008 and adjusted for price change to put the ratios in real terms. Then the ratios are averaged weighting by the square root of the number of observations in each of the ratios. By averaging over a number of wealth transitions we aim to reduce the influence of macro shocks that would obscure anticipated or desired wealth change.

Another possible statistic, which we do not present, is $\frac{1}{n}\sum \frac{w_{i,t+1}}{w_{i,t}}$, which is the mean of household level wealth ratios. This statistic has considerable bias because of observation error on w, which renders some of the individual changes very large.

Table 3a shows the three summary measures of two-year rates of real wealth change for single persons living alone. It is important to exclude those living in extended families because we do not know the sharing of expenses. For example, the older person living with her children may spend little with the expectation that she will bequeath her remaining wealth to her children. In this case most of the household's spending pertains to the children. The older person's wealth change would not match the saving rates derived from deducting the household's total spending from the older person's income.

In Table 3a all three measures of wealth change show dissaving from age 75 on. In the other age bands there are differences depending on the measure of wealth change. In our view the measures based on medians combine reliability and theoretical appeal in the best manner: even with averaging the ratio of means is still vulnerable to large wealth outliers. For describing what the typical person does the medians are more useful. Therefore we will focus most of our discussion on the median-based results. Both show wealth decumulation by singles in their early 70s with the rate of dissaving accelerating with age.

The ratio of medians, which is an average of median wealth in a wave divided by median wealth in the subsequent wave where the averaging is across six wealth transitions in the HRS, indicates large rates of wealth decline: a 9% decline for those in their late 70s, just under 11% decline for those in their early 80s and an even larger decline among those age 85 and older (-16%). The median of individual changes shows

rates of wealth decline for the person in the middle of the distribution of rates of wealth change. The magnitudes are closely comparable to the ones implied by the population median with one notable difference. The median of individual changes shows wealth declines already among singles in their late 60s.

To find what these rates of wealth change imply for life-cycle wealth trajectories, we have graphed the associated wealth paths beginning at 100 at age 65. The method is to apply the age-specific rate of wealth change year-by-year so as to cumulate the year-to-year changes. Thus according to the ratio of means a single person age 66 would have 100.9 (= 100*(1+0.018/2)) and a single person age 67 would have 101.8 (= 100*(1+0.018/2)*(1+0.018/2)), and so forth. The three wealth paths are shown in Figure 1. Based on medians, wealth drops sharply, so that a single person who survives from 65 to 90 would have 30-35% of initial wealth. The path implied by the median of individual changes (yellow line) indicates a somewhat steeper decline than that based on the ratio of medians (pink line). The survival rate from age 65 to age 90 is about 21%, so that significant numbers would survive with that rather low percentage of initial wealth. The trajectory based on the mean initially increases and only decreases following age 75.

Although demographic factors interfere with the clear predictions of the life-cycle model with respect to wealth change, for completeness we present in Table 3b the same statistics calculated over the entire population of single persons. Of immediate note is that about 30% of single persons over the age of 70 live with others. A prediction about saving or dissaving would require a model of intra household resource flows as well as information about the other household members. Nonetheless, the general pattern is the same and the quantitative outcomes are quite similar as is shown in Figure 1b: as measured by medians, the rate of dissaving is substantial, leading to remaining wealth at age 90 of about 30-38%.

Table 4a has similar results for couples living alone. The reason for restricting the sample to couples living alone is the same as that in the analysis of singles. In addition we have excluded couples where the age difference between spouses is greater than five years and who therefore have a different (longer) time horizon that would call for a different wealth decumulation path. Classifying by the age of the older spouse the median of household change in Table 4a shows modest dissaving of between two and four percent from age 70 onward. According to the ratio of medians there is less dissaving, and even wealth accumulation after the age of 80, and the ratio of means does not show any dissaving at any age. In Figure 2a we trace out the wealth paths implied by the estimated wealth changes. Wealth trajectories are much flatter than for singles. For example, according to the median household change a typical couple would still have about 83% of initial wealth when the oldest spouse is 85. Couples retain their wealth much longer, in accordance with the predictions of the theoretical model. Note that the chances that both spouses survive until advanced old age, say 85, are small and that most couple households will become single before then. Thus couples preserve wealth for the surviving spouse.

For completeness we show in Table 4b the results for all couples, i.e. those living alone and those living with others, despite the caveat of unknown sharing of expenses. The estimated wealth changes turn out to be closely comparable to those in the restricted couples sample in Table 4a only for the median of household changes. Those based on the ratio of means or on the ratio of medians are quite different. Figure 2b shows the implied wealth paths. Based on medians, Figure 2b suggests dissaving by couples beginning in their early 70s whereas Figure 2a would suggest little, if any, dissaving.

5.2. Active Saving

Our second measure of saving is "active saving" which we define to be the difference between after-tax income and spending. For every wave of CAMS we match spending with the income recorded in the immediately following HRS wave. For example, spending from CAMS 2001, which refers to the 12 months preceding October 2001, is compared with income measured in HRS 2002, which refers to income in 2001. Thus we have some discrepancy in time period between them but the difference is relatively minor. The HRS elicits pre-tax income. To arrive at post-tax income we use the NBER tax calculator "TAXSIM."[14] Because we do not have sufficient information to calculate the taxes of household members other than the respondent and the spouse we restrict the analysis to singles and couples living alone. Because we want to compare active saving with wealth change, we normalize active saving by wealth so as to obtain saving or dissaving as a percentage of wealth. To describe the patterns observed in the data we use the same three summary measures that we used for the study of wealth change (i.e., population medians, individual-level medians and population means).

Table 5a shows results for singles living alone. The statistics are based on averages of median values across four waves of CAMS. Additional explanation of the method is found in the note to the table. We find dissaving at all ages, except for people in their late 60s, the youngest age band in our analysis. The rates of dissaving are greatest in the highest ages, just as we found for wealth change earlier. However, the magnitude of the saving rates out of wealth based on active saving is substantially smaller for singles than what we found based on wealth change. For example, the one-year change in wealth predicted by median active saving among 80-84 year-olds is -1.7%, but the estimated actual change in median wealth (Table 3a, ratio of medians) is -10.7% over 2 years or -5.3% per year. The qualitative result is confirmed when using the individual-level medians (Table 5b). In contrast, the rates of saving when calculated using population means of active saving have a different pattern from rates of mean wealth change in Table 3a, but the overall predictions about wealth trajectories are approximately the same. This can be seen in Figure 3 which shows the wealth trajectories calculated from active saving. Whereas the paths based on active median saving lie substantially above those based on median wealth change, the path based on active mean saving is at or below the path based on mean wealth change. For example at age 95, the wealth path based on mean active saving predicts that a single person living

[14] For further information see the TAXSIM website at http://www.nber.org/taxsim/ and the paper by Feenberg and Coutts (1993) for additional background.

alone would have 69% of wealth remaining; the wealth path based on mean wealth change would predict 72% of wealth remaining. In principle, paths based on mean values are superior because of the adding-up characteristic of means, but those paths may be unduly influenced by outliers.

In order to facilitate the comparison of the saving rates based on active saving with those based on wealth change we present the implied wealth trajectories side-by-side using the population median summary statistics. They are depicted in Figure 4. The trajectory based on active saving results in much less wealth decumulation. For example, at age 90 single persons would have about 70% of initial wealth according to active saving, whereas they would only have about 35% of wealth remaining according to the estimates based on wealth change.

Tables 6a through 6c show the summary statistics of active saving for couples living alone. For them the saving rates are positive at all ages which implies *increasing* wealth as shown in Figure 5. This finding is not consistent with the simple lifecycle model we presented: the marginal utility of wealth to the surviving spouse should decline with age so that the household would want to consume in such a way that wealth would decrease. Figure 6 shows the side-by-side comparison of the wealth trajectory based on the analysis of wealth change with that based on active saving. Both are calculated from the population medians (i.e., ratio of medians). According the to active saving path a household would accumulate about 50% of additional wealth by age 90 which is in contrast to the trajectory based on wealth change which is essentially flat (neither wealth accumulation nor decumulation).

6. **Wealth paths based on CEX spending levels**

According to the average discrepancy in Table 1, CAMS spending levels among those 55 or older averaged about 8% higher than spending levels in CEX. In this section we compare wealth paths based on active saving that use CEX spending levels rather than CAMS spending levels. There are, however, a number of obstacles to such comparisons. First, we believe we must use CAMS income rather than CEX income: until recently CEX only reported income totals for households that were complete income reporters, that is, only over households that had no missing values for any income category. Because more well-to-do households have more categories of income, they are more likely to be nonrespondents to at least one income category which would bias downward population totals. Furthermore, taxes in the CEX appear to be substantially underreported which would cause discrepancies between pre- and after-tax income. Second, there likely are population mismatches based on age because of the use of head of household in CEX as discussed in section 4. An additional problem is that we cannot apply the restriction about the age difference of the spouses in the case of couples. Third, our tax calculations are for single persons and couples living alone, which is necessitated by our not having the income detail on other household members required by the NBER tax calculator. Yet we do not have CEX spending data by age and family composition.

Because of these problems, our method is to reduce CAMS spending by age band according to the average discrepancies between CAMS and CEX spending reported in

table 1. Thus we reduce observed spending by 55-64 year-olds by about 4%, by 65-74 year-olds by about 8% and by 75 or older by about 16%. When compared with CAMS after-tax income these adjustments will result in new levels of active saving, and new implied wealth paths. We calculated the new levels of active saving and wealth paths only for the measures based on means, not for the measures based on medians, because we only have mean spending in the published CEX tables. We do so for singles and couples whether living alone or with others because we do not have that demographic detail in the CEX data.

Figure 7 shows the wealth paths based on panel wealth changes, which is extracted from Figure 1b, and on two measures of active saving, actual CAMS and adjusted CAMS to CEX levels. The actual CAMS (active saving) approximately tracks observed mean wealth change until about age 80 when it begins to predict a flatter wealth path than actually observed. Nonetheless it shows dissaving, matching at least qualitatively observed wealth change. In contrast CAMS active saving adjusted to CEX levels shows positive saving at all ages, resulting in increasing wealth.

Figure 8 has similar paths for couples. Until age 80, the paths based on mean active saving, whether CAMS or adjusted CAMS, match fairly well the path based on mean wealth change. At older ages, the path based on wealth declines whereas the paths based on active saving continue to increase.

6. Conclusions

We have shown two types of results: wealth change based on observed wealth levels in panel data, and active saving rates based on observed income, calculated after-tax income and spending levels. In the case of single persons they are broadly consistent at least qualitatively: Singles dissave after age 65.

Among married persons the rate of wealth change eventually becomes negative, but the overall rate of wealth decline is much lower than among singles. Active saving by couples is always positive.

We conclude that the patterns of wealth change and active saving among single persons are consistent with a simple life-cycle model where the only uncertainty is mortality. Among married persons the pattern of wealth change is also consistent with the life-cycle model although caution should be exercised when speaking of the quantitative pattern. However, active saving implies wealth accumulation, which is not observed in the wealth change data.

The source of the discrepancy between wealth change, which should be reliable over long periods, and active saving could arise from a number of factors. Capital gains—whether realized or unrealized—do not enter the calculation of active saving. These are empirically more important for couples than for singles, because couples hold substantially more wealth than singles at older ages. To the extent that capital gains are positive, they would increase the discrepancy between wealth change and active saving. However, it is not certain that capital gains were positive over this time period. The older population holds considerable fixed-price assets which, in real terms, had negative capital gains. While the stock market recorded gains over this time period, only about one-third of older households hold stocks outside of retirement accounts. Whether house prices

increased faster than the CPI depends on location: a quantitative assessment would require detailed geographic information linked to local house prices indices.

A second source of discrepancy between wealth change and active saving is that measures of income in the HRS may be too large. HRS income is somewhat larger than CPS income, but there are good reasons associated with the measurement of income from assets that would correctly lead to the greater values.[15]

A third source is taxation of withdrawals from tax-advantaged accounts. For example, consider a single person for whom after-tax income equals spending in the absence of any IRA withdrawals. Active saving would be zero and wealth change calculated from active saving would be zero. Should this person survive to advanced old age, she would have withdrawn all of her tax-advantaged wealth, paid taxes on those withdrawals and re-deposited the after-tax amounts in post-tax accounts to comply with IRS rules concerning mandatory IRA withdrawals. Thus simply by moving wealth out of tax-advantaged accounts, wealth would decline from age 70 to the end of life by the marginal tax rate. Our tax calculations do account for mandatory withdrawal of tax-advantaged savings at ages 70½ and older, and their resulting taxation, but they do not account for any withdrawals which are necessary to finance consumption. This omission would cause an underestimate of taxes and a corresponding over-estimate of active saving.

Fourth, we may be under-measuring spending. It is difficult for respondents to remember completely their spending, and the longer the recall period over which respondents are asked to report the larger the recall bias (Hurd and Rohwedder, 2009). Underreporting is likely to be more prevalent among couples than among singles, because of the difficulties for a respondent to account for all of the spouse's spending in addition to his or her own spending. Although our measure of consumption is somewhat larger than the CEX measure, the CEX itself has been criticized as under-stating spending levels.

We summarize our results in the following table which shows wealth at age 90 for single persons and at age 80 for couples beginning with wealth of 100 at age 65. Because we consider medians to be more reliable than means we only show results based on medians.

Percent of wealth remaining at age 90 for single persons living alone and at age 80 for married persons living alone with an age difference of five years or less.

	Statistic used for wealth change	
Data source	Population medians	Medians of households
	Single persons	
wealth change	35.1	29.8
active saving	67.1	85.2
	Married persons	
wealth change	103.0	90.0

[15] Hurd, Juster and Smith (2003) show that linking queries about income from assets to asset values, as was done beginning in HRS 1996, resulted in a substantial increase in income from assets between 1994 and 1996. The CPS uses the method of HRS prior to 1996 (where queries about income from assets are asked separately from asset values), which, according to Hurd, Juster and Smith, likely results in an underestimation of income from assets in the CPS.

active saving	126.9	119.6

Note: Results based on population medians use the ratios of population median wealth in the case of "wealth change" and the difference between median after-tax income and median spending in the case of "active saving." Results based on medians of households use the medians of the change in wealth measured at the household level.

As measured by actual wealth change in panel, a single person who survives to age 90 would be expected to have 30-35% of age 65 wealth. While the other measures show smaller wealth declines, they all show declining wealth. Among married persons the results based on actual wealth change in panel suggests little wealth change to age 80; yet, active saving predicts wealth accumulation of about 20% or about 1.2% per year. A possible reason for the difference between single persons and married persons is that active saving only incompletely accounts for taxation of withdrawals from tax-advantaged accounts. Because married persons have higher tax rates than single persons the omission of such taxation would have a greater effect on their results.

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Table 1. Mean spending (thousands) in CAMS and in CEX

	55 or over	65 or over	55-64	65-74	75 or over
2001					
CAMS	35.4	31.9	40.2	34.2	29.2
CEX	30.7	26.6	37.1	30.4	22.4
Ratio CAMS/CEX	1.15	1.20	1.08	1.12	1.30
2003					
CAMS	38.0	33.2	44.9	36.9	28.9
CEX	32.8	28.1	39.4	31.8	24.4
Ratio CAMS/CEX	1.16	1.18	1.14	1.16	1.19
2005					
CAMS	37.6	32.9	43.5	36.0	29.5
CEX	36.7	31.1	43.7	36.0	26.1
Ratio CAMS/CEX	1.03	1.06	1.00	1.00	1.13
2007					
CAMS	39.7	35.5	45.0	40.7	29.4
CEX	40.6	34.7	47.6	39.7	29.4
Ratio CAMS/CEX	0.98	1.02	0.95	1.03	1.00
Average spending ratio	*1.08*	*1.12*	*1.04*	*1.08*	*1.16*

Note: CAMS household age is the male age if coupled. If male age is missing for wave and surrounding waves, then female age is used.

Table 2
Interview schedule of HRS and CAMS and youngest age of age-eligible respondents

	HRS Core	CAMS
1996	54	
1997		
1998	51	
1999		
2000	53	
2001		54
2002	55	
2003		56
2004	51	
2005		52
2006	53	
2007		54
2008	55	

Table 3a
Singles living alone. Two-year percent change in wealth.

Age	ratio of means	ratio of medians	median of individual change	N for ratios	N for median
65-69	1.8	0.2	-5.3	2,596	2,438
70-74	5.8	-5.4	-6.5	2,762	2,594
75-79	-3.9	-9.0	-8.9	3,079	2,918
80-84	-1.8	-10.7	-8.4	2,919	2,743
85+	-7.3	-15.8	-17.9	2,833	2,567
Total				14,189	13,260

Note: Excludes three outliers

Table 3b
Singles living alone or with others. Two-year percent change in wealth.

Age	ratio of means	ratio of medians	median of individual change	N for ratios	N for median
65-69	-0.2	-2.6	-7.6	4,413	4,062
70-74	3.3	-4.9	-7.4	4,231	3,912
75-79	-4.8	-8.5	-9.5	4,457	4,150
80-84	-0.7	-8.9	-10.2	4,211	3,867
85+	-4.6	-16.8	-18.3	4,075	3,593
Total				21,387	19,584

Note: Excludes three outliers

Table 4a
Couples living alone. Spouse age difference five years or less. Two-year percent change in wealth.

Age	ratio of means	ratio of medians	median of household change	N for ratios	N for median
65-69	2.0	4.0	0.8	3,819	3,803
70-74	3.2	-0.9	-2.2	2,621	2,609
75-79	0.5	-1.9	-2.4	1,901	1,892
80 +	0.5	1.2	-3.6	1,198	1,183
Total				9,539	9,487

Note: Excludes seven outliers

Table 4b
Couples living alone or with others. Two-year percent change in wealth.

Age	ratio of means	ratio of medians	median of household change	N for ratios	N for median
65-69	4.1	0.3	-0.3	7,877	7,798
70-74	0.7	-1.0	-3.4	4,983	4,946
75-79	1.8	-2.4	-2.4	3,167	3,128
80 +	-1.7	-4.6	-4.3	2,154	2,117
Total				18,181	17,989

Note: Excludes seven outliers

Table 5a

Singles living alone. Active saving. Averages of median values across four waves of CAMS.

	N	after-tax income	Spending	wealth	saving	saving rate, income	saving rate, wealth
65-69	663	24,094	23,855	126,180	239	-0.10%	-0.10%
70-74	596	21,287	23,001	130,020	-1,714	-8.10%	-1.20%
75-79	566	19,455	21,785	148,490	-2,330	-11.90%	-1.60%
80-84	548	19,658	21,781	145,348	-2,123	-11.50%	-1.70%
85+	525	17,679	20,888	102,360	-3,209	-18.90%	-3.30%
Total	2898	20,624	22,330	130,256	-1,706	-9.40%	-1.50%

Note: Excludes two observations due to missing data on after-tax income. "Saving" in a wave is the difference between median after-tax income and median spending all in 2008 dollars. The column entries are the averages of median values across waves weighted by the square root of N. "Saving rate, income" in a wave is "saving" divided by median after-tax income and the column entries are averages across waves. "Saving rate, wealth" is "saving" divided by median wealth.

Table 5b

Singles living alone. Active saving. Average of individual-level medians

	saving	saving rate, income	saving rate, wealth
65-69	519	1.3%	0.2%
70-74	-1,198	-6.3%	-0.6%
75-79	-1,089	-7.3%	-0.6%
80-84	-831	-6.2%	-0.7%
85+	-1,665	-10.4%	-1.5%
Total	-776	-5.1%	-0.5%

Note: Excludes two observations due to missing data on after-tax income. "Saving" in a wave is the median of after-tax income minus spending all in 2008 dollars. The column entries are the average across waves (weighted by square root N). "Saving rate, income" in a wave is the median of the saving rate with respect to after-tax income and "Saving rate, wealth" is the median of the saving rate with respect to wealth. The column entries are the average across waves (weighted by square root N)

Table 5c

Singles living alone. Active saving. Averages of values across four waves of CAMS.

	N	after-tax income	spending	wealth	saving	saving rate, income	saving rate, wealth
65-69	663	29,851	30,266	281,218	-414	-2.1%	-0.3%
70-74	596	27,421	29,306	304,837	-1,885	-6.6%	-0.6%
75-79	566	27,382	27,278	313,917	103	0.1%	0.0%
80-84	548	24,519	26,454	281,671	-1,936	-8.7%	-1.1%
85+	525	22,640	27,662	211,775	-5,022	-22.7%	-2.6%
Total	2898	26,536	28,264	279,206	-1,728	-7.5%	-0.8%

Note: Excludes two observations due to missing data on after-tax income. Income, spending, wealth and saving in a wave are averages in 2008 dollars. The column entries are the average across waves (weighted by square root (N)). "Saving rate, income" in a wave is "saving" divided by mean after-tax income and the column entries are averages across waves. "Saving rate, wealth" is "saving" divided by mean wealth.

Table 6a

Couples living alone. Spouse age difference five years or less. Active saving. Averages of median values across four waves of CAMS.

	N	after-tax income	spending	wealth	saving	saving rate, income	saving rate, wealth
65-69	476	48,527	42,404	370,663	6,123	12.4%	1.7%
70-74	351	45,778	37,494	399,305	8,284	17.9%	2.0%
75-79	241	41,003	36,053	433,509	4,950	10.8%	1.1%
80 +	171	37,345	29,527	306,029	7,818	20.2%	2.5%
Total	1,239	44,769	38,015	382,201	6,754	14.8%	1.8%

Note: Excludes two observations due to missing data on wealth. "Saving" in a wave is the difference between median after-tax income and median spending all in 2008 dollars. The column entries are the average across waves (weighted by square root (N)). "Saving rate, income" in a wave is "saving" divided by median after-tax income and the column entries are averages across waves. "Saving rate, wealth" is "saving" divided by median wealth.

Table 6b

Couples living alone. Spouse age difference five years or less. Active saving. Average of individual-level medians

	saving	saving rate, income	saving rate, wealth
65-69	6,453	14.4%	1.6%
70-74	6,864	17.1%	1.3%
75-79	3,064	8.2%	0.7%
80 +	6,670	18.7%	2.7%
Total	5,704	16.6%	1.8%

Note: Excludes two observations due to missing data on wealth. "Saving" in a wave is the median of after-tax income minus spending all in 2008 dollars. The column entries are the average across waves (weighted by square root (N)). "Saving rate, income" in a wave is the median of the saving rate with respect to after-tax income and "Saving rate, wealth" is the median of the saving rate with respect to wealth. The column entries are the average across waves (weighted by square root (N))

Table 6c

Couples living alone. Spouse age difference five years or less. Active saving. Averages of values across four waves of CAMS.

	N	after-tax income	spending	Wealth	saving	saving rate, income	saving rate, wealth
65-69	476	67,548	53,231	726,113	14,317	21.2%	2.1%
70-74	351	58,152	49,071	830,334	9,081	14.6%	0.9%
75-79	241	49,864	48,764	599,310	1,101	2.1%	0.2%
80 +	171	47,469	37,022	494,040	10,446	20.0%	2.0%
Total	1,239	58,709	49,029	699,805	9,680	15.4%	1.4%

Note: Excludes two observations due to missing data on after-tax income. Income, spending, wealth and saving in a wave are averages in 2008 dollars. The column entries are the average across waves (weighted by square root (N)). "Saving rate, income" in a wave is "saving" divided by mean after-tax income and the column entries are averages across waves. "Saving rate, wealth" is "saving" divided by mean wealth.

Figure 1a

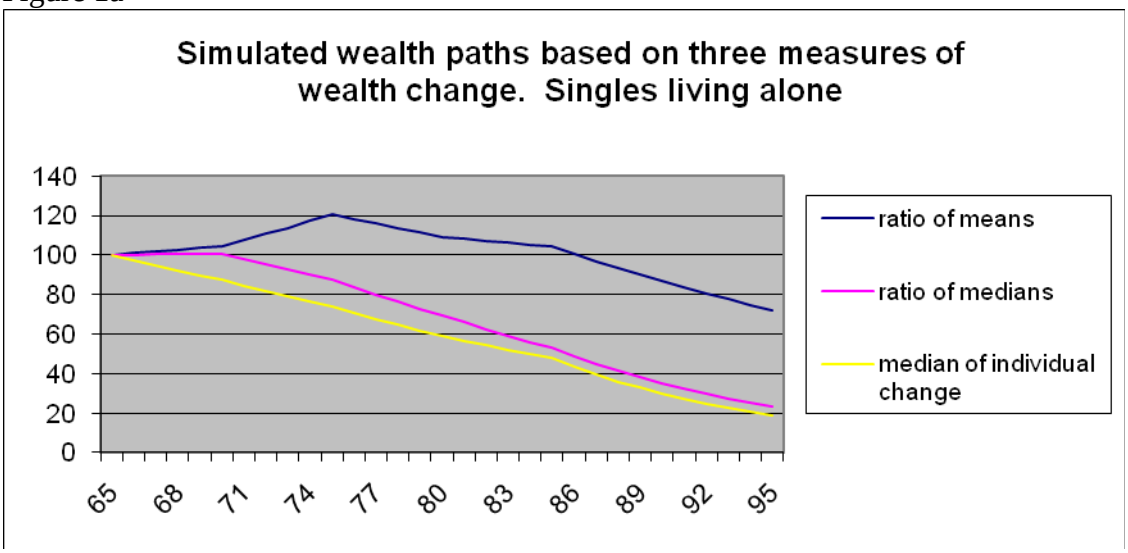


Figure 1b

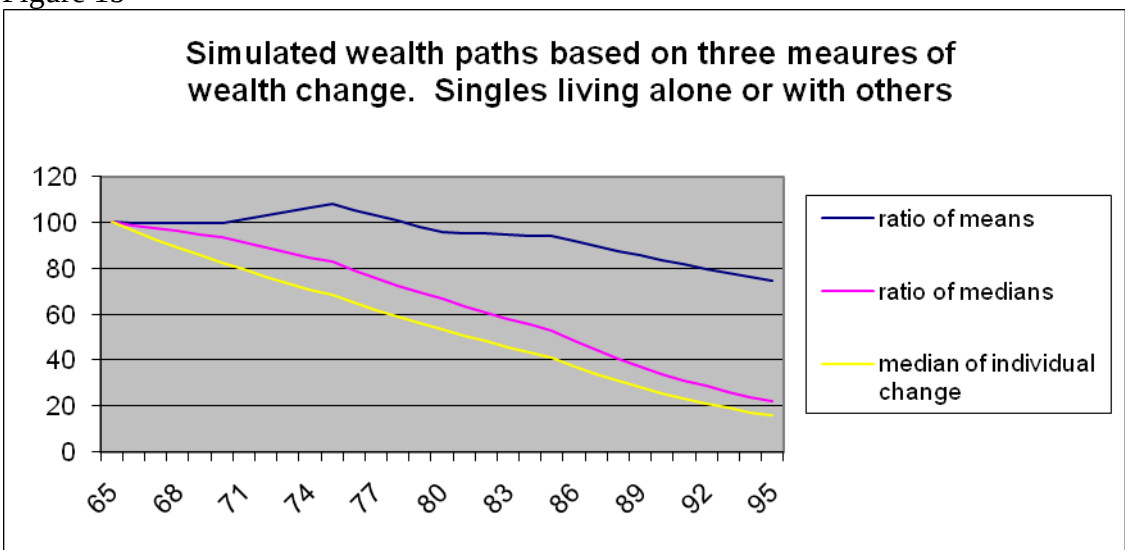
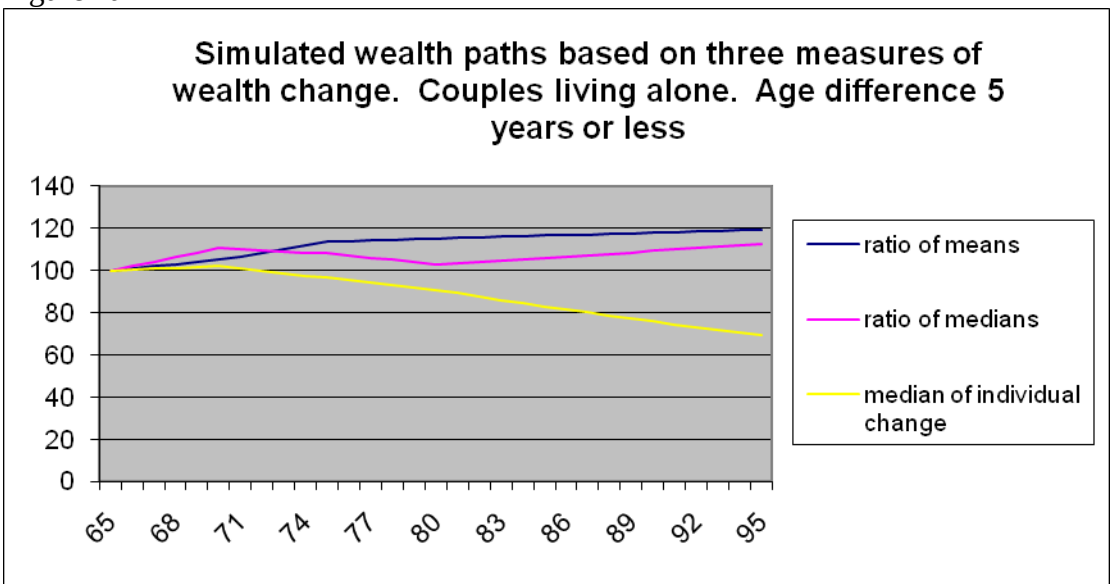


Figure 2a



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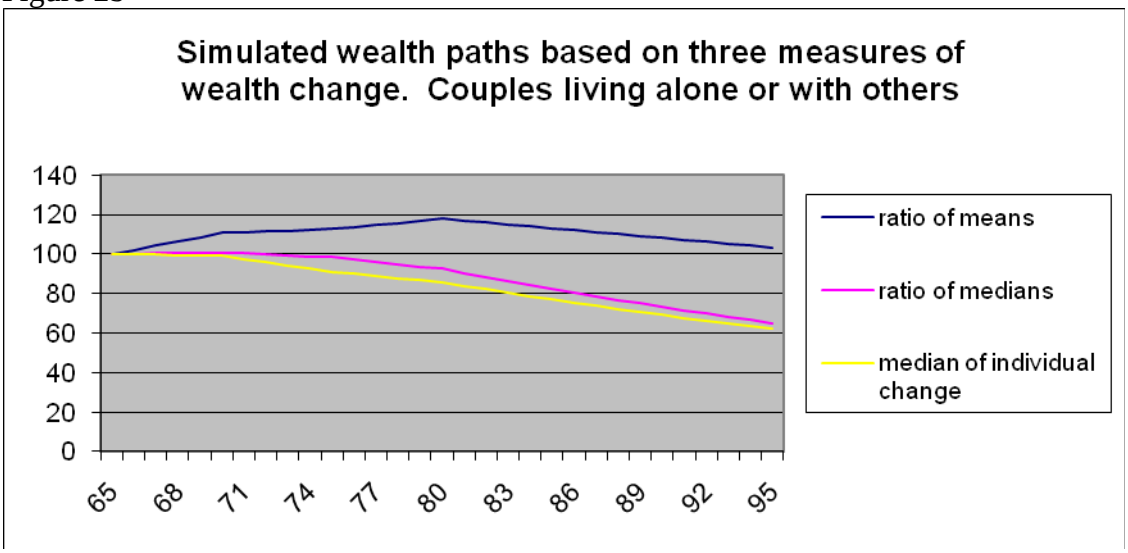

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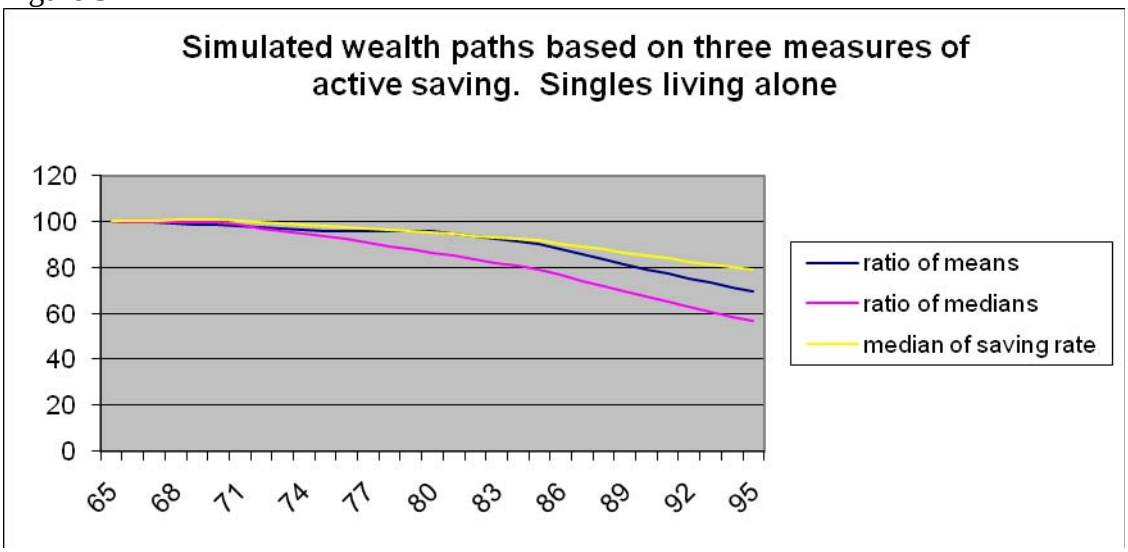

Figure 4

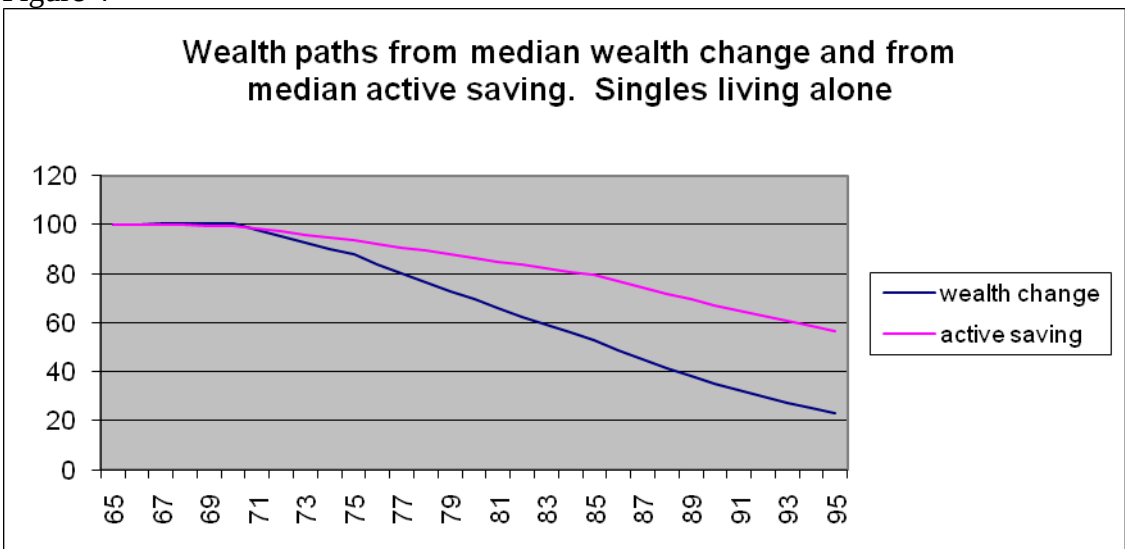

Figure 5

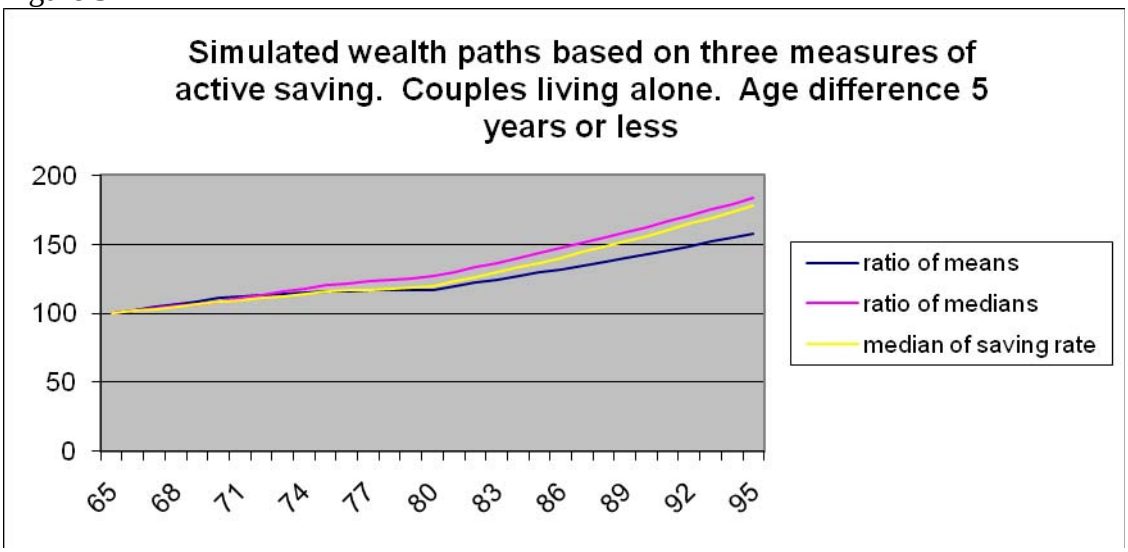

Figure 6

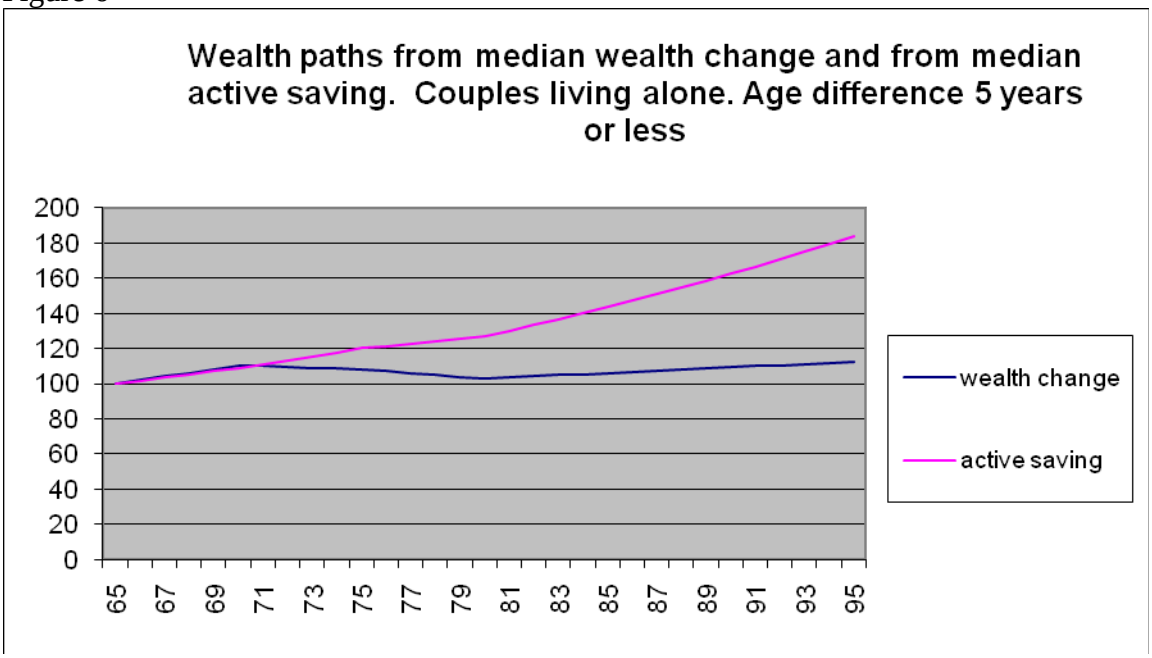

Figure 7. Wealth paths from wealth change (ratio of means) and from active saving (ratio of means) for CAMS spending and CAMS spending adjusted to CEX levels. Single persons living alone or with others.

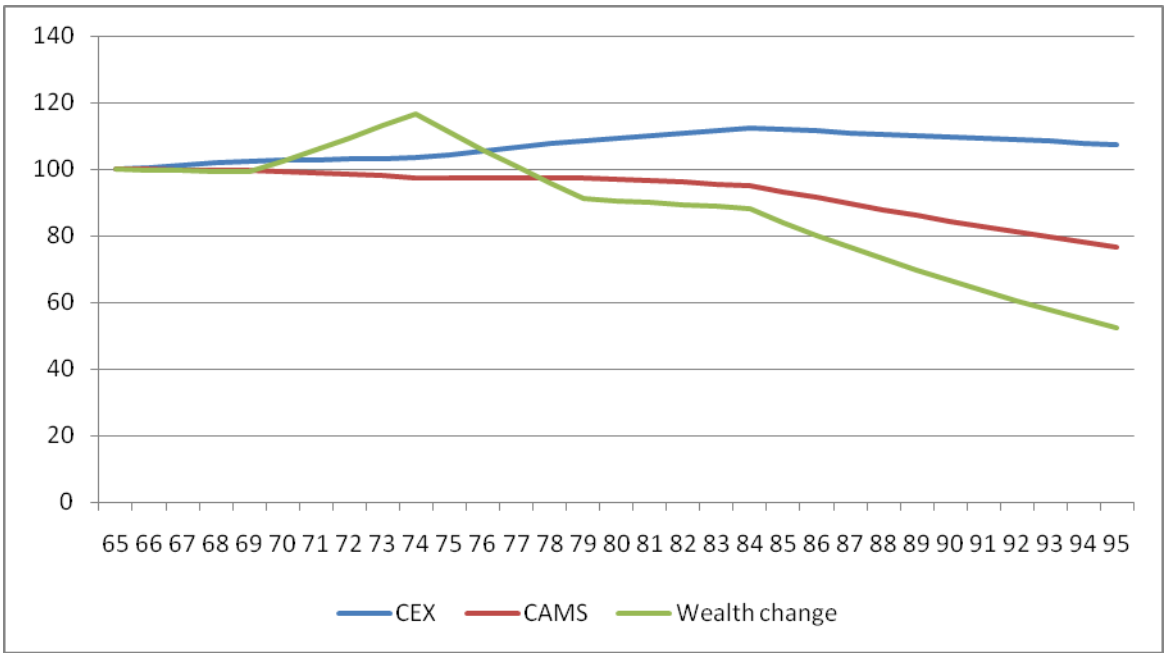

Figure 8. Wealth paths from wealth change (ratio of means) and from active saving (ratio of means) for CAMS spending and CAMS spending adjusted to CEX levels. Married persons living alone or with others.