Wealth Dynamics and Active Saving at Older Ages: Do They Add Up?

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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 the unusually rich 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 suspect that the discrepancy is due to consumption being under measured.

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1. Introduction

One of the fundamental predictions of the simple life-cycle model of single persons is that households save when young to support themselves in old age, which is when they will decumulate their assets. 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, 1964). 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 or not households are saving is to study whether they spend more than their after-tax income. 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 (CES), which focuses on collecting spending data, asks about some 300 categories as part of its recall interviews. Unfortunately, the income data in the CES are of poor quality.

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 actual saving. Here we present results on both as we would think they be 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 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 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 new data on consumption and after-tax income collected in the Health and Retirement Study. The consumption data come from a mail supplement, the so-called Consumption and Activities Mail Survey (CAMS), which is collected separately from the HRS core data. Because of existing skepticism that consumption data can be collected in a general-purpose survey, we will devote some discussion to illustrate the quality of the data.

2. Caveats and 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. Such data have not been available in the U.S.[1]

2.2 Wealth Change in Synthetic Panel Data

Synthetic panel data on wealth change cover longer periods of time, hence allowing for averaging out macro shocks. However, for synthetic panel results to be valid a fundamental necessary condition needs to be satisfied: the composition of the sample must stay the same over time. At older ages this is not the case in synthetic panels, because differential mortality leads to persons with lower socioeconomic status (SES) 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

If we had good measures of both consumption and after-tax income, they could form a direct measure of intended saving or dissaving by households. But we would need good measures of consumption, income and taxes in a fairly large sample. We have not had such data.

In this paper we use data on total spending to estimate directly the saving rate over household-level observations. The data are from the Consumption and Activities Mail Survey, which has complete measures of spending by a random sample of 5,000 Health and Retirement Study (HRS) households in 2001, 2003, 2005 and 2007. We compare evidence about life-cycle models based on the saving rate with evidence based on wealth change calculated over the same populations.

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[1] The PSID is a possible exception; however, the sample size in the PSID is relatively small at older ages.

3. Underlying Theoretical Structure

Our model of consumption is based on a life-cycle model that has these features and assumptions: life-time utility is based on time-separable utility from consumption and from bequests (Yaari, 1965); the only uncertainty is the date of death; resources are initial bequeathable wealth and a stream of annuities; bequeathable wealth cannot become negative, and, therefore, borrowing against future annuities is not allowed.

3.1. Singles Model

As specified by Yaari, there is only one economic agent so the model is only appropriate for single people. Therefore, we will refer to it as the singles model. We discuss the couples model below.

The solution to the singles model is:

$$\frac{du_t}{dt} = u_t(h_t + \rho - r) - h_t V_t \tag{1}$$

for $w_t > 0$. Consumption equals income from annuities when $w_t = 0$; w_0 is given.[2] Here

$u_t =$ marginal utility of consumption at time t

$h_t =$ mortality risk (mortality hazard);

$\rho =$ the subjective time rate of discount;

$r =$ interest rate which is known and fixed;

$w_t =$ bequeathable wealth at t ;

$V_t =$ marginal utility of bequests at time t , which will depend on the personal characteristics of potential inheritors such as the economic status of any children in an altruistic model or in a strategic bequest model.

The first order condition can be written in terms of consumption

$$\frac{d \ln c_t}{dt} = -\frac{1}{\gamma_t}(h_t + \rho - r) + \frac{h_t}{\gamma_t}\left(\frac{V_t}{u_t}\right) \tag{2}$$

where $\gamma_t = -c_t u_{tt}/u_t$ is a measure of risk aversion evaluated at c_t and $u_{tt} = du_t/dc_t$. This is an Euler equation modified to include mortality risk and a bequest motive but excluding rate-of-return risk. When the bequest motive is zero ($V_t = 0$) consumption will decline at advanced age because mortality risk, h_t, becomes large. An implication is that wealth will decline, providing annuity income is approximately constant, which is the case for people who rely on the public pension system for annuity income. If wealth does not decline, it will continue to increase because consumption is declining. The result will be that the individual will die with positive wealth should she survive to the greatest age possible, violating a terminal condition.

3.2. Couples Model

[2] See Hurd (1989) for a derivation.

A couple chooses a consumption path to maximize expected lifetime utility, which includes the utility from consumption while both are alive, the utility from the wealth that a surviving spouse would inherit, and the utility from wealth that the surviving spouse would bequeath outside of the household. [3]

$$\int U(C_t)e^{-\rho t}a_t dt + \int M(w_t)e^{-\rho t}p_{m_t}dt + \int F(w_t)e^{-\rho t}p_{f_t}dt + \int V(w_t)e^{-\rho t}m_t dt$$

$U(\cdot) =$ utility function of the couple

$\rho =$ subjective time rate of discount of the couple

$a_t =$ probability that both spouses will be alive at t

$M(\cdot) =$ widower's utility of wealth

$p_{m_t} =$ probability density that the husband becomes a widower at t; that is, the probability that the wife dies at t and the husband is still alive at t.

$F(\cdot) =$ widow's utility of wealth.

$p_{f_t} =$ probability density that the wife becomes a widow at t; hat is, the probability that the husband dies at t and the wife is still alive at t.

$V(\cdot) =$ utility from true bequests (bequeathed outside the household).

$w_t =$ bequeathable wealth at t

$m_t =$ probability density that the surviving spouse dies at t.

This objective function has the same structure as in the singles model: the couple gets utility from consumption and utility from "bequests." The utility from bequests is in three parts: future utility of the widower, future utility of the widow, and future utility from true bequest.

The maximization is subject to the same conditions as in the singles model.

The solution is

(4) $$\frac{dU_t}{dt} = U_t(h_t + \rho - r) - (M_t\phi_t + F_t\mu_t)$$ where

$U_t =$ marginal utility of consumption by the couple

$h_t =$ the couple's mortality risk (the probability density that one of them will die at t given that neither has died before t)

$M_t =$ widower's marginal utility of wealth

$F_t =$ widow's marginal utility of wealth

$\phi_t =$ mortality risk of the wife (the probability density that the wife will die at t given that she has survived to t)

$\mu_t =$ mortality risk of the husband

This equation can be rewritten as

(5) $$\frac{d\ln C_t}{dt} = -\frac{1}{\gamma_t}(h_t + \rho - r) + \frac{1}{\gamma_t}\Omega_t$$

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[3] See Hurd (1999) for a derivation and discussion of the couples' model.

where $\Omega_t = M_t\phi_t + F_t\mu_t$ which is the expected marginal utility of wealth in the event a spouse dies. This equation has the same form as the solution to the singles problem: the first term depends on the mortality risk of the couple and the marginal utility of consumption when both spouses are alive; the second term depends on the marginal utility of wealth in the event of "death" of the couple, that is, either of the spouses dies.

Because Ω_t will be substantial in most cases (the marginal utility of wealth is substantial to the surviving spouse) and because it 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 consumption path should be flatter and wealth should decline more slowly among couples where one spouse is substantially younger than the other.

4. Data

Our data come from the Health and Retirement Study (HRS). 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) or 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 rejuvenate the sample and to make it again representative of the population 51 or over. In 2006 and 2008 all survivors were reinterviewed. The total sample size is around 22,000 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 fielded nine waves as of the 2008 wave. 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, and the time use of 3,800 persons in those households.[6]

Section A of CAMS asks about time-use in 32 categories. Section B 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. 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. Similarly among

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[4]Food purchases, food eaten 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.

nonrespondents to the question about homeowners insurance and who owned a home with mortgage in 2000, 69% reported that their insurance was included in their mortgage payment. Apparently they did not respond in CAMS because they had already included that amount in the mortgage report. Based on these and similar imputations that use HRS core data to provide household-level information, 64% of CAMS respondents are 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 outliers were similarly improved.

We note that the LCM 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 therefore 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]

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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.

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

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 of income minus consumption. Including the rent-equivalent of owner-occupied housing in total household consumption would impute increasing housing consumption to households during the time that house values increased, which was the case during almost the entire survey period covered by the data we use. However, homeowners did not actually pay more for the staying in their own house (unless they moved to a more expensive house) and so their wealth change would not reflect the apparent increase in the consumption of housing services derived from the computation of owner-occupied housing services. We therefore include in our measure of total consumption "total spending on housing" that 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.

Additional evidence about the quality of the CAMS data is shown in Table 1, where we have compared 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.

In 2001 spending among those 55-64 years old was about $2,000 or 5% higher in CAMS than in the CEX. Given the difficulties of measuring total spending, we view this discrepancy as rather minor. But it is notable that spending declines much more rapidly with age in the CEX than in CAMS. As shown in the last two columns, spending by those 75 or older was 77% of spending by those 55-64 in CAMS but is was just 60% in CEX. The discrepancy in the age pattern is similar in other years.

Overall as shown in the last line spending in the 55-64 age band is almost identical in the two surveys, but the difference in the oldest age band remains. For reasons we will discuss below, we believe the CEX under-measures spending in this age band. Nonetheless, our conclusion is that CAMS does a remarkably good job of measuring spending, taking the CEX to be the appropriate standard of comparison.

In this paper we will use wealth data from HRS 1996 through 2008 and from CAMS waves 2001, 2003, 2005 and 2007. 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.

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decline in spending on durables.

5. Results

5.1 Wealth Dynamics

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. $\Delta \overline{w}_t = \dfrac{\sum w_{i,t+1}}{\sum w_{i,t}}$ 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. $\Delta w_t^{med} = \dfrac{w_{t+1}^{med}}{w_t^{med}}$ 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 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 $\dfrac{1}{n}\sum \dfrac{w_{i,t+1}}{w_{i,t}}$, 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 five 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 change, 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+1.8/2)) and a single person age 67 would have 101.8 (= 100*(1+1.8/2)*(1+1.8/2)), 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 LCM 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 individual change in Table 4a shows modest dissaving of between two and four percent from age 70 onward. According to the ratio of medians the modest dissaving sets in later (age 75 to 79), while the ratio of means does not show any dissaving. In Figure 2a we trace out the wealth paths implied by the estimated wealth changes and find much flatter wealth trajectories than for singles, indicating that couples hold on to their wealth much longer. This accords with the predictions of the theoretical model. For example, according to the median individual change a typical couple would still have about 80% of initial wealth when the oldest spouse is 85. Note that the chances that both spouses survive until advanced old age are small and that most couple households will become single before then. Thus couples preserves 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. Figure 2b shows the implied wealth paths. The median-based measures are almost identical in this broader sample.

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 core observation on income. 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."[13] Because we do not have sufficient information to calculate the taxes of other 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. This result is confirmed when using the individual-level medians (Table 5b) or population means (Table 5c) to measure active saving for singles. Figure 3 shows the corresponding wealth trajectories.

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

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

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 stark contrast to the trajectory based on wealth change which is essentially flat (neither wealth accumulation nor decumulation).

5.3. Consumption Paths

Table 7a shows estimated changes in consumption based on three panel transitions in spending from CAMS. The calculations are analogous to those for wealth change. Thus the "ratio of means" is the average consumption in a wave divided by average consumption in the previous wave calculated over the same persons. The three ratios based on the three transitions are averaged and those averages are shown in the table. The table entries show sharply declining spending which is consistent with the simple life-cycle model for singles when there is no bequest motive.

Table 7b has similar results for all single persons. While the quantities differ from those in 7a, the overall pattern is similar.

We put the rates of change in a life-cycle perspective by graphing the implied spending paths (Figure 7a). We have also graphed the spending path predicted by a simple life-cycle model

$$\frac{d \ln c_t}{dt} = -\frac{1}{\gamma}(h_t + \rho - r)$$

with $r - \rho = 0$ and $\gamma = 1.2$. All show a life-cycle path that predicts much reduced consumption should a single person survive to advanced old age. Thus at age 90 consumption would be only 45-50% of spending at age 65. The life-cycle model predicts a path that is similar to the empirical paths approximately to the age of 88. At older ages the model predicts greater reductions in consumption.

Table 8a has similar results for couples who live alone. All measures show declines in spending with age. Because of the complexity of the first-order conditions for dynamic consumption by couples with age, no simple model comparison is possible. Table 8b shows that the rates of decline calculated over all couples are similar to those of couples living alone. Of note is the low proportion of couples aged 80 or older, just 12% of all couples. The implication is that it is rather unlikely that a couple will survive until well into their 80s, so the most relevant part of the table is the entries for 65-79 year-olds. This is in contrast with single persons where 34% are 80 or older.

5.4. Simulations

Does it add up? Our method is to simulate consumption and wealth paths based on initial consumption (age 65-69), the estimated consumption paths (as in Figures 7 and 8), observed income after taxes and compare the simulated wealth paths with actual wealth paths (Figures 1 and 2). These simulations take into account differential mortality, the inheritance of wealth by the surviving spouse, taxes and the mix off assets as between tax sheltered and post-tax.
[To be added.]

6. Conclusions

We have shown two types of results: wealth change and active saving rates. In the case of singles they are broadly consistent. Singles dissave after age 65 according to all but one measure, and after about age 74 according to all measures. One notable discrepancy is the difference in the rate of wealth decline when measured by active saving. Active saving implies much slower wealth decline.

Among couples 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 by singles are consistent with a simple life-cycle model where the only uncertainty is mortality. The patterns of active saving by singles are also consistent with the model. Among couples 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 consistent 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. To the extent that they are positive, however, they would deepen the discrepancy between wealth change and active saving. Income may be too large. While possible, it seems unlikely in that HRS income is close to CPS estimates. Our tax calculations may underestimate taxes: we have no basis for assessing the likelihood of this. Finally, we may be under-measuring consumption. We believe this is the most likely explanation. It is difficult for respondents to remember completely their spending. The longer the recall period over which respondents are asked to report the larger the recall bias (Hurd and Rohwedder, 2009). Although our measure of consumption is close to the CEX measure, the CEX itself has been criticized as under-stating spending levels. But we note that spending among those age 75 or older is considerable lower in the CEX than in CAMS. Thus were we to use the CEX spending measures we would find even greater discrepancies between wealth change and predicted wealth based on active saving.

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Table 1

CAMS-CEX comparison, 2001, 2003 and 2005				
			Relative	
	CAMS 2003$	CEX 2003$	CAMS	CEX
2001				
55-64	40,585	38,505	1.00	1.00
65-74	36,193	31,615	0.89	0.82
75+	31,241	23,282	0.77	0.60
All	36,605	31,942		
2003				
55-64	39,491	39,372	1.00	1.00
65-74	34,832	31,782	0.86	0.81
75+	27,623	24,365	0.68	0.62
All	34,231	32,824		
2005				
55-64	36,834	41,156	1.00	1.00
65-74	31,803	33,910	0.86	0.82
75+	27,420	24,551	0.74	0.60
All	32,580	34,521		
All years average				
55-64	38,970	39,677	1.00	1.00
65-74	34,276	32,436	0.88	0.82
75+	28,761	24,066	0.74	0.61
All	34,472	33,096		

Notes:
CAMS household age is the male age if coupled. If male age is missing for wave and surrounding waves, then female age is used.
**Weights were not available on the current CAMS05 file so used RANDHRS household analysis weight (R7WTHH)*
CPI indices: 2001: 177.1 2003: 184.0 2005: 195.3

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. 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	4.1	3.4	0.3	5,656	5,621
70-74	2.5	0.8	-2.4	3,888	3,871
75-79	1.7	-2.0	-2.1	2,629	2,611
80 +	0.1	-2.1	-4.0	1,805	1,784
Total				13,978	13,887

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 individual 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	24,221	23,855	141,128	366	0.4%	0.1%
70-74	596	21,299	23,001	147,373	-1,702	-8.0%	-1.0%
75-79	566	19,391	21,785	168,234	-2,393	-12.3%	-1.4%
80-84	548	19,658	21,781	163,260	-2,123	-11.5%	-1.4%
85+	525	17,772	20,888	115,289	-3,116	-18.4%	-2.7%
Total	2898	20,661	22,330	146,808	-1,669	-9.3%	-1.2%

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 average across waves (weighted by sqrt (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	557	1.7%	0.3%
70-74	-1247	-6.1%	-0.5%
75-79	-1143	-6.9%	-0.5%
80-84	-1091	-6.9%	-0.7%
85+	-1305	-7.4%	-1.0%
Total	-803	-4.8%	-0.4%

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 sqrt (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 sqrt (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	30,036	30,256	315,512	-220	-1.5%	-0.1%
70-74	596	27,783	29,304	344,208	-1,521	-5.2%	-0.4%
75-79	566	27,159	27,280	354,043	-120	-0.7%	-0.1%
80-84	548	25,010	26,451	315,045	-1,441	-6.8%	-0.7%
85+	525	22,978	27,662	237,979	-4,684	-21.2%	-2.0%
Total	2898	26,774	28,261	313,998	-1,487	-6.6%	-0.6%

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 sqrt (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. 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	732	50,884	42,898	394,583	7,987	15.6%	2.1%
70-74	502	45,696	38,471	425,678	7,225	15.8%	1.7%
75-79	342	38,801	35,818	419,390	2,984	7.5%	0.7%
80 +	261	37,806	30,609	314,281	7,197	18.4%	2.3%
Total	1,837	45,375	38,649	396,410	6,726	14.5%	1.7%

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 sqrt (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. Active saving. Average of individual-level medians

	saving	saving rate, income	saving rate, wealth
65-69	7,175	16.9%	1.8%
70-74	6,431	15.3%	1.3%
75-79	2,161	6.6%	0.6%
80 +	6,380	18.9%	2.4%
Total	5,902	17.3%	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 sqrt (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 sqrt (N))

Table 6c

Couples 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	732	70,488	54,047	800,855	16,441	23.0%	2.2%
70-74	502	60,302	48,800	855,343	11,502	18.3%	1.3%
75-79	342	50,406	48,755	635,936	1,651	3.0%	0.3%
80 +	261	46,083	36,989	499,273	9,093	17.8%	1.8%
Total	1,837	60,508	49,238	743,366	11,270	17.2%	1.5%

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 sqrt (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 7a
Singles living alone. Two-year percent change in consumption.

Age	ratio of means	ratio of medians	median of individual change	N
65-69	1.4	-4.3	-5.6	380
70-74	-4.8	-5.3	-2.1	346
75-79	-6.9	-5.2	-6.0	320
80-84	-15.8	-11.9	-8.6	317
85+	-6.5	-2.0	-6.7	283
Total				1,646

Note: excludes 54 observations because of missing data

Table 7b
Singles living alone or with others. Two-year percent change in consumption.

Age	ratio of means	ratio of medians	median of individual change	N
65-69	-3.4	-5.7	-5.5	659
70-74	-4.8	-5.3	-3.6	545
75-79	-7.8	-6.7	-6.6	452
80-84	-16.0	-15.2	-10.8	437
85+	-4.9	-5.1	-7.4	410
Total				2,503

Note: excludes 54 observations because of missing data

Table 8a
Couples living alone. Two-year percent change in consumption.

Age	ratio of means	ratio of medians	median of individual change	N
65-69	-3.8	-2.5	-3.0	1,417
70-74	-5.4	-2.2	-4.7	1,109
75-79	-2.9	-1.6	-2.8	734
80 +	-13.0	-6.0	-5.3	506
Total				3,766

Note: excludes 64 observations due to missing data

Table 8b
Couples living alone or with others. Two-year percent change in consumption (real).

Age	ratio of means	ratio of medians	median of individual change	N
65-69	-5.1	-4.4	-3.0	1,937
70-74	-5.5	-2.1	-4.7	1,495
75-79	-2.9	-3.2	-3.6	904
80 +	-10.3	-5.2	-4.6	577
Total				4,913

Note: excludes 64 observations due to missing data

Figure 1a

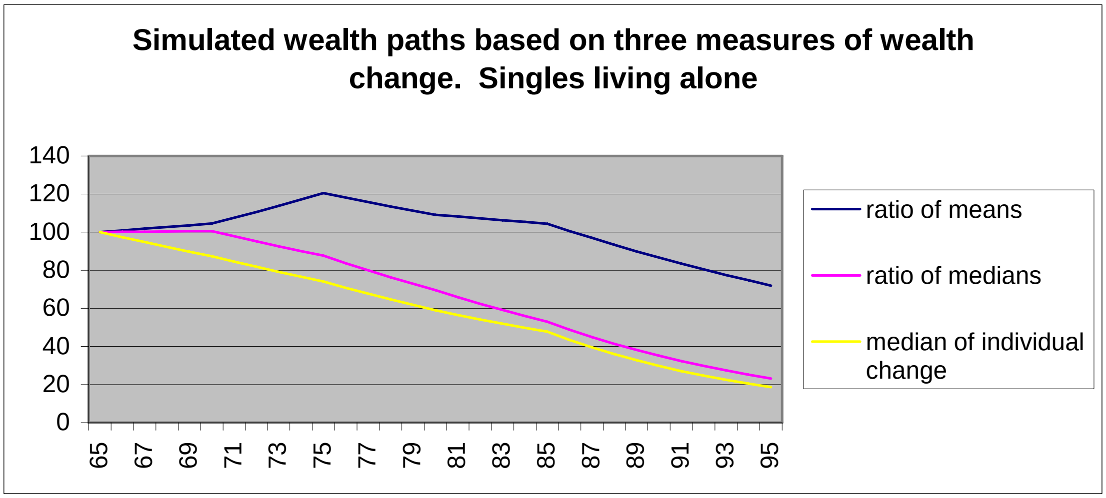


Figure 1b

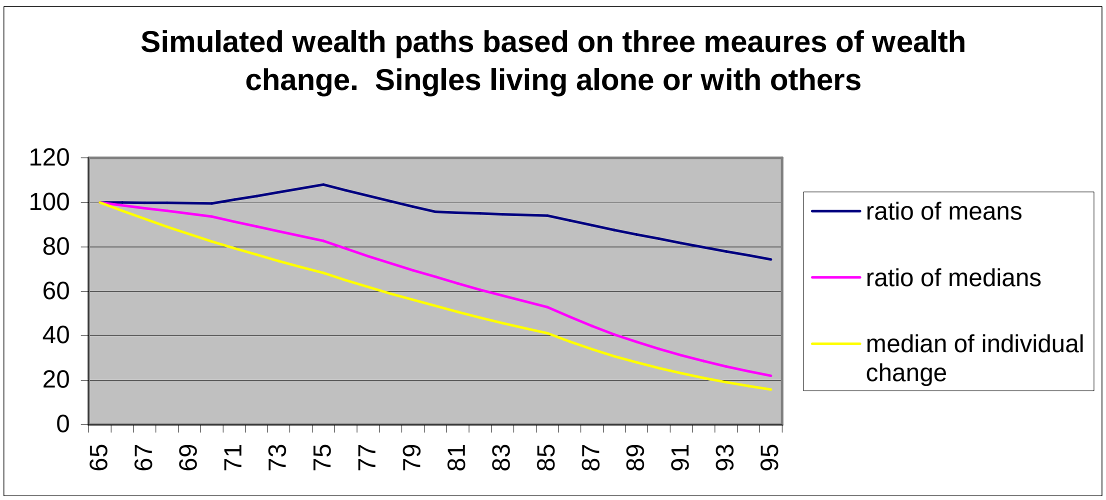


Figure 2a

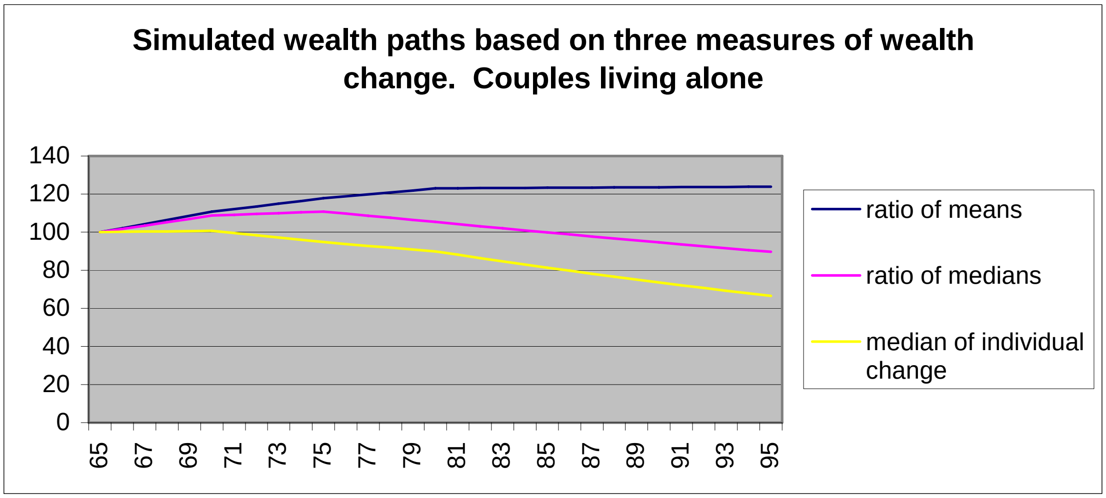


Figure 2b

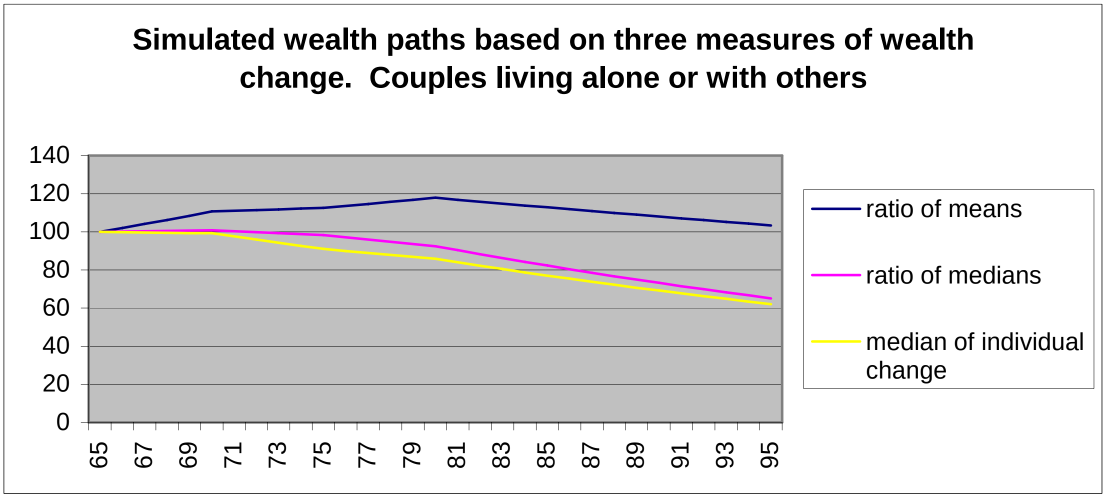


Figure 3

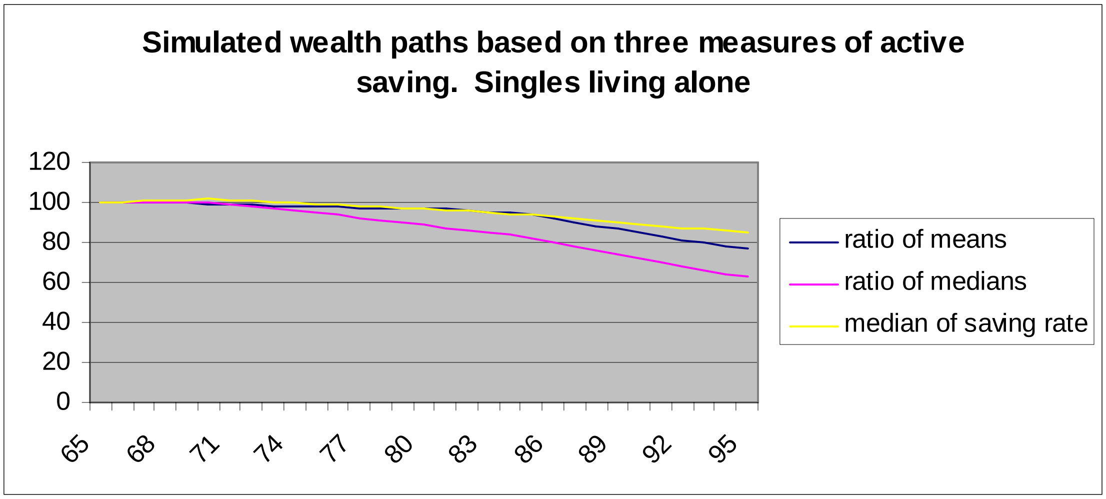
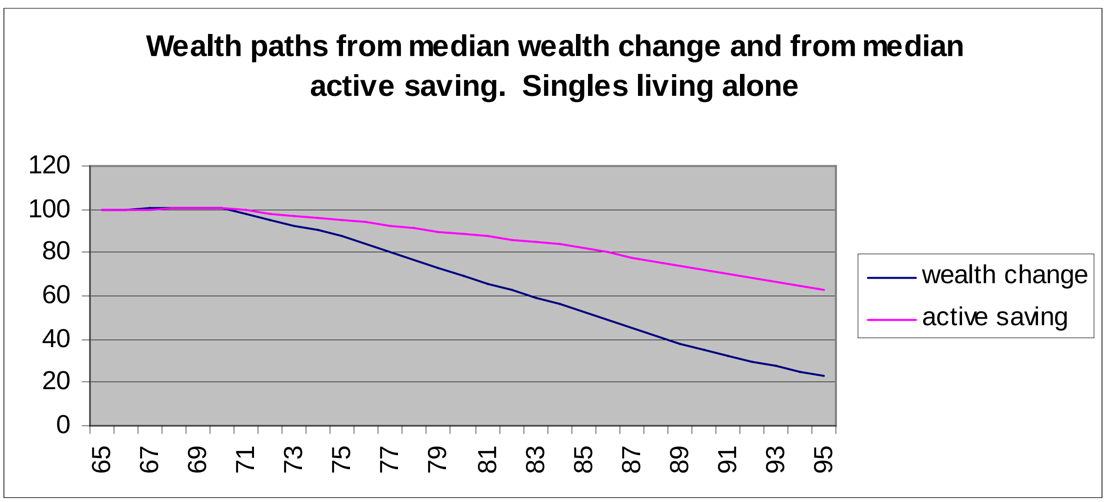


Figure 4



Note: The above is based on "ratio of medians" (population) for the wealth change and for the ratio of median saving divided by median wealth for active saving.

Figure 5

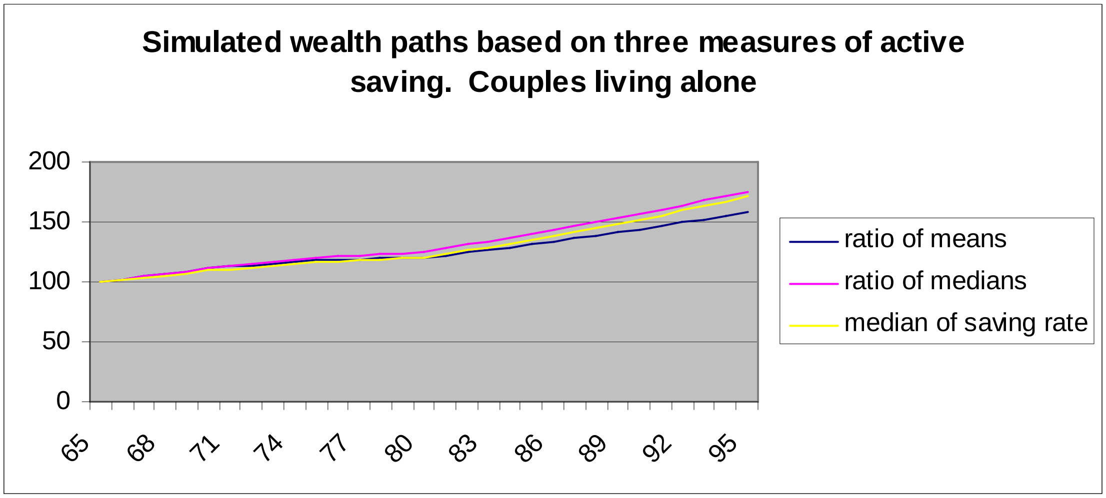
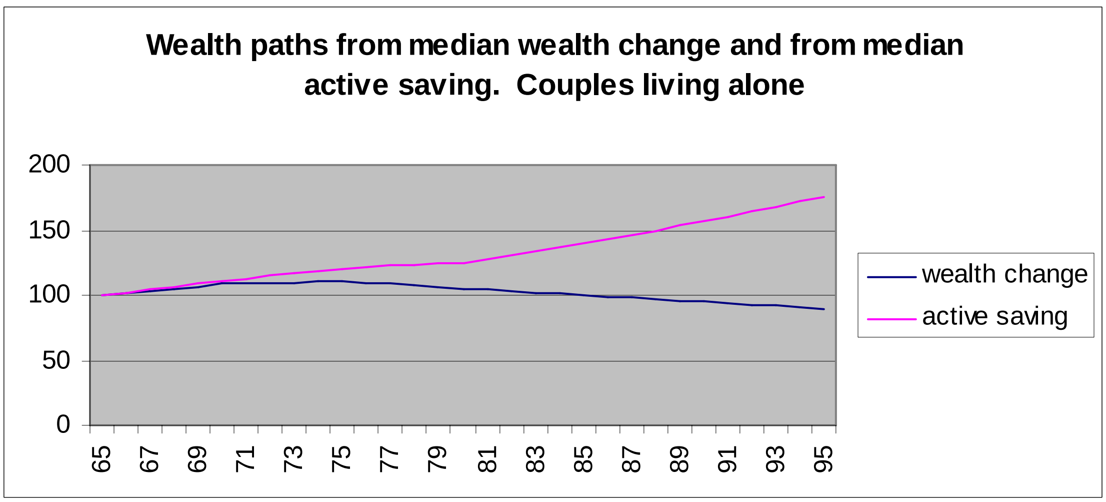


Figure 6



Note: The above is based on “ratio of medians” (population) for the wealth change and for the ratio of median saving divided by median wealth for active saving.

Figure 7a

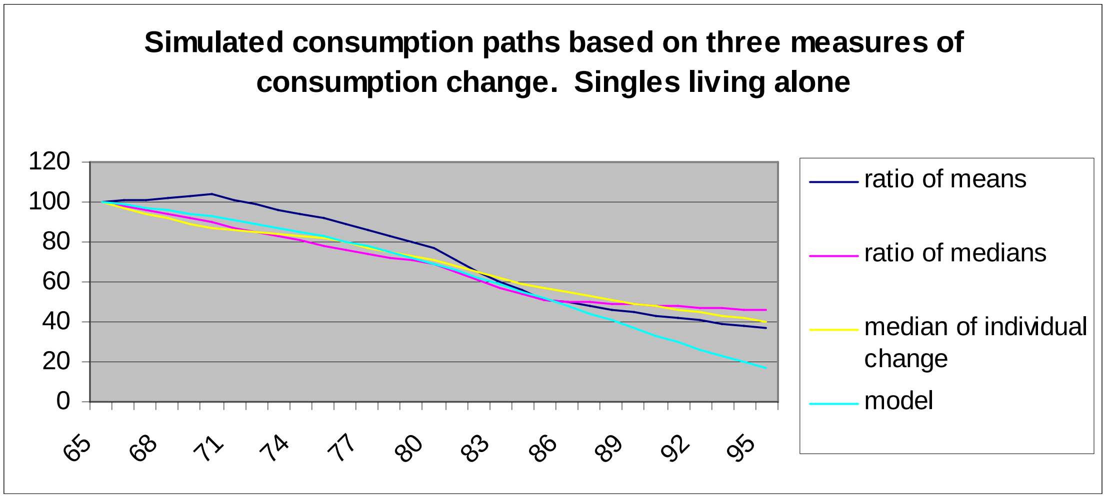


Figure 7b

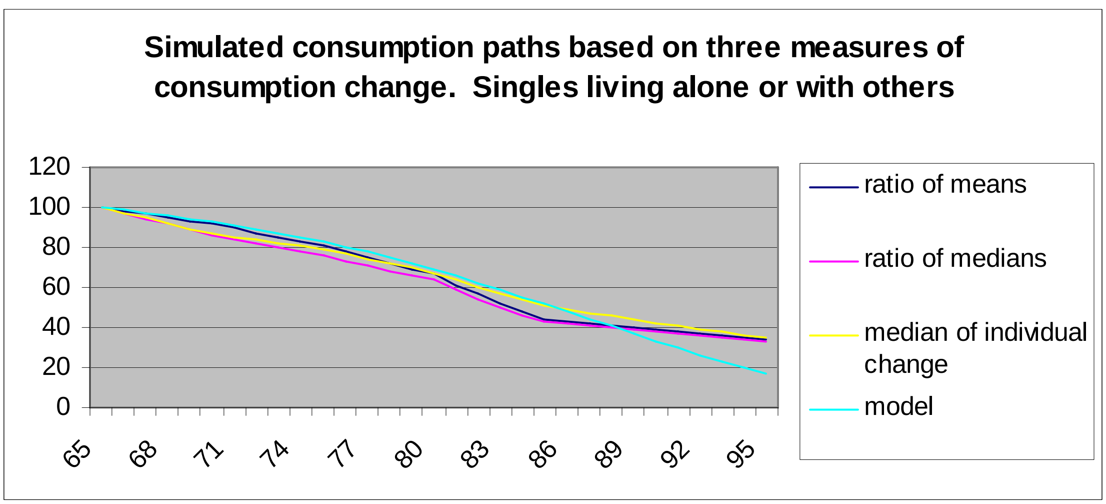


Figure 8a

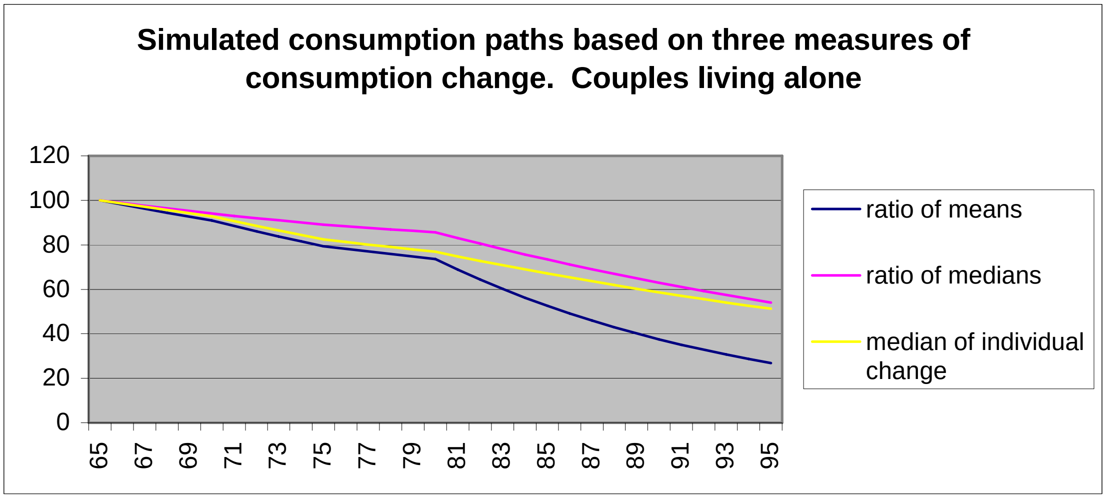


Figure 8b