

# **Grasshoppers, Ants and Pre-Retirement Wealth: A Test of Permanent Income Consumers**

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## *Abstract*

This paper shows that households who enter retirement with low wealth consistently followed non-permanent income consumption rules during their working years. Using the Panel Study of Income Dynamics (*PSID*), household wealth in 1989 is predicted for a sample of 50-65 year olds using both current and past income, occupation, demographic, employment, and health characteristics. Using the residuals from this first stage regression, the sample of pre-retired households is subsetting into households who save 'lower' than predicted and all other households. The panel component of the *PSID* is then used to analyze the consumption behavior of these households early in their lifecycle. It is shown that these low pre-retirement wealth households had consumption growth that responded to predictable changes in income during their early working years. No such behavior was found among the other pre-retired households. Moreover, the low wealth residual households responded both to predictable income increases as well as predictable income declines, a result that is inconsistent with a liquidity constraints explanation. After ruling out other theories of consumption to explain these facts, it is concluded that households who entered retirement with lower than predicted wealth consistently followed near sighted consumption plans during their working lives.

## **Grasshoppers, Ants and Pre-Retirement Wealth: A Test of Permanent Income Consumers**

*It was wintertime, the ants' store of grain had got wet and they were laying it out to dry. A hungry grasshopper asked them to give it something to eat. 'Why did you not store food in the summer like us?' the ants asked. 'I hadn't time', it replied. 'I was too busy making sweet music.' The ants laughed at the grasshopper. 'Very well', they said. 'Since you piped in the summer, now dance in the winter'.*

– Aesop's Fable

There are three distinct literatures which have received substantial attention in isolation. First, it has been well documented that, conditional on lifetime income, wealth varies dramatically across households entering retirement (Gustman and Juster, 1996; Smith, 1997; Hurst, Luoh and Stafford, 1998; Venti and Wise, 1998 and 2000; Lusardi, 2002). Second, the average household experiences a sharp decline in consumption expenditures at the time of retirement (Banks et al., 1998; Bernheim et al., 2001; Hurd and Rohwedder, 2005; Haider and Stephens, 2005). Third, it has been shown that at least some fraction of households have consumption profiles that respond to predictable income shocks during their working years, an apparent violation of the canonical Permanent Income Hypothesis (PIH) with perfect capital markets (see Attanasio, 1999 and the cites within).

This paper shows that these three literatures are explicitly linked. Households with low pre-retirement wealth relative to expected wealth given historical income, employment, demographic and health trajectories make consumption choices that seem to violate the standard representation of the PIH throughout their entire lives. The main finding of this paper is that these low pre-retirement wealth households have consumption profiles that respond to predictable income changes during their working years. This excess sensitivity of consumption to predictable income changes during working years is not found in the remaining group of higher pre-retirement wealth households, nor does it seem to be driven by liquidity constraints. Thus, the evidence in Bernheim et al (2001) that households with the lowest wealth entering retirement

experience the largest consumption declines at the time of retirement seems to be consistent with their lifelong pattern of consumption decisions.

This paper provides a set of facts that describe at least two different types of households within the population. Similar to Aesop's fabled ants who saved during their summer to sustain consumption during their winter, most households in the population smooth their consumption to predictable income changes during both their working years and as they transition from work to retirement. However, there is a segment of households who enter retirement with very low wealth even after controlling for differences in income, demographic, employment and health histories. These 'economic grasshoppers' experience a large consumption decline at the onset of retirement, relative to other pre-retired households. More importantly, these households have consumption profiles that respond to predictable income shocks throughout their working years suggesting a pattern of behavior that persists over one's entire life.

Many alternative theories can explain a subset of the above behaviors, but very few theories can jointly explain them all. The behaviors documented in this paper are consistent with either myopic rule-of-thumb consumers (Campbell and Mankiw, 1989) or consumers with time inconsistent preferences (Laibson, 1997).<sup>1</sup> In either of these theories, the households display a lack of planning behavior. Under the former theory, the households are myopic and do not attempt to plan for the future, while under the latter theory, the households attempt to plan, but are incapable of committing themselves to carry out those plans. Evidence in the data does indicate that differences in planning propensities are driving the differences in behavior between the two groups. In 1972, questions were asked of all PSID respondents about 1) their propensity to plan for the future, 2) carry out their plans for the future and 3) their propensity to spend their income rather than save it. Households who entered retirement with lower than normal savings were much less likely to report that they plan for the future, were much less likely to report that

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<sup>1</sup> In section 5, I discuss the possibility of non-separabilities in preferences between consumption and leisure as an explanation for these results.

they carry out their plans and were much more likely to report that they spend their income rather than save it compared to households with higher amounts of pre-retirement wealth.

This paper adds to a growing literature that assesses the effects of planning behavior on household wealth accumulation (Lusardi, 1999, 2002, 2003a; Ameriks, Caplin and Leahy, 2003). Lusardi (2002) uses data from the Health and Retirement Survey (HRS) to show that 1/3 of households nearing retirement report that they have “hardly thought” about retirement. These households have much lower wealth levels than households who reported to have thought a lot about retirement. Similarly, Ameriks et. al. (2003) use special surveys of TIAA-CREF investors to show that households who self-report spending time financially planning for retirement have higher wealth than households who self-report spending little time financially planning. Bernheim and Garrett (2003) and Lusardi (2003b) find positive causal effects between attending firm sponsored retirement planning seminars and retirement wealth, adding further to the broad evidence that planning can foster higher savings.

The notion that the population is segmented into forward-looking permanent income consumers and myopic consumers is not new. Hall and Mishkin (1982) find that eighty percent of consumption and income co-movements can be explained by a standard permanent income consumption rule. Likewise, Scholz et al. (2005) finds that only twenty percent of the population has saved insufficiently for retirement.

## **2. Identifying Grasshoppers and Ants**

To identify pre-retired households with lower than ‘normal’ wealth, households are who have had similar opportunities to save over their lifetime are compared. Household wealth at the time of retirement is a function of economic factors such as income, demographics, health shocks and interest rates and of individual decision factors such as saving propensities and portfolio allocations. Using the 1989 PSID, where there are multiple decades of past income, demographic and health data for each household, pre-retired households are segmented by whether they have

higher or lower wealth than other households who experienced similar economic, demographic, and health histories.

The sample includes pre-retired households who were in the *PSID* during the 1989 survey, where pre-retired households are defined to be households with a non-retired head between the age of 50 and 65. The analysis year of 1989 was selected so that households could be followed backwards in time to observe consumption behavior during working years as well as forward in time to observe consumption behavior around retirement<sup>2</sup>. While the *PSID* has collected income, employment and demographic information in all survey years since its inception in 1968, information on wealth and savings in the *PSID* is limited to the years of 1984, 1989, 1994, 1999, and 2001. Additionally, certain pension questions used in the wealth prediction equation are asked only in 1989. Given the sample design of the *PSID*, nearly all 1989 pre-retired households had one family member participate in the *PSID* every year since the survey's inception in 1968. As a result, there are almost twenty years of income, employment, demographics and health data for each pre-retired household in the 1989 *PSID*.

The analysis sample is restricted to include only those households with positive 1989 wealth. Given that pre-retired households are well into their lifecycle, this requirement is not overly restrictive. Less than 4% of non-retired 50-65 year olds in the 1989 *PSID* had zero or negative wealth. The positive wealth restriction allows the log of wealth to be used as the dependent variable in subsequent regressions.<sup>4</sup> In total, there are 819 households that met the above sample restrictions.

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<sup>2</sup> The main results of the paper carry through if the 1984 wealth data is used to segment pre-retired households by their wealth residuals.

<sup>4</sup> The measure of wealth used in this paper includes the sum of the household's investments in real estate (including main home), vehicles, farms, businesses, stocks, bonds, mutual funds, saving and checking accounts, money market funds, certificates of deposits, cash value of life insurance policies, valuable collections for investment purposes, and rights in a trust or estate less any collateralized or non-collateralized debt. See Hurst, Luoh, and Stafford (1998) for a full discussion of the *PSID* wealth measure. Up through 1999, the *PSID* did not ask about either public or private pensions. However, in 1989, respondents were asked detailed questions about their private pension replacement rates. We use this information as part of our controls when estimating household wealth via (1). See the Data Appendix for details.

To identify households who saved little given their economic opportunities, the following regression is estimated:

$$W_{i,1989} = \varphi_0 + \varphi_1 X_{i,1989} + \varphi_2 Z_{i,historical} + \eta_{i,1989}, \quad (1)$$

where  $W_{i,1989}$  is the log of household  $i$ 's net wealth in 1989,  $X_{i,1989}$  is a vector of household  $i$ 's 1989 income, employment, demographic, and health controls, and  $Z_{i,historical}$  is a vector of household  $i$ 's historical income, employment, demographic and health controls. The error term,  $\eta_{i,1989}$ , represents the portion of current household log wealth that is unexplained by the  $X$  and  $Z$  controls.

The Data Appendix details the specific controls used in estimating regression (1). Briefly,  $X_{i,1989}$  includes the current age of the household head, age squared, dummies for the household head's race, marital status, educational attainment, occupation, industry and family composition, a quadratic in household current total labor income, dummies for the household head and "wife's" current health and employment status, and the household's self reported expectation of their pension replacement rate.<sup>5</sup>  $Z_{i,historical}$  includes a quadratic in average household labor income between 1980 and 1987, a quadratic in average household labor income between 1974 and 1979, the change in labor income between 1980 and 1988, the coefficient of variation of income over 1975 and 1989, and health and unemployment shocks experienced by the head and the wife between 1980 and 1988. In some specifications, health and unemployment shocks experienced by the household in the 1970s were included. These variables provided no additional explanatory power to the regression and, as a result, were omitted from the base specification.

The residuals from (1),  $\eta_{i,1989}$ , provide a measure of whether the household has saved more or less than households with similar economic, demographic, employment, and health trajectories. The adjusted R-squared from (1) was 0.53, indicating that the controls capture a majority of the variation in wealth across households. Figure 1 presents the distribution of 1989

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<sup>5</sup> The *PSID* surveys its respondents in the spring of the year. During the 1989 survey year, households are asked about their wealth (spring 1989) and about the previous year of income (1988 income).

wealth residuals for the sample of 1989 pre-retired households. Any classification of households into two groups based on these wealth residuals is in some sense arbitrary. To begin, households with the lowest 20% of residuals are classified as having low “normalized” wealth. These households correspond to the proverbial economic grasshoppers discussed above. The comparison group will be all other pre-retired households in the sample (the proverbial economic ants).

The 20<sup>th</sup> percentile cutoff is chosen given that: 1) Hall and Mishkin (1982) find that about twenty percent of the population appears to be rule of thumb and 2) Scholz et al. (2003) find that about 20% of households under save for retirement. In section 5, the results are shown to be robust to redefining the cutoff as the 10<sup>th</sup>, 30<sup>th</sup>, 40<sup>th</sup> or 50<sup>th</sup> percentile of the normalized wealth distribution. In this sample, based on the first stage regression, the corresponding cutoffs of the log pre-retirement wealth residuals for the 10<sup>th</sup>, 20<sup>th</sup>, 30<sup>th</sup>, 40<sup>th</sup> and the 50<sup>th</sup> percentiles of the wealth residual distributions are -1.32, -0.73, -0.36, -0.12, and 0.12, respectively. The results of the robustness checks demonstrate that the twenty percent cutoff is well justified.

These residuals should not be strictly interpreted as a measure of a household’s planning propensity because many of the controls in equation (1) are a function of the extent to which individuals are forward looking. For example, education affects income (the opportunity to save). However, education is also the result of forward looking behavior. The fact that wealth differs across households despite the inclusion of these controls suggests that households have different saving propensities above and beyond the extent that these saving propensities are correlated with the controls included in  $X$  and  $Z$ . The alternative would be to include only controls which are totally exogenous to the propensity to plan. However, there are very few controls that are truly exogenous. Even age, given its relationship to health, is potentially a proxy for household planning behavior. Using very few controls in equation (1) would leave the results open to the criticism that the sample selection procedure isolated households who have had different opportunities to save. However, by including controls that may also proxy for household

planning propensity into equation (1), the estimates below may underestimate the amount of ‘grasshopper’ behavior in the sample. Given this, the estimates below should be treated as lower bounds. In Section IV, the same analysis is performed on samples split using actual wealth levels as opposed to the wealth residuals and the *qualitative* conclusions of the paper are not sensitive to the control variables included in equation (1). Table 1 presents descriptive statistics for the two samples of pre-retired households where the sample is split based on the first stage wealth residuals estimated from (1). Aside from wealth, the two samples look very similar along income, demographic and health histories. Given the sample selection procedure, this result should not be surprising.<sup>6</sup>

If variation in household planning ability drives the differences in normalized pre-retirement wealth across households, retirement behavior should also exhibit cross sectional variation. Households who accumulated too little wealth for retirement should react to the realization that they are ill prepared by: 1) reducing their consumption in retirement and/or 2) delaying the time of their retirement (or working a part time job after retiring). There are potentially two drawbacks to comparing the subsequent retirement behavior of the households with low normalized wealth and all other pre-retired households. First, given the short amount of time that has elapsed since the 1999 *PSID*, it is not possible to observe all households actually retiring. A household who was 50 in 1989 will likely not retire until the mid 2000s. Second, and potentially more important, those who retire early may be a selected sample. One may imagine that those households with very low wealth would delay their retirement relative to other households. There is no information, however, to suggest that the households in the two pre-retirement normalized wealth groups retire at different ages. Row 1 of Table 2 Panel A shows that the average age of retirement, conditional on retiring, is between 62 and 63 years old for both those with low and high first stage 1989 pre-retirement normalized wealth. Self-reported retirement status is used to define household retirement behavior. Furthermore, similar percentages of both groups were

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<sup>6</sup> Unless otherwise specified, all dollar values reported in the paper are in 1989 dollars.

observed actually retiring before 1999 (43% of high residual wealth households and 38% of low residual wealth households). Given the incentives in public and private pension systems and the fact that the average household in each group is similar along occupation, education and income dimensions, it is not surprising that the retirement age is similar between the two groups. However, as shown below, the propensity to take a part-time job in retirement does differ between the two groups.

The only measure of consumption, aside from housing expenditures, that the *PSID* directly asks its respondents about is their food consumption.<sup>7</sup> Specifically, in all years between 1970 and 1987 and between 1990 and 1999, households are asked to report the amount that spent on food at home and away from home during the previous month. Consistent with the hypothesis that the group of low normalized wealth households are ill prepared for retirement, these households have much larger declines in consumption upon retirement.

Rows 2 and 3 of Table 2 Panel A shows the mean and median percentage decline in consumption associated with retirement for those households that retired. It should be noted that the sample sizes for the two groups are quite small, 267 and 51 for the high and low wealth residual households respectively, because not every household in the original sample had the opportunity to retire by 2001. The percentage decline in consumption is computed as the change in the three year average consumption before and after retirement, averaged over retired households.

The average decline in consumption for the low normalized wealth households was 11%, while the other group, on average, only decreased their consumption during retirement by 3%.

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<sup>7</sup> Many authors examining consumption in the *PSID* use the ‘Skinner’ measure of consumption (Skinner, 1987). The Skinner consumption measure optimally weights food consumption with measures of housing expenditures (including utility expenditures) to come up with a total measure of consumption. However, when examining changes in consumption, all the time series variation in the Skinner consumption measure comes from either the variation in food consumption or the variation in housing expenditures. Given that housing expenditures may be directly related to a household’s level of wealth (because of liquidity constraints in the housing market), it is inappropriate to use the Skinner consumption measure when estimating consumption Euler equations when the samples are split based on wealth. For this reason, in this paper, I only focus on food consumption and do not include housing expenditures in my *PSID* consumption measure.

The median decline in consumption at retirement showed a similar pattern--low normalized wealth households experienced nearly a 20% consumption decline compared to a 11% decline for the other households. The fact that the average household experiences a consumption decline during retirement is consistent with almost all existing empirical work (see, Banks et al, 2000; Bernheim, et al, 2001, Aguiar and Hurst, 2005; Hurd and Rohwedder, 2005).<sup>8</sup> Furthermore, Bernheim et al. (2002) finds that low wealth households experience much larger consumption expenditure declines at the onset of retirement.

The results in Table 2 are based on very few low normalized wealth households who were observed to subsequently retire. As seen in Table 2, the average declines in consumption between the two samples are not statistically different from each other. To increase the power of the statistical test, the analysis is repeated using 1984 wealth to split the sample.<sup>9</sup> Doing so allows many more households who actually retired between 1984 and 1999 to be observed. The results are shown in Panel B of Table 2. The results are nearly identical to the results shown in Panel A of Table 2. Low normalized wealth households experience a consumption decline that is nearly twice as large as the other pre-retired households. The increased sample sizes improves the power of the test, allowing the average and median declines to be statistically distinguishable across the two groups. The results from Table 2 and Appendix Table A1 document large differences in consumption declines between the two groups at the time of retirement.

While the average household in each group retire at similar ages, there is evidence that the low normalized wealth households take less leisure in retirement. Households in the bottom 20% and the top 80% of the normalized wealth distribution work similar average annual hours during the three years prior to retirement (1,631 hours vs 1,806 hours,  $p$ -value of difference = 0.11).

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<sup>8</sup> Both Hurd and Rohwedder (2003) and Aguiar and Hurst (2003) provide evidence that a large portion of the decline in expenditure – particularly food expenditure - associated with retirement for the average or median household is the result of a switch towards home production. Aguiar and Hurst show that while food expenditure falls for the average household by 10-20%, food consumption for the average household, measured via food diaries, does not change at the onset of retirement.

<sup>9</sup> For a sample of non-retired, 50-65 year olds in 1984, 1984 log wealth was regressed on the full set of variables used to segment the 1989 pre-retired households, except all control variables were lagged 5 years.

However, during the three years after retirement, low normalized wealth households work 413 hours annually (on average) compared to 240 annually for other pre-retired households ( $p$ -value of difference = 0.05). The average decline in work hours is 11 percentage points less for low normalized wealth households (75% decline vs. 86% decline,  $p$ -value of difference = 0.03). These work hours result from the retired household working a part-time job. So although the low normalized wealth households retire at a similar age as other pre-retired households, the low normalized wealth households are much more likely to continue working in some manner after their self reported age of retirement. These results can be reconciled with institutional incentives for households to retire between the ages of 63 and 65.

### **3. A Test for Differences in Consumption Behavior during Working Years Between Grasshoppers and Ants**

The large decline in consumption at retirement for low normalized wealth households seems at odds with the standard permanent income hypothesis (PIH) model (Modigliani and Brumberg, 1954; Friedman, 1957).<sup>10</sup> Given that the date of retirement is largely forecastable, forward looking households should accumulate enough wealth to sustain consumption during retirement. In this section, consumption behavior of households in the decades prior to retirement are examined to explicitly test if low normalized wealth households behave as permanent income consumers earlier in life. In other words, do low normalized wealth pre-retired households seem to violate the PIH throughout their lives or only at the time of retirement?

According to the PIH with perfect capital markets and patient consumers, expected income growth between period  $t$  and  $t+1$  should not have statistical power in predicting consumption growth between period  $t$  and  $t+1$  (Hall 1978). Any predictable future changes in the household's income stream should already be incorporated into the household's current consumption plan.

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<sup>10</sup> If consumption and leisure are substitutes, the PIH model could predict a large consumption decline at retirement. This proposition is tested in Section V.

Using Zeldes's (1989) model of consumer optimization, the consumption Euler equation can be represented as follows:<sup>11</sup>

$$\dot{C}_{i,t+1} = \lambda_0 + \lambda_1 \ln(1+r_{i,t+1}) + \lambda_2 \dot{famsize}_{i,t+1} + \lambda_3 age_{it} + \varphi D_t + \varepsilon_{i,t+1} \quad (2)$$

where  $C_{it}$  is household  $i$ 's consumption in year  $t$ ,  $r_{it}$  is the household specific after tax interest rate between years  $t$  and  $t+1$ ,  $age_{it}$  is the age of the household head  $i$  in year  $t$ ,  $famsize_{it}$  is the size of household  $i$ 's family in year  $t$ , and  $D_t$  is vector of year dummies. Additionally,  $\dot{q}_{ik,t+1} = \Delta \ln q_{ik,t+1}$ , for any variable  $q$  and  $\varepsilon_{i,t+1}$  is the mean zero expectations forecast error. The law of iterated expectations implies that  $\varepsilon_{i,t+1}$  is uncorrelated with any variable known at time  $t$  (Hall, 1978).

To distinguish differences in the early lifecycle consumption behaviors of those with low normalized wealth relative to other households, (2) is jointly estimated for the two different sub-populations of households identified above. Specifically, (2) can be augmented to allow the coefficients of the Euler equation to differ for each of the two identified groups such that:

$$\begin{aligned} \dot{C}_{ik,t+1} = & \alpha_0 + \alpha_1 D_{<20} + \alpha_2 \ln(1+r_{ik,t+1}) + \alpha_3 D_{<20} \ln(1+r_{ik,t+1}) + \alpha_4 \dot{famsize}_{ik,t+1} \\ & + \alpha_5 D_{<20} \dot{famsize}_{ik,t+1} + \alpha_6 age_{ikt} + \alpha_7 D_{<20} age_{ikt} + \varphi D_{Year} + \varepsilon_{ik,t+1}^* \end{aligned} \quad (3)$$

where  $D_{<20}$  is a dummy variable equal to 1 if the household has a first stage normalized wealth (defined in the previous section) in the lowest twenty percent of the normalized wealth distribution. Including  $D_{<20}$  by itself and  $D_{<20}$  interacted with the interest rate, age and family size allows for preference parameters of the utility function to differ across the two groups.

To test whether household consumption responds to predictable changes in income, the following regression can be estimated:

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<sup>11</sup> Zelde's (1989) model assumes households generate utility only from consumption. Utility is governed by CRRA preferences augmented by evolving household tastes. Tastes are a function of a quadratic in age, the natural log family size, an individual fixed effect, and an aggregate time effect.

$$\begin{aligned} \dot{C}_{ik,t+1} = & \alpha_0 + \alpha_1 D_{<20} + \alpha_2 \ln(1+r_{ik,t+1}) + \alpha_3 D_{<20} \ln(1+r_{ik,t+1}) + \alpha_4 \dot{famsize}_{ik,t+1} \\ & + \alpha_5 D_{<20} \dot{famsize}_{ik,t+1} + \alpha_6 age_{ikt} + \alpha_7 D_{<20} age_{ikt} + \varphi D_{Year} + \beta_1 \overset{\bullet}{Y}_{ik,t+1} + \beta_2 D_{<20} \overset{\bullet}{Y}_{ik,t+1} + \varepsilon_{ik,t+1}^* \end{aligned} \quad (7)$$

where  $\overset{\bullet}{Y}_{ik,t+1}$  is the predictable component of income growth rate between  $t$  and  $t+1$  estimated simultaneously with (7).<sup>12,13</sup> If households are not sufficiently ‘impatient’, the PIH predicts that consumption growth between periods  $t$  and  $t+1$  should be unaffected by forecastable changes in income between periods  $t$  and  $t+1$ .<sup>14</sup> Any predictable change in income should already be included in the household’s consumption plan. If either  $\beta_1$  or  $\beta_2$  is positive and significant, predictable income growth has statistical power in predicting consumption growth and the standard PIH with no liquidity constraints and patient consumers can be rejected.

In order for the two stage least squares estimation of (3) to yield unbiased estimates of  $\beta_1$  and  $\beta_2$ , both the predictable income growth components and the dummy indicating the bottom 20% of the pre-retirement wealth distribution must be independent of the regression error term. As is standard in the literature, the household’s predictable component of income growth is instrumented using four lags of income growth, excluding the first lag. By definition, these lagged variables are orthogonal to the error term,  $\varepsilon_{i,t+1}$ .

The standard assumption made about the error structure when estimating consumption Euler equations is that  $E_t[\varepsilon_{ik,t+1} | \Omega_t] = 0 \forall k$  and  $\forall t$ , where  $\Omega_t$  is all information known at time  $t$ .

<sup>12</sup> This procedure to test for the excess sensitivity of consumption is standard in the literature. See Browning and Lusardi (1996) and the cites within.

<sup>13</sup> It has been suggested that the wealth residual itself, as opposed to the wealth dummy,  $D_{<20}$ , should be interacted with the predictable component of income in (3). Given the theory, this would be inappropriate. The relationship between the wealth residual and the response of consumption to predictable income changes is non-linear. If the permanent income hypothesis is correct, the coefficient on the predictable income change should be zero for most households and positive for others. One could, in principle, include higher powers of the residual interacted with the predictable component of income growth to capture the non-linear relationship. For simplicity, and ease of exposition, the wealth dummy approach is used in this paper. In Section IV and in Table 5, the non-linear relationship between the wealth residuals and the violation of the PIH is explored more fully.

<sup>14</sup> ‘Impatient’ households are classified as households who wish to borrow, all else equal, in the current period. Formally, households are deemed ‘impatient’ if the following condition is satisfied:  $\gamma_k (r_{i,t+1} - \delta_k) + (\rho_k/2) \sigma_{i,N}^2 < g_i - \sigma_{i,N}^2/2$ . This impatience condition is necessary to generate buffer stock saving behavior (Carroll, 1997). Below, I discuss how buffers stock saving behavior cannot explain the full set of results presented in the paper – particularly, the sharp decline in consumption associated with retirement.

However, given the above sample selection procedure,  $E_t[\varepsilon_{ik,t+1} | D_{<20}]$  need not equal zero within each normalized wealth group. For example, it is possible that households with low normalized wealth repeatedly received poor income draws throughout their lifetime. In other words, these households may have been perpetually unlucky. Once the subsequent period came, they realized a low draw for income growth and, as a result, adjusted their consumption downward. Such households who were persistently unlucky (or persistently over optimistic) could end up in retirement with little wealth. Furthermore, their expectations about future income growth could not be ascertained from lagged income growth. Such a situation could cause households with negative realizations of  $\varepsilon$  in years prior to 1989 to have low wealth in 1989.<sup>15</sup>

However, under rather general assumptions, estimating (3) will still yield unbiased estimates of  $\beta_1$  and  $\beta_2$ . The reason for this is that (3) includes a dummy variable indicating differences in type across households,  $D_{<20}$ . If the low residual group had persistently low-income realizations (relative to their expectations), the lagged income growth controls will persistently under-predict their expected income growth. These households will be consistently revising their consumption downward with each ‘unlucky’ income draw. As a result, their consumption growth will be lower, on average, than the other group of pre-retired households. If this underestimate is constant over time within the low normalized wealth group, the differences in expectations will be captured by the inclusion of  $D_{<20}$  into the estimating equation. In other words, the estimation of (3) will yield valid estimates of  $\beta_1$  and  $\beta_2$  if  $\text{Cov}[\varepsilon_{i,t+1}, D_{<20} \overset{\bullet}{Y}_{i,t+1}^{\text{Predict}} | D_{<20}] = 0$ . The two groups could have different, non-zero ex-post mean realized shocks. However, in order for (3) to be valid, the shocks must be i.i.d *within* each group. This assumption is not much different than the standard assumption that  $\varepsilon_{i,t+k}$  is i.i.d. for the full sample. As long as the shocks are i.i.d. within

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<sup>15</sup> Note that this perpetual unluckiness during their working years would not explain their sharp decline in consumption at the time of retirement.

each group, the instruments for the predictable component of income growth will be orthogonal to the error term within each group.

To test if the income processes differ between the two groups, current income growth is regressed on lags of income growth and those lags interacted with  $D_{<20}$ . If the two groups have different income processes, the interaction terms would enter significantly. However, there is no evidence that the two groups have different income processes. The coefficients on the interaction terms in this regression are essentially zero and no interacted term is statistically different from zero. Furthermore, the joint test of significance on the interacted terms cannot reject that the two income processes are similar. This result is not surprising. By definition, the low normalized wealth households are very similar to other pre-retired households along all observables including actual income shocks (unemployment spells) and expected income shocks (education/occupation/industry interactions) (see Table 1). Given the way the sample was split in regression (1), there should be no reason to believe that the expected income processes differ between the two groups of pre-retired households.<sup>16</sup>

#### **4. Main Results: Pre-Retirement Consumption Patters of Grasshoppers and Ants**

Equation (3) is estimated on data from 1975–1987 for the sample of *PSID* households who were ‘pre-retired’ in 1989. Formally, consumption growth is defined as the change in log annual food expenditures between year  $t$  and year  $t+1$ .<sup>17</sup> See the Data Appendix for a full discussion of the creation of household real consumption growth and household real after-tax interest rates.

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<sup>16</sup> For all estimations reported in Tables 3-5, the income processes were estimated separately for each group. All the regressions were re-estimated forcing both groups to have the same income process. As expected, given the above discussion, there was no difference in results between the two procedures.

<sup>17</sup> Food consumption in the *PSID*, used by many authors to estimate consumption Euler equations, has been argued to be a good measure to test household consumption behavior. First, food consumption has little aspects of durability. Second, because households can substitute away from eating in restaurants or from buying more expensive brands, food consumption will be sensitive to changes in income. However, Aguiar and Hurst (2005) show that food is particularly amenable to home production making changes in food expenditures a poor proxy for changes in actual food consumption.

When estimating (3), the predictable component of household labor income growth is instrumented using 4 lags of household labor income growth, excluding the first lag. If household labor income growth follows an autoregressive or moving average process, past labor income growth will have predictive power in determining expected future labor income growth. As noted above, the income processes is allowed to differ between the two different groups of pre-retired households. A first stage regression of current household labor income growth on four lags of household labor income growth shows that the lags have strong predictive power both for households who have normalized wealth in the top 80% ( $F$ -statistic = 10.7,  $p$ -value < 0.01) and in the bottom 20% ( $F$ -statistic = 4.2,  $p$ -value < 0.01).

Table 3 shows the results from estimating equation (3). If both the low and high normalized wealth groups follow standard PIH consumption rules, then both  $\beta_1$  and  $\beta_2$  equal zero. If the low normalized wealth group follows a similar consumption plan as the high normalized wealth group,  $\beta_2$  would equal zero, regardless of the value of  $\beta_1$ . Table 3 reports that  $\beta_1$ , the coefficient on the predictable change in income for the whole sample, is negative and not statistically different from zero.  $\beta_2$ , however, is large, positive, and statistically different from zero. Households who had little pre-retirement wealth relative to their lifecycle characteristics responded positively to predictable income changes. The model predicts that the marginal propensity to consume out of predictable income changes is 56 percentage points higher for households with lower than normal pre-retirement wealth ( $t$ -statistic = 2.0). The net response to predictable income changes for the low normalized wealth group ( $\beta_1 + \beta_2$ ) is positive (an estimated marginal propensity to consume of 0.40) and statistically different from zero ( $p$ -value 0.06).

In summary, households who display retirement consumption behavior that is inconsistent with the PIH also display behavior that is inconsistent with the PIH during their working lives. Moreover, there is no evidence that those who enter retirement with “sufficient” wealth violate the PIH during their working years.

## 5. Robustness Analysis

The results in section 4 suggest that pre-retired households residing in the lowest twenty percent of the normalized wealth distribution have different consumption behavior during their working years than other households with similar economic histories as measured by a statistically greater degree of consumption sensitivity. Is the difference in consumption behavior due to liquidity constraints? How sensitive are the results to the choice of a 20% wealth residual cutoff? Are the findings in section 4 robust to changes in the sample selection criteria? In this section, all of these questions are explored.

### 5.1. Empirically Testing for the Existence of Binding Liquidity Constraints

If market imperfections prevent households from borrowing when expected income growth is positive, predictable income growth will have statistical power in predicting consumption growth. The lower the household wealth, the more likely the household will be liquidity constrained. However, as noted by Altonji and Siow (1987), Zeldes (1989) and Shea (1995), it is possible to empirically test whether the existence of liquidity constraints is driving the rejection of the Permanent Income Hypothesis in micro data. Liquidity constraints prevent a household from borrowing but do not place any restrictions on a household's ability to save. As a result, the consumption growth of liquidity constrained households should only respond to predictable *increases* in income, but not predictable income *declines*. If households truly expect their income to decline, they could save a percentage of their income today so as to fund consumption in the future, leaving their discounted marginal utility of consumption unchanged.

To test whether liquidity constraints are causing the rejection of the PIH, the following equation is estimated:

$$\begin{aligned}
\dot{C}_{ik,t+1} = & \alpha_0 + \alpha_1 D_{<20} + \alpha_2 \ln(1 + r_{ik,t+1}) + \alpha_3 D_{<20} \ln(1 + r_{ik,t+1}) + \alpha_4 \dot{famsize}_{ik,t+1} \\
& + \alpha_5 D_{<20} \dot{famsize}_{ik,t+1} + \alpha_6 age_{ikt} + \alpha_7 D_{<20} age_{ikt} + \phi D_{Year} + \beta_3 D_{Up} \dot{Y}_{ik,t+1}^{Predict} \\
& + \beta_4 D_{Down} \dot{Y}_{ik,t+1}^{Predict} + \beta_5 D_{<20} D_{Up} \dot{Y}_{ik,t+1}^{Predict} + \beta_6 D_{<20} D_{Down} \dot{Y}_{ik,t+1}^{Predict} + \varepsilon_{ik,t+1}^*
\end{aligned} \tag{4}$$

where  $D_{Up}$  and  $D_{Down}$  are dummy variables indicating whether the household's predicted income growth between  $t$  and  $t+1$  was positive or negative, respectively. Table 4 reports the results of estimating equation (4). If liquidity constraints are driving the failure of the PIH for the low normalized wealth households, the consumption of the household would respond to predictable income increases but not to predictable income declines. In other words,  $\beta_5$  would be positive and  $\beta_6$  would equal zero. Table 4 shows that the low normalized wealth households respond equally to predictable income increases and to predictable income declines. Such a result suggests that liquidity constraints are not driving the rejection of the PIH.

This should not be surprising given that the two groups of households earned similar levels of labor income over their lives. If one group was liquidity constrained while young, their consumption over that time period should have been lower, all else equal. This implies that liquidity constrained households will show up in retirement with higher wealth, not lower wealth. Additionally, there is no reason for young liquidity constrained households to later experience sharper declines in consumption at the time of retirement. So although liquidity constraints may explain the excess sensitivity of consumption to predictable consumption changes for the group of economic grasshoppers identified, they cannot explain the low normalized wealth at the time of retirement or the sharp decline in consumption associated with retirement. However, a poor planning story can explain all three facts.

## 5.2. Alternate Specifications of Low Normalized Wealth Households

The results in Tables 3 and 4 compare the consumption behavior of households in the lowest twenty percent of 1989 normalized wealth to the consumption behavior of all other pre-retired

households. There is nothing magical about the twenty percent cutoff. Table 5 explores how robust are the findings in Tables 3 and 4 to alternate definitions of ‘lower than normal’ pre-retirement wealth.

Instead of defining an absolute cutoff for the low normalized wealth group, the responsiveness to predictable income changes are allowed to differ by normalized wealth deciles. Specifically, households are grouped together based upon having pre-retirement normalized wealth (estimated from the first stage regression discussed in section 2) in the following ranges: 0-10%, 10%-20%, 20%-30%, 30%-40%, 40%-50%, and greater than 50%. Such a specification allows for a non-linear consumption response to predictable income changes depending on the wealth residuals. Additionally, with such a specification one can see whether the responsiveness of consumption growth to predictable income shocks increases as the wealth residuals become more negative.

Table 5 reports the results of this specification. Households with normalized wealth in the bottom 10% of the distribution respond the strongest to predictable income changes; the marginal propensity to consume out of predictable income shocks is 0.67 (0.93-0.26) with a  $p$ -value = 0.07. Households with normalized wealth in the 10<sup>th</sup>-20<sup>th</sup> percentile also respond positively to predictable income changes, although the responsiveness is much smaller and statistically indistinguishable from zero; 0.08 (0.34 – 0.26),  $p$ -value = 0.34. It is worth noting that those in the 10<sup>th</sup>-20<sup>th</sup> percentile of the normalized wealth distribution do respond differently compared to those in the top ½ of the normalized wealth distribution (coefficient = 0.34,  $p$ -value = 0.05). Households in the other normalized wealth distribution deciles (20<sup>th</sup>-30<sup>th</sup>, 30<sup>th</sup>-40<sup>th</sup>, or 40<sup>th</sup>-50<sup>th</sup>) did not respond in any way that was economically or statistically different than households higher in the normalized wealth distribution. This evidence indicates that somewhere between 10-20% of the normalized wealth distribution have consumption profiles that respond to predictable changes in income. Thus the twenty percent cutoff used in the early parts of the paper is justified.

### 5.3. Redefining the Sample Splitting Equation

As discussed in Section 2, the sample selection procedure may bias the results against finding grasshopper behavior. By including  $X$  and  $Z$  controls that are likely to be correlated with poor household planning in regression (1), some differences in planning propensities across households will be purged from the residuals. To examine the impact of including such controls in the sample selection equation, two samples are isolated using the actual wealth distribution as opposed to the normalized wealth distribution. This procedure is the same as including no  $X$  or  $Z$  controls when estimating (1). As noted in section II, including many controls has a distinct advantage. The PIH theory says that households who experience different economic, demographic and health trajectories should have different consumption and saving patterns entering retirement. Using the  $X$  and  $Z$  controls creates households who are similar along all the  $X$  and  $Z$  dimensions but differ in wealth. However, it can still be illustrative to examine the results when no controls are used when splitting the sample.

To start, equation (3) is re-estimated with  $D^*_{<20}$  replacing by  $D_{<20}$ .  $D^*_{<20}$  is defined as taking the value of 1 if the pre-retired household resides in the bottom 20% of the actual 1989 log wealth distribution. The overlap of households in both  $D^*_{<20}$  and  $D_{<20}$  is 76%. This implies that the actual wealth levels of most households in the left tail of the wealth distribution cannot be explained by the  $X$  and  $Z$  controls. Given the high overlap of households in the normalized and actual wealth groupings, it is not surprising that the results do not change dramatically when (3) is re-estimated using  $D^*_{<20}$  instead of  $D_{<20}$ . The estimate of  $\beta_1$  was -0.22 (standard error = 0.16) and the estimate of  $\beta_2$  was 0.85 ( $p$ -value = 0.09). Using the same procedure to get the results presented in Table 5, it is found that between 20 and 30% of households with the lowest normalized wealth respond to predictable income changes. In other words, slightly more households behave as the proverbial grasshopper using the method with no first stage controls.

#### *5.4 Exploring Other Consumption Theories*

Many alternative theories can explain a subset of the above facts, but very few theories can jointly explain them all. For example, models of consumption habits or precautionary savings could predict excess sensitivity in consumption to predictable income changes during a households working years, but neither would predict such a sharp decline in consumption upon retirement. To the contrary, standard models of consumption habits (Deaton, 1992) predict that consumption will decline less slowly during retirement for those households with habit preferences, compared to PIH households, all else equal. Furthermore, there is nothing to suggest that models of habit persistence in consumption would lead households to have extremely low levels of wealth upon retirement. Precautionary models of saving may predict low pre-retirement savings along with the excess sensitivity of consumption, but such households would still smooth their consumption across the period of retirement (Gourichas and Parker, 2000). Also, differences in time preferences across households cannot alone generate the above findings. It is true that households with a high, constant time discount rate will enter retirement with little wealth, relative to households with similar income profiles and a lower time discount rate. However, such household will still smooth the marginal utility of consumption over time. These households will have consumption profiles that would not respond to predictable income changes, including retirement.

A strong substitutability between leisure and consumption could reconcile the main results outlined above. Leisure is high in both retirement and periods of job loss. Households who treat consumption and leisure as substitutes would optimally plan for lower consumption in retirement and, as a result, would save less during their working years. Furthermore, as the household became retired, and leisure increased, we would expect a sharp decline in consumption if the household was smoothing total utility and not just consumption. Lastly, these households would optimally choose to have a positive correlation between predictable income movements and consumption while young, if the predictable income changes were associated with a change in

leisure (such as job loss). When leisure is low, consumption would be high and when leisure is high, consumption would be low.<sup>18</sup> To explore whether the substitutability between leisure and consumption is causing the failure of the permanent income tests, changes in total hours worked by both the household head and wife (if present) were included directly into the estimation of regressions (7) and (8). This procedure is similar to that used by Attanasio and Browning (1995) to test for the substitutability of consumption and leisure. The results reported in Tables 3-5 were essentially unchanged with the inclusion of work hours into the estimation equation. Such a finding suggests that the substitutability between consumption and leisure is not causing the failure of the PIH documented above.

## **6. The Self-Awareness of Economic Grasshoppers**

There are two possible types of behavior that are consistent with all of the results above. First, households who follow myopic (rule-of-thumb) consumption rules would have consumption that closely tracks income (Campbell and Mankiw, 1987). If households do not plan for the future, they will have consumption profiles that respond to predictable income changes during their working years, will end up in retirement with little wealth, and will be forced to take a consumption decline upon retirement.

Second, a theory of time inconsistent preferences can match the above facts. Such households may want to plan for the future, but are incapable of doing so these households have relatively high discount rates over short horizons and relatively low discount rates over longer horizons. This discount structure sets up a conflict between today's preferences (which prefer current consumption), and the preferences that will be held in the future (which prefer that they had deferred consumption in the past). A household may realize that retirement is coming, yet in each period the household would choose to postpone saving for retirement until the next period. Eventually, the household could enter retirement with little accumulated wealth, and as a result,

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<sup>18</sup> See Attanasio and Browning (1995) for a discussion.

consumption would eventually have to decline. Furthermore, consumers with time inconsistent preferences could have consumption growth that responds to both predictable income increases and predictable income declines (Laibson, 1997) and could have consumption that falls sharply at the time of retirement (Angeletos et al., 2000).

Aside from the consumption behavior during their working years, there is one final piece of evidence that suggests pre-retired households in 1989 who had lower than normal wealth did so because of poor planning. In 1972 and 1975, the *PSID* asked its respondents to self assess many of their socio-economic characteristics. Three questions asked as part of these supplements directly pertained to a household's consumption-savings tradeoff and the household's willingness to plan for the future. Specifically, the questions were:

1. Are you the kind of person that plans his life ahead all the time or do you live more from day-to-day?
2. When you make plans ahead, do you usually carry out things the way you expected?
3. Would you rather spend your money and enjoy life today or save more for the future?

The first question was asked in both 1972 and 1975, while the second and third questions were only asked in 1972. The questions above are inherently vague about what they are intended to measure. The answers to such questions may not be in any way indicative of the household's actual behavior, however, they may provide some suggestive evidence about how the two groups of pre-retired households studied above assess their own behavior.

As noted earlier, most of the pre-retired *PSID* households in 1989 were in the *PSID* since its inception in 1968 and, as a result, provided answers to the self-assessment questions in both 1972 and 1975. The results are reported in Table 6. Responses were compared between households with low normalized wealth (bottom 20%) and all other households. The sample split is identical to the one described in Table 1. As expected, households with low normalized wealth were much less likely to classify themselves as planners in 1972 (46% for the low normalized wealth households vs. 59% for all other households,  $p$ -value of difference = 0.06). The results are even

more striking in 1975. Households with low normalized wealth in 1989 only reported themselves to be a planner 38% of the time compared to 56% of the time for the other sample households. In 1972, only 54% of the low normalized wealth households said that they were likely to carry out plans as expected. The other pre-retired households said that they carried out their plans 67% of the time. All these differences are significant at the ninety-four percent level of confidence.

Perhaps the most interesting question is the one that most directly assesses the household's consumption decisions. Of the households with low normalized wealth, 60% of them reported in 1972 preferring spending money today as opposed to saving it for the future. The comparable number for the other sample households was only 40%. While only suggestive, it appears that those households who behave most like the proverbial 'economic grasshopper' are aware of their grasshopper tendencies. Such households report being less likely to plan for their future, less likely to carry out plans conditional on making them, and more likely to spend their money today rather than save it for the future. One should not forget that these self-assessments were made almost two decades prior to when their pre-retirement wealth was measured.

There are two other questions in the early *PSID* surveys that are worth reporting. The first question asks households whether or not they had any positive savings. The second asks if the household had accumulated savings greater than two months of income. These questions are asked both in 1972 and 1975. The responses to these questions for the 1989 pre-retired households are also reported in Table 6. Not surprisingly, households who under-saved entering retirement were low savers throughout their early working years. For example, in 1972, only 30% of low normalized wealth households had two months worth of accumulated savings compared to over  $\frac{1}{2}$  of the other pre-retired households who had at least two months of accumulated savings. Households with low normalized wealth entering retirement were much less likely to have had any significant amount of saving early in their lifecycle.

## 7. Conclusion

In this paper, it is shown that households who enter retirement with low wealth consistently followed non permanent income consumption rules during their working years. Using the Panel Study of Income Dynamics (*PSID*), household wealth in 1989 is predicted for a sample of 50-65 year olds using both current and past income, occupation, demographic, employment, and health characteristics. Using the residuals from this first stage regression, the sample of pre-retired households is subsetting into households who save ‘lower’ than predicted and all other households. By construction, these households had similar opportunities to save; the average household in both these sub-samples are very similar along all observable income and demographic characteristics. It is then shown that households in the low normalized wealth sample had much larger declines in consumption upon retirement. Such a result is consistent with the household not adequately planning for retirement.

In the main part of the paper, the panel component of the *PSID* is used to analyze the consumption behavior of these households early in their lifecycle. It is shown that low normalized wealth households had consumption growth that responded to predictable changes in income during their early working years. No such behavior was found among the other pre-retired households. Moreover, the low normalized wealth households responded both to predictable income increases as well as predictable income declines, a result that is inconsistent with a liquidity constraints explanation. Moreover, a liquidity constraint story cannot explain the low level of wealth entering retirement (conditional on lifetime income) or the large decline in consumption associated with retirement.

There are two theories that can explain all of the behaviors associated with low wealth residual households. First, households who follow myopic (rule-of-thumb) consumption rules would have consumption that closely tracks income. If households do not plan for the future they will end up in retirement with little wealth, be forced to take a consumption decline upon retirement, and will have consumption profiles that respond to predictable income changes during

their working years. Second, the results could be reconciled if the household had time inconsistent preferences. Such households may want to plan for the future, but are incapable of doing so. While both the rule of thumb and the time inconsistent preference theories can reconcile the behavior of households with low wealth residuals, it is not possible to disentangle the two theories. Specifically, given PSID data, it is not possible to distinguish whether these identified household are completely myopic with respect to their consumption decisions or whether they would like to plan for the future, but are incapable of doing so. Regardless, the near sighted behavior of both types of households leaves them ill prepared to sustain consumption through retirement. However, these households at the beginning of their lifecycle did assess themselves as low savers and poor planners.

At the beginning of the paper, a classic fable by Aesop is recounted. In the fable, a sharp distinction is drawn between ants, who saved during their summer (i.e., working years) to sustain consumption during their winter (i.e., retirement), and grasshoppers, who saved little for their future period of low earnings. The results shown in this paper confirm Aesop's proposition; within an economy, consumers are of different types. Some households are forward looking and behave according to the PIH. Others, however, lack either the desire or the ability to plan for the future. When constructing economic models, it is often misguided to assume all households follow similar consumption rules. With respect to retirement saving, while it is true that the majority of households appear to follow permanent income consumption rules, approximately 20% of the population behaves as 'economic grasshoppers'. In future work, it would be useful to understand the reasons why households do not plan for the future and to explore the origins of such households. Are households born of a given type or do they evolve as their life progresses?

## References

- Aguiar, Mark and Erik Hurst (2003). "Consumption vs. Expenditure", University of Chicago Working Paper.
- Altonji, Joseph and Aloysius Siow (1987). "Testing the Response of Consumption to Income Change with (Noisy) Panel Data." *Quarterly Journal of Economics*, 102(2): 293-328.
- Ameriks, John, Andrew Caplin, and John Leahy (2003). "Wealth Accumulation and the Propensity to Plan," *Quarterly Journal of Economics*, 118(3), 1007-48.
- Angeletos, George-Marios, David Laibson, Andrea Repetto, Jeremy Tobacman, and Stephen Weinberg (2001). "The Hyperbolic Buffer Stock Model: Calibration, Simulation, and Empirical Evaluation," *Journal of Economic Perspectives*, 15(3), Summer, 47-68.
- Attanasio, Orazio (1999). "Consumption," *Handbook of Macroeconomics*, in: J. B. Taylor & M. Woodford (ed.), 741-812.
- Attanasio, Orazio and Martin Browning (1995). "Consumption over the Life Cycle and over the Business Cycle." *American Economic Review*, 85(5): 1187-1237.
- Banks, James, Richard Blundell and Sara Tanner (1999). "Is There a Retirement-Savings Puzzle?" *American Economic Review* 88(4): 769-88.
- Bernheim, Douglas and Daniel Garrett (2003), "The Effects of Financial Education in the Workplace: Evidence from a Survey of Households," *Journal of Public Economics*, 87, pp. 1487-1519.
- Bernheim, Douglas, Jonathan Skinner, and Steven Weinberg (2001). "What Accounts for the Variation in Retirement Wealth Among U.S. Households?" *American Economic Review* 91(4): 832-57.
- Carroll, Christopher (1997). "Buffer Stock Saving and the Life Cycle/Permanent Income Hypothesis." *Quarterly Journal of Economics* 112(1): 1-56.
- Campbell, John and Gregory Mankiw (1989). "Consumption, Income, and Interest Rates: Reinterpreting the Time Series Evidence." *NBER Macroeconomics Annual* 4(1): 185-247.
- Deaton, Angus (1992). *Understanding Consumption*. Oxford: Clarendon Press.
- Friedman, Milton (1957). *A Theory of the Consumption Function*. Princeton: Princeton University Press.
- Gourinchas, Pierre-Olivier and Jonathan Parker (2000). "Consumption Over the Life Cycle," *Econometrica*, 70(1): 47-89.
- Gustman, Alan and F. Thomas Juster (1996). "Income and Wealth of Older American Households," in Eric Hanushek and Nancy Maritato, Assessing Knowledge of Retirement Behavior, Washington D.C.: National Academy Press.

- Haider, Steven and Melvin Stephens (2006). "Is There a Retirement-Consumption Puzzle? Evidence Using Subjective Retirement Expectations," *Review of Economics and Statistics*, forthcoming.
- Hall, Robert (1978). "Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence." *Journal of Political Economy* 86(6): 971-987.
- Hall, Robert and Frederic Mishkin (1982). "The Sensitivity of Consumption to Transitory Income: Estimates from Panel Data on Households." *Econometrica* 50(2): 461-481.
- Hurd, Michael and Susann Rohwedder (2003). "The Retirement Consumption Puzzle: Anticipated and Actual Declines in Spending at Retirement," NBER Working Paper #9586.
- Hurst, Erik, Ming-Ching Luoh and Frank Stafford (1998). "Wealth Dynamics of American Families: 1984-1994." *Brookings Papers on Economic Activity* 1998(1): 267-337.
- Laibson, David (1997). "Golden Eggs and Hyperbolic Discounting." *Quarterly Journal of Economics* 112(2): 443-477.
- Lusardi, Annamaria (1999). "Information, Expectations, and Savings", in *Behavior Dimensions of Retirement Economics*, Henry Aaron, eds. New York: Brookings Institution/Russel Sage Foundation, 81-115.
- Lusardi, Annamaria (2002). "Explaining Why So Many Households Do Not Save", Mimeo, Dartmouth College.
- Lusardi, Annamaria (2003a). "Planning and the Effectiveness of Retirement Saving", Mimeo, Dartmouth College.
- Lusardi, Annamaria (2003b). "Financial Education and Saving", in *Pension Design and Decision-Making Under Uncertainty*. Eds, Olivia Mitchell and Steven Utkus. Pension Research Council, Philadelphia.
- Modigliani, Franco and Richard Brumberg (1954). "Utility Analysis and the Consumption Function: An Interpretation of the Cross-Section Data," in *Post-Keynesian Economics*. Eds., Kenneth Kurihara. New Brunswick, NJ. Rutgers U. Press: 388-436.
- Scholz, Karl, Anath Seshadri, and Surachai Khitatrakrun (2003). "Are Americans Saving "Optimally" for Retirement?", Mimeo, University of Wisconsin.
- Shea, John (1995). "Union Contracts and the Life Cycle-Permanent Income Hypothesis." *American Economic Review* 85(1): 186-200.
- Skinner, Jonathan (1987). "A Superior Measure of Consumption from the Panel Study of Income Dynamics," *Economic Letters*, 23(2): 213-16.
- Smith, James P. (1997). "Wealth Inequality Among Older Americans," *Journal of Gerontology*, 52(B), May: 74-81.
- Venti, Stephen and David Wise (2000). "Choice, Chance and Wealth Dispersion at Retirement," *NBER Working Paper* #7521.

Venti, Stephen and David Wise (1998). "The Cause of Wealth Dispersion at Retirement: Choice or Chance?" *American Economic Review* 88(2): 185-191.

Zeldes, Stephen (1989). "Consumption and Liquidity Constraints: An Empirical Investigation." *Journal of Political Economy* 97(2): 305-346.

## Data Appendix

In this appendix, the controls included in the estimation of equation (1) are discussed. After which, the construction of the after tax interest rate and the household's consumption growth rate, included in the estimation of equations (7) and (8) are detailed.

Regression equation (1) included a vector of 1989 household controls,  $X_{i,1989}$ , and a vector of historical, pre-1989 controls,  $Z_{i,historical}$ . The specific controls included in the  $X$  vector were:

- a quadratic in the household head's age,
- a dummy equal to 1 if the household head is black,
- a dummy equal to 1 if the household head is currently married,
- the number of children in the family unit,
- the number of children between the ages of 13-17 (living within or away from the household),
- the number of children between the ages of 18 and 21 (living within or away from the household),
- a dummy equal to 1 if the head had less than a high school degree,
- a dummy equal to 1 if the head had exactly a high school degree,
- a dummy equal to 1 if the head had some college education (but no college degree) (household heads with four or more years of college was the excluded group),
- dummy variables indicating the census region where the household resides,
- a vector of one digit occupation dummies,
- a vector of one digit industry dummies,
- a dummy variable equal to 1 if the head was unemployed,
- and, a quadratic in household labor income, where household labor income is defined as the sum of labor earnings of both the head and spouse, if a spouse was present.

Additionally, the PSID asked the following question of both heads and spouses to ascertain individual health status: "Would you say your (Head's/Wife's) health in general is excellent, very good, good, fair, or poor?". If the individual responded that their health was fair or poor, the

individual was coded as having “bad health”. 1989 “bad health dummies” were included for both the head and the wife.

Lastly, two questions were asked in 1989 about household pensions. First, households were asked the following question about their pension replacement rates:

“We're interested in how much of earnings will be replaced by pensions. Thinking of your (and your (wife's/"WIFE'S")) total pension benefits when you (both) retire, including Social Security, how will they compare with your (and your (wife's/"WIFE'S")) pre-retirement earnings--I mean, about what percent of your pre-retirement earnings will they be?”

The response to this question was included as part of the  $X$  vector of controls. Secondly, equation (1) also included the amount that households directly contributed to their pension during the previous 5 years. In other specifications (not reported), occupation, industry and education controls were interacted. These interactions had no effect on the results and, as a result, were omitted from the main specification discussed in the text.

The  $Z$  vector included pre-1989 controls including:

- a dummy variable equal to 1 if the household head had any “bad health” between 1980 and 1988,
- a dummy variable equal to 1 if the spouse had any “bad health” between 1980 and 1988,
- the number of years of “bad health” reported for both the head and the spouse between 1980 and 1988,
- a dummy variable equal to 1 if the household head become divorced anytime between 1980 and 1988,
- a quadratic in average family labor income between 1980 and 1988,
- the change in family labor income between 1980 and 1988,
- the coefficient of variation of income between 1975 and 1989,
- a dummy variable indicating whether the household head was ever unemployed between 1980 and 1988,
- and the total duration of unemployment spells (in weeks) of the household head between 1980 and 1988.

For completeness, income and employment controls from the 1970s were included in many of the regression specifications. These controls added little to the predictive power of regression (1).

Including income and employment controls from the 1970s did not alter the reported results in any way.

When estimating equation (7), a measure of consumption growth and the after tax interest rate must be constructed. Consumption growth is defined as the percentage increase in annual food expenditures between year  $t$  and year  $t+1$ . The *PSID* annually collects information on the cost of food consumed at home, the amount spent away from home in restaurants and the value of food purchased with food stamps. Aside from the potential measurement error in the reporting of consumption data, researchers also must deal with the potential uncertainty surrounding the time period to which the respondents' answers refer. Questions dealing with the amount of non-food stamp consumption the household undertakes in an average week are asked primarily during April through August of each year, with the median interview date occurring in June. To obtain an estimate of annual food consumption flow, the *PSID* editors multiply this response by 52. A potentially important question is the time frame used by consumers in determining average consumption since that will determine the appropriate timing of the interest rate, current consumption, consumption growth and the relevant income growth. All food consumption reported during the early summer of year  $t$  is assumed to apply to all of year  $t$ .

Formally, a household's after-tax interest rate can be expressed as  $r_{i,t+1} = r_{t+1}^{bill} (1 - \tau_{i,t+1}) - \pi_{t+1}^e$ , where  $r_{t+1}^{bill}$  equals the average nominal rate on a one year treasury starting in June of year  $t$ ,  $\tau_{i,t+1}$  equals household  $i$ 's marginal tax rate in year  $t+1$ , and  $\pi_{t+1}^e$  is the expected inflation rate between  $t$  and  $t+1$ . The *PSID*, during this sample period, reports the household's marginal tax rate computed on the basis of detailed income data and the relevant tax tables. It is assumed that households have perfect foresight with respect to their future marginal tax rates. Because inflation is unpredictable, the household in period  $t$  may not know the real rate that it will face between  $t$  and  $t+1$ . Using the actual inflation rate between  $t$  and  $t+1$  may bias estimated coefficients because of the potential correlation with the error term. To account for this, most

researchers use the actual inflation rate when calculating the return and instrument using lagged inflation rates. Instead, I calculate the household's expected borrowing rate using the Livingston Inflation Forecast, where the forecast runs from June of year  $t$  to June of year  $t+1$ . The Livingston Survey of Inflation Forecasts is maintained by the Philadelphia Federal Reserve. All values were converted into 1989 dollars. This methodology for computing after-tax interest rates and consumption growth rates is similar to most authors who use the *PSID* data to estimate consumption Euler equations (see Shapiro, 1984; Zeldes, 1989; and Shea, 1995).

**Table 1: Descriptive Statistics for Two Sub Samples of Pre-Retired Households:  
Bottom 20% of 1989 Wealth Residuals and Top 80% of 1989 Wealth Residuals**

	I	II	III
	<i>1<sup>st</sup> Stage Residual Top</i>	<i>1<sup>st</sup> Stage Residual Bottom</i>	<i>p-value of difference Column I and II</i>
<i>Selected Income and Demographic Variables</i>	<i>80 Percent</i>	<i>20 Percent</i>	
<u><i>Wealth Distribution and Portfolio Composition</i></u>			
25 <sup>th</sup> percentile of Household Wealth	\$28,900	\$2,014	<0.01
Median Household Wealth	\$83,150	\$8,275	<0.01
75 <sup>th</sup> percentile of Household Wealth	\$205,500	\$29,954	<0.01
% Owning Home	0.77	0.43	<0.01
% Owning Stocks	0.31	0.12	<0.01
% Owning Business	0.19	0.03	<0.01
<u><i>Demographics</i></u>			
Age of Head in 1989	57	57	0.30
Dummy: Marital Status in 1989	0.68	0.58	0.02
Dummy: Divorced Anytime 1980 – 1988	0.11	0.12	0.50
Dummy: Race of Head in 1989 (Black = 1)	0.10	0.13	0.35
Dummy: Education in 1989 12 years or less	0.48	0.55	0.22
Dummy: Have Children Aged 1– 5 in 1989	0.03	0.01	0.09
Dummy: Have Children Aged 6 – 13 in 1989	0.06	0.05	0.65
Dummy: Have Children Aged 14 - 20 in 1989	0.20	0.20	0.91
Number of People in Household	2.4	2.2	0.25
<u><i>Labor Income and Labor Income Variability</i></u>			
Mean Family Labor Income in 1989	\$39,947	\$39,790	0.98
Mean Family Labor Income: 1980-1989	\$37,793	\$35,260	0.49
Change in Family Labor Income: 1980 to 1989	\$4,349	\$6,949	0.62
% Heads Unemployed in 1989	0.04	0.03	0.66
% Heads Unemployed Anytime 1980-1988	0.21	0.23	0.60
Median Coefficient of Variation of Income: 1975-1989	0.51	0.53	0.21
<u><i>Health Shocks</i></u>			
% With Head ‘Bad Health’ in 1989	0.19	0.25	0.10
% With Head ‘Bad Health’ Anytime 1980-1988	0.33	0.39	0.14
% With Wife ‘Bad Health’ in 1989	0.11	0.09	0.52
% With Wife ‘Bad Health’ Anytime 1980-1988	0.22	0.24	0.68
<u><i>Retirement Pension</i></u>			
% of 1989 Income Replaced During Retirement	0.54	0.52	0.66
<u><i>Consumption</i></u>			
Mean Household Food Consumption: 1980-1987	\$4,125	\$3,901	0.25
Mean Household Food Consumption: 1975-1979	\$3,481	\$3,264	0.13
Med. Coefficient of Variation of Consumption: 1975-87	0.37	0.41	0.13

Notes: The sample was split using the residuals from a first stage regression of 1989 household log wealth on a vector of household observables. The sample included all non-retired households aged 50-65 in the 1989 wave of the PSID (819 households). All dollar values are in 1989 dollars.

**Table 2**  
**Average Age of Retirement and Consumption Decline Upon Retirement,**  
**By 1989 Wealth Residual Groups**

Panel A: Sample Split Using 1989 Data			
	I	II	III
	1 <sup>st</sup> Stage Residual Top 80 Percent	1 <sup>st</sup> Stage Residual Bottom 20 Percent	p-value of difference Column I and II
Average Age of Retirement	62.4	62.3	0.99
Average Percentage Point Decline in Consumption At Retirement	-0.03	-0.11	0.14
Median Percentage Point Decline in Consumption At Retirement	-0.11	-0.19	0.40
Panel B: Sample Split Using 1984 Data			
Average Age of Retirement	62.7	62.8	0.99
Average Percentage Point Decline in Consumption At Retirement	-0.08	-0.16	0.07
Median Percentage Point Decline in Consumption At Retirement	-0.13	-0.22	0.08

Notes: Sample for Panel A includes all non-retired households aged 50-65 in the 1989 wave of the PSID, who were subsequently retired between 1990 and 1999. The sample size included 267 high wealth residual households (column I) and 51 low wealth residual households (column II). Sample for Panel B includes all non-retired households aged 50-65 in the 1984 wave of the PSID, who were subsequently retired between 1985 and 1999. The sample size included 421 high wealth residual households (column I) and 91 low wealth residual households. See the text for how the wealth residuals are computed. Retirement Age is defined as the first year that the household self-reports being retired. For each household, consumption prior to retirement is the sum of total food consumption in the three years prior to retirement. Likewise, consumption after retirement is the sum of total food consumption in the three years after retirement. To get the average percentage point decline in consumption at retirement, we compute the change in consumption for each household and then average across all households within the group. To compute the consumption statistics in this table, the top/bottom 5% of outliers in the change in consumption distribution were truncated. All dollar amounts reported in 1989 dollars.

**Table 3: Responsiveness of Early Life Consumption to Predictable Income Changes, Segmenting By 1989 Pre-Retired Wealth Residuals**

Variable	Coefficient (Standard Error)
Predictable Income Growth, All Households ( $\beta_1$ )	-0.16 (0.15)
Predictable Income Growth, Low Wealth Residual Households ( $\beta_2$ )	0.56 (0.28)

Notes: This table reports the estimates of the response of household consumption growth to predictable income changes (equation (7) in text).  $\beta_1$  is the coefficient on predictable income changes for the full sample.  $\beta_2$  is the coefficient on predictable income changes for households with low first stage wealth residuals. All other estimated coefficients were suppressed. Households with low first stage wealth residuals are defined to be pre-retired households between the age of 50 and 65 who had wealth residuals in the bottom 20% of the wealth residual distribution. See footnote to Table 1 for additional details. Households for which their one year consumption growth was in excess of 50% or less than -33% were excluded from the sample. The household was only excluded from the sample for that given year. These sample restrictions left 4,668 observations, based on 727 households. Standard errors (in parentheses) were adjusted for within household heterogeneity. The equation was estimated using two-stage least squared where the predictable component of household labor income growth was instrumented for using four lags of household labor income growth (excluding the first lag). The income processes was estimated separately for low wealth residual and other wealth residual households.

**Table 4: Responsiveness of Early Life Consumption to Predictable Income Changes, Testing For Liquidity Constraints**

Variable	Coefficient (Standard Error)
Predictable Income Increase, All Households ( $\beta_3$ )	-0.11 (0.25)
Predictable Income Decline, All Households ( $\beta_4$ )	-0.01 (0.29)
Predictable Income Increase, Low Wealth Residual Households ( $\beta_5$ )	0.35 (0.14)
Predictable Income Increase, Low Wealth Residual Households ( $\beta_6$ )	0.31 (0.17)

Notes: This table reports the estimates of the response of household consumption growth to predictable income increases and to predictable income declines (equation (8) in text).  $\beta_3$  is the coefficient on predictable income increases for the full sample.  $\beta_4$  is the coefficient on predictable income declines for the full sample.  $\beta_5$  and  $\beta_6$  are the coefficients on predictable income increases and predictable income declines for households with low first stage wealth residuals. All other coefficients were suppressed. Households with low first stage wealth residuals are defined to be pre-retired households between the age of 50 and 65 who had wealth residuals in the bottom 20% of the wealth residual distribution. See footnote to Table 1 for additional details. Households for which their one year consumption growth was in excess of 50% or less than -33% were excluded from the sample. The household was only excluded from the sample for that given year. These sample restrictions left 4,668 observations, based on 727 households. Standard errors (in parentheses) were adjusted for within household heterogeneity. The equation was estimated using two-stage least squared where the predictable component of household labor income growth was instrumented for using four lags of household labor income growth (excluding the first lag). The income processes was estimated separately for low wealth residual and other wealth residual households.

**Table 5:**  
**Responsiveness of Early Life Consumption to Predictable Income Changes, Additive**  
**Definitions of 1989 Low Wealth Residual**

Variable	Estimated Coefficient
Predictable Income Change, All Households	-0.26 (0.16)
Predictable Income Change, Households with 0-10 <sup>th</sup> percentile wealth residuals	0.93 (0.45)
Predictable Income Change, Households with 10-20 <sup>th</sup> percentile wealth residuals	0.34 (0.17)
Predictable Income Change, Households with 20-30 <sup>th</sup> percentile wealth residuals	0.14 (0.19)
Predictable Income Change, Households with 30-40 <sup>th</sup> percentile wealth residuals	-0.29 (0.25)
Predictable Income Change, Households with 40-50 <sup>th</sup> percentile wealth residuals	-0.18 (0.29)

Notes: This table reports the estimates of the response of household consumption growth to predictable income changes. The predictable income changes are interacted with five different dummy variables corresponding to the household's 1989 wealth residuals. All five dummy variables interacted with predictable income changes were included in the regression simultaneously. The five dummy variables indicated whether the household had 1989 wealth residuals in the: 0-10<sup>th</sup> percentile, the 10<sup>th</sup>-20<sup>th</sup> percentile, the 20<sup>th</sup>-30<sup>th</sup> percentile, the 30<sup>th</sup> – 40<sup>th</sup> percentile, and the 40<sup>th</sup> – 50<sup>th</sup> percentile. All other coefficients from the regression were suppressed. Households for which their one year consumption growth was in excess of 50% or less than -33% were excluded from the sample. The household was only excluded from the sample for that given year. These sample restrictions left 4,668 observations, based on 727 households. Standard errors (in parentheses) were adjusted for within household heterogeneity. The equation was estimated using two-stage least squared where the predictable component of household labor income growth was instrumented for using four lags of household labor income growth (excluding the first lag). The income processes was estimated separately for each wealth residual group.

**Table 6**  
**Household Response to Historical Saving Questions and to Subjective Self-Assessment of Planning and Spending Behavior:**  
**By 1989 Wealth Residual Groups**

	<b>I</b>	<b>II</b>	<b>III</b>
	<i>1<sup>st</sup> Stage Residual Top</i>	<i>1<sup>st</sup> Stage Residual Bottom</i>	<i>p-value of difference Column I and II</i>
1972 and 1975 Saving and Subjective Self Assessment Questions.	<i>80 Percent</i>	<i>20 Percent</i>	
<i>1972 Variables</i>			
% of households who describe themselves as being a planner (as opposed to living day-to-day). <sup>a</sup>	0.59	0.46	0.06
% of households who describe themselves as likely to “carrying out plans”. <sup>b</sup>	0.67	0.54	0.06
% of households who describe themselves as being a spender (as opposed to a saver). <sup>c</sup>	0.41	0.60	<0.01
% of households in 1972 with any positive savings.	0.80	0.66	0.02
% of households in 1972 with accumulated savings greater than two months of income.	0.52	0.30	<0.01
<i>1975 Variables</i>			
% of households who describe themselves as being a planner (as opposed to living day-to-day). <sup>a</sup>	0.56	0.38	0.01
% of households in 1975 with any positive savings.	0.80	0.74	0.25
% of households in 1975 with accumulated savings greater than two months of income.	0.48	0.29	<0.01
Sample Size	500	127	

<sup>a</sup> PSID question reads: “Are you the kind of person that plans his life ahead all the time or do you live more from day-to-day?”

<sup>b</sup> PSID question reads: “When you make plans ahead, do you usually carry out things the way you expected?”

<sup>c</sup> PSID question reads: “Would you rather spend your money and enjoy life today or save more for the future?”

Notes: All non-retired households between the age of 50 and 65 in the 1989 PSID who were in the sample during either 1972 or 1975 (627 households). Subjective self assessment questions were asked only in the 1972 and 1975 waves of the PSID. The 1972 set of questions were more extensive. As a result, the ‘carry out plans’ and the ‘saver versus spender’ questions were not asked in 1975. Household response to the question were on a 1-5 scale, with 5 being agree strongly with the statement and 1 being disagree strongly with the statement. Households are considered to respond positively to a question if they answered a 4 or a 5. Wealth residuals are defined as in Table 1.