Consumption vs. Expenditure

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Abstract

Standard tests of the permanent income hypothesis (PIH) using data on nondurables typically equate expenditures with consumption. However, as noted by Becker (1965), consumption is the output of a "home production" function that uses both expenditure and time as inputs. Individuals with lower values of time will spend more time on home production and less on market expenditures for a given unit of consumption. With this in mind, we revisit the retirement consumption puzzle by documenting that the dramatic decline in expenditures at the time of retirement is matched by an equally dramatic rise in time spent on home production. The innovation of our paper is that we empirically disentangle changes in actual consumption from changes in expenditures. To do so, we use a novel data set which collects detailed food diaries for a large cross-section of U.S. households. We show that despite the decline in food expenditures, neither the quantity nor the quality of food intake deteriorates with retirement status. Using our measures of actual consumption, we directly test the Permanent Income Hypothesis and find that the marginal value of wealth remains constant as individuals transition into retirement. We show that the increase in time spent on home production is quantitatively large enough to explain the decline in expenditure, holding actual consumption constant. Lastly, we show that unemployed households experience a decline in consumption commensurate to the impact of job displacement on permanent income. Taken together, the results on retirement and unemployment highlight how direct measures of consumption distinguish between anticipated and unanticipated shocks to income, while using expenditure alone obscures this difference and leads to false rejections of the PIH.

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I. Introduction

Standard tests of the permanent income hypothesis (PIH) using data on nondurables typically equate consumption with expenditure.[1] However, as noted by Becker (1965), consumption is the output of "home production" which uses as inputs both market expenditures and time.[2] To the extent possible, individuals will substitute away from market expenditures towards time spent in home production, including more intensive search for bargains, as the relative price of time falls. In this sense, an individual's opportunity cost of time has a direct bearing on the total cost of consumption, making market expenditures a poor proxy for actual consumption. In particular, consumption may remain constant even while observed market expenditures fluctuate.

In this paper, we directly examine the link between expenditures, time spent on home production, and actual consumption. To do this, we exploit a novel dataset - the Continuing Survey of Food Intake of Individuals (CSFII), conducted by the U.S. Department of Agriculture – which tracks the dollar value, the quantity, and the quality of food consumed within U.S. households. These data allow us to distinguish empirically between food expenditure and food consumption. We find that agents, in response to forecastable income changes, smooth consumption, but not necessarily expenditures, as predicted by the standard PIH model augmented with search/home production.

We use this data to revisit two major stylized facts in the household consumption literature: household non-durable consumption drops significantly during retirement (Haider and Stephens (2003), Bernheim, Skinner, and Weinberg (2001), Banks, Blundell, and Tanner (1998)) and household non-durable consumption drops significantly during unemployment (Stephens (2001)). The majority of researchers documenting these stylized facts use food expenditures as their measure of non-durable consumption. Some authors have interpreted the decline in expenditure at the onset of retirement as being

[1] This literature is vast. See surveys by Browning and Lusardi (1996) and Attanasio (1999). We use the terms Permanent Income Hypothesis, Life-cycle Model, and "consumption smoothing" to refer to the class of models in which agents seek a constant marginal utility of consumption (up to an adjustment for differences between time preference and the interest rate).

[2] See also Ghez and Becker (1975). Becker's insight was revived and extended by, among others, Benhabib, Rogerson, and Wright (1991), Greenwood and Hercovitz (1991), Rios-Rull (1993), and Baxter and Jermann (1999). Rupert, Rogerson and Wright (1995, 2000) and McGrattan, Rogerson, and Wright (1997) provide empirical evidence documenting the importance of home production.

evidence that households do not plan sufficiently for retirement (Bernheim et. al. (2001)), while others conclude that there is some unexpected news about lifetime resources that occurs at the time of retirement (Banks et al (1998)). Angeletos et al. (2001) interpret the decline in expenditure at the time of retirement as evidence that household preferences are time inconsistent. Using the CSFII data, we find that consumption expenditures fall by 17% at retirement.[3] However, this decline is accompanied by a 53% increase in time spent in home production (shopping for and preparing food) by individuals during retirement.

Given the sharp increase in time spent shopping for and preparing food, the pattern for expenditures may differ significantly from the pattern of actual consumption. To explore the response of consumption during retirement, we perform a comprehensive analysis of individual food diaries of retirement-age household heads. We first document that nutritional summary statistics of individual diets do not vary by retirement status. These nutritional measures include calories, vitamin content, protein, fat, cholesterol, and calcium. While rough aggregates, many of these measures (particularly cholesterol, fat, and vitamins) display strong income elasticities across working-age employed households, yet do not vary at all with retirement status. If anything, the quality of a household's diet, as measured by nutrition, improves with retirement. Secondly, we identify several individual food categories that display large income elasticities. For example, high income households tend to eat more fresh fruit, shellfish and wine, and less hot dogs and ground beef. Again, we find the frequency which retirees consume any of the individual food categories to be essentially identical to nonretirees with similar demographics. Thirdly, we examine consumption categories within which we can identify an observable quality component. For example, while retirees are less likely to eat out, the difference comes almost exclusively from a decline in visits to fast food restaurants. We find, however, that the probability of dining at a restaurant with table service does not vary across retirement status. Additionally, if the individual was ill-prepared for retirement, we would expect them to switch to lower quality goods. However, we find that retirees are

[3] Bernheim et. al. (2001) find similar food expenditure declines upon retirement using a panel of households from the Panel Study of Income Dynamics (PSID).

just as likely to consume brand name products (as oppose to generic store brands) and that they do not switch towards fattier cuts of meat (as oppose to lean cuts of meat).

While the fact that numerous individual components of consumption do not change during retirement is very informative, the CSFII data contains thousands of consumption categories. We therefore conduct a systematic analysis of the entire consumption basket of households. To do this, we first show that a standard intertemporal model of consumption, augmented to allow for home production, implies a one-to-one mapping from the entire vector of consumption categories along with total expenditure of the consumption basket, to the marginal utility of wealth (or the multiplier on lifetime resources). Taking this relationship to the data is complicated by the fact that agents face different relative prices depending on the opportunity cost of time. We show that this can be accommodated in a large class of home production models by including total expenditure as an additional control. Using a large number of consumption goods, we then estimate this mapping and test whether retirees experience a significant change in marginal utility. This is a direct test of the PIH given that retirement is an anticipated change in current income. Using several alternative sub-samples and specifications, we find no evidence that marginal utility changes with retirement status. Additionally, we are able to create a theoretically based composite consumption index. As seen in Figure 1, our composite consumption index is essentially flat across retirement ages despite the dramatic fall in expenditure.

We perform the same battery of tests to determine whether unemployment results in a consumption decline. As with retirement, the unemployed experience a decline in expenditures in both food at home and food away from home, with total expenditure falling 19%. The unemployed increase time spent in home production as well, although to a lesser extent than the retirees. In sharp contrast to retirement, however, our formal test of the PIH indicates that unemployment results in a significant decline in consumption. Controlling for demographics, our composite consumption index for unemployed households suggests a 5 to 6% decline in lifetime resources. This is not surprising given that other researchers have documented that involuntary job loss results in a persistent decline in annual income of roughly 8-10%.[4] The results on unemployment are therefore consistent with the PIH in the absence of perfect social insurance and provide an interesting counterpoint to retirement. That is, direct observation of consumption indicates a quantifiable difference between an unanticipated shock to permanent income and an anticipated shock such as retirement. This difference is obscured when one looks solely at expenditure.

This paper breaks new ground by looking directly at the home production function for food. Food expenditure has been used extensively in the estimation of consumption Euler equations using micro data sets (see surveys by Browning and Lusardi (1996) and Attanasio (1999)). The reason for the prominent use of food consumption is two fold. First, panel data sets, primarily the *Panel Study of Income Dynamics* (PSID), report only food expenditures out of the class of nondurable goods. Secondly, food is a necessary good with a small income elasticity, making it a strong test for consumption smoothing. However, as we show in this paper, the elasticity of substitution between time and expenditures may be large in the production of food intake; one can spend less money at the market and more time shopping or in the kitchen to produce an equivalent quantity of food. Given home production, we conclude that certain expenditures, particularly expenditures on food, are poor proxies for actual household consumption and mask the extent to which individuals smooth consumption in practice. However, it should be noted that search can reduce the expenditure of all goods, not just expenditures on food, if prices vary across retail outlets. To this end, we show that time spent shopping for non-food household items increase by 60% at the time of retirement.

The rest of the paper is organized as follows: Section 2 describes the two data sets used in the paper; Section 3 explores expenditure and time use in retirement; Section 4 studies the response of individual measures of consumption; Section 5 presents a formal model that allows a systematic test of the PIH using a full vector of consumption and expenditure data; Section 6 studies expenditure, time use and consumption during unemployment; and Section 7 concludes.

[4] See Huff-Stevens (1997).

II. Data

For our primary analysis, we use data from the *Continuing Survey of Food Intakes by Individuals* (CSFII) collected by the U.S. Department of Agriculture. Since the 1930's, the U.S. Department of Agriculture has conducted nationwide food surveys in order to monitor the health and dietary habits of the U.S. population. The survey is cross sectional in design and is administered at the household level. We make use of the two most recent cross sectional surveys; the first interviewed households between 1989 and 1991 (CSFII_89) and the second interviewed households between 1994 and 1996 (CSFII_94). Despite presenting a unique opportunity to study household consumption patterns, the CSFII data sets have been relatively unexploited by economists.[5]

The CSFII_89 included two independent random samples of the U.S. population. The "main" sample was designed to be nationally representative of all U.S. households. The "low-income" sample was designed to over-sample the poor by limiting eligibility to households with gross income for the previous month at or below 130 percent of the Federal poverty threshold. Unless we are specifically looking at a sample of low income households, we restrict all of our analysis to the main sample. The CSFII_94 was designed to obtain a nationally representative sample of non-institutionalized persons residing in households within the United States. The CSFII_94 differed slightly in design from the CSFII_89 in that it did not over-sample the poor.[6] All individuals within the households in both CSFII cross sections were asked to complete the survey. When analyzing individual-level data, we restrict our analysis to only include household heads. If more than one person in the household identified themselves as being the household head, we selected only the male member to maintain consistency with alternative household datasets, such as the *Panel Study of Income Dynamics* (PSID). The CSFII_89 interviewed 15,192 individuals in 6,718 distinct households while the CSFII_94 interviewed 16,103 individuals in 8,067 distinct households. The response rates for both surveys were high (over 85%). For all the analysis below, we pool the CSFII_89 and the CSFII_94 datasets.

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[5] See Wilde and Ranney (2000) and Shapiro (2003) for exceptions. Both papers examine the food intake of welfare recipients.
[6] See the Data Appendix for a detailed discussion of the sampling techniques used in the CSFII_89 and the CSFII_94.

The data sets track standard economic and demographic characteristics of its survey respondents including age, educational attainment, race, gender, occupation, employment status, hours worked, retirement status, family composition, geographic census region, whether the household lives in an urban area and household income. Additionally, given the Department of Agricultures goals, the survey asks respondents detailed health questions. These health questions come in three forms. First, respondents are asked to self assess their own health as being either excellent, very good, good, fair or poor. Such a question is similar to health questions asked in the PSID and the *Health and Retirement Survey* (HRS). Second, the respondents are asked specific health questions such as "Do you have high blood pressure?", "Do you have cancer?", "Have you had a stroke?", etc. We summarize all such questions regarding the household head's health inventory in the Data Appendix. Lastly, survey respondents are asked specific physiological questions such as height and weight.

The CSFII data sets also track two separate measures of consumptions. First, like the PSID and the HRS, respondents are asked to report their total expenditure during the previous month for food purchased at the grocery store, food delivered into the home, and food purchased at restaurants, bars, cafeterias or fast food establishments. We refer to the former two food expenditure measures as food expenditures "at home" while the latter measures food expenditures "away from home". This classification provides consistency with the food expenditure questions from the PSID.

As we discussed above, food expenditure need not reflect actual food intake due to home production. The CSFSII data allows a different – and arguably better – measure of food consumption. Each household in the CSFII data fill out detailed food diaries which are designed to record their total food intake during a given 24 hour period. The data is collected in person by a trained CSFII interviewer. The interviewer began by asking the sample person to report everything eaten or drunk the previous day between midnight and midnight.[7] The CSFII_89 collected detailed food diaries on three days while he

[7] The interviewers were not allowed to interrupt the respondent (sample person) during this initial listing of the day's intake. The sample person was invited to add any other items remembered as the interview progressed. Then, for each food and drink mentioned by the respondent, the CSFII interviewer followed up with detailed questions about that food item to illicit more information (i.e., the brand name, was it reduced calorie, was it high fiber, what type of fat or oil was used in preparing the meal, etc.). Additionally, the interviewer was armed with measuring cups, rulers, and graphical aides to help the respondent report

CSFII_94 collected detailed food diaries on two non-consecutive days. All data was collected via an in-home visit by a trained CSFII interviewer. The Data Appendix discusses the methodology of the food diary in much greater detail. In the empirical work that follows, we average each of our daily food intake measures over all the days for which the individual completed the food diary (i.e., over three days for the CSFII_89 and over two days for the CSFII_94).

Lastly, the CSFII data sets have measures of household income and wealth. The surveys report total labor income and income from interest and dividends for the household over the last year. The surveys also report the previous month's income from wages or salary for the household and the usual hours worked per week for the household head. Both surveys ask whether the household owns their own home. Additionally, the households are asked whether they have over $5,000 in "Cash, savings or checking accounts, stocks, bonds, mutual funds, and certificates of deposits". If the respondent answers no, they were asked to provide the amount of liquid assets they had less than $5,000.

Appendix Table A1 shows that a sample of household heads between the ages of 22 and 65 from the CSFII datasets mirrors a similarly defined sample from the 1993 PSID. Specifically, the proportion of heads that are male (75% vs 74%), the percent that are black (13% vs 14%), the percent with only a high school degree (35% vs 36%), the percent that own homes (60% for both), the percent employed (75% vs 81%), and the percent retired (7% vs. 6%) are nearly identical between the CSFII data sets and the 1993 PSID. More importantly, the average yearly household total food expenditure in the CSFII ($5,600/year, in 1996 dollars) is essentially the same as the average yearly household total food expenditure in the PSID ($5,400/year, in 1996 dollars). Likewise, the propensity for households to report themselves as being in good health or better is similar between the two surveys (85% in the CSFII vs 88% in the PSID). The Data Appendix discusses more fully how the CSFII data matches up with the PSID. In particular, the results from Appendix Table A1 document that the CSFII data is of good quality and representative of the U.S. population.

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accurate quantities. We found no evidence that the quality of responses differed between retired and non-retired households. See the "Documentation to the 1994-1996 Continuing Survey of Food Intakes by Individuals" for complete survey methodology.

Aside from a question regarding shopping frequency, the CSFII data does not explicitly track time spent on home production. To examine the extent to which households spend time in food production, we make use of an additional data set: the *National Human Activity Pattern Survey* (NHAPS) conducted for the United States Environmental Protection Agency by the Survey Research Center at the University of Maryland and administered between the fall of 1994 and the fall of 1996. The survey was designed to provide estimates of potential exposure to pollutants in air, water, and soil systems with which people in the United States come into contact throughout their typical daily routine. The study was a random-digit telephone survey of households in the continental U.S. Only one individual per household was included in the survey. The survey respondent in each household was chosen randomly (including children) based on which household member would have the next birthday. The total sample included 9,386 individuals.[8]

As part of the survey, each respondent was asked to provide a minute-by-minute time diary of the previous 24 hour day. The survey administrators at the University of Maryland aggregated up the information from the time diaries into 91 time use categories.[9] In this paper, we use two of these aggregate time use categories: "minutes spent preparing food" and "minutes spent shopping for food". In additional to the time diaries, the NHAPS asked the respondent to provide background information. While this information is far less extensive than in the CFSII data, it does include: age, gender, race, educational status, Census region, current work status, whether the individual is retired, whether the individual is unemployed, the size of the household to which the individual belongs, and whether the individual is a homeowner or renter. The data does not explicitly ask questions about the individual's income or wealth.

[8] While many other surveys ask detailed information on individual time use (i.e., Michigan Time Use Survey, The American's Use of Time, and the Time Use Longitudinal Panel), the NHAPS data set has two advantages. The first, and most important, is the large sample size. Neither the Michigan Time Use Survey nor the Time Use Longitudinal Panel has sample sizes exceeding 2,000 individuals. Additionally, the NHAPS data surveys households in recent time periods unlike the Michigan Time Use Survey (1965 and 1975), the American's Use of Time (1965-1966) or the Time Use Longitudinal Panel (1975, 1976, and 1981). Starting in 2003, the U.S. Census, via the Current Population Survey, will ask detailed questions about individual time use. This data is not expected to be available to researchers until late 2004.

[9] See EPA report EPA/600/R-96/148 (July 1996) for a detailed description of the survey methodology and coding classifications.

III. Expenditure and Time Use among the Retired

Retirement, for most households, is a discreet, planned event (Haider and Stephens (2003)). According to the permanent income hypothesis, forward looking agents will smooth their marginal utility of consumption across predictable income changes. However, there is a large literature which documents that upon retirement, household expenditures fall dramatically (Banks, Blundell, and Tanner (1998), Bernheim, Skinner and Weinberg (2001), Miniaci, Monfardini and Weber (2002), Haider and Stephens (2003), and Hurd and Rohwedder (2003)). The literature refers to such a finding as "the retirement consumption puzzle". Specifically, using PSID data, Bernheim et. al. (2001) find that: 1) total food expenditure declines by about 30% between the pre and post retirement periods for the average household, 2) the decline in expenditure occurs for both food purchased at grocery stores and food "away from home", and 3) total expenditures decline dramatically regardless of the household's position in the pre-retirement wealth distribution. With respect to the last point, they find that households with pre-retirement wealth in the lowest wealth quartile experience a 57% decline in expenditure during the subsequent two years after retirement. The comparable decline in expenditure for households in the second wealth quartile, third wealth quartile, and the top wealth quartile are 29%, 30%, and 21%, respectively.[10] They find that while the decline in expenditure is largest among low wealth households, very wealthy households and median wealth households experience similar declines in food expenditure at the time of retirement.[11,12]

In this and the subsequent two sections, we use the CSFII and NHAPS data sets to illustrate that the retirement consumption puzzle is no puzzle at all once we disentangle consumption from expenditure. Given that their opportunity cost of time has declined, retired individuals will be more willing to expend effort to reduce the market prices they face for a given unit of consumption. When time is cheap,

[10] Table 3 and Figure 4 of Bernheim, Skinner and Weinberg (2001).
[11] Hurd and Rohwedder (2003) exploit expectation questions in the HRS to illustrate that most households expect a decline in consumption expenditures during retirement. They conclude that the decline in consumption expenditures at the time of retirement does not result from poor planning on the part of the household. Additionally, they report survey evidence from the HRS that time spent on home production increases after retirement. Our paper complements their work by examining the change in actual consumption intake that occurs as a household retires.
[12] Miniaci, Monfardini and Weber (2002), using Italian data, and Banks, Blundell and Tanner (1998), using data from the British Family Expenditure Survey, document that total expenditures decline sharply at the incidence of retirement.

individuals are likely to substitute toward time intensive activities like clipping coupons, searching for sales across multiple stores, or engaging in home production. All of which will reduce the price paid by those individuals for a given unit of consumption. With respect to food expenditure in particular, home production is very important. An individual can spend less by making a meal from scratch as opposed to ordering that same meal from a take-out restaurant or the grocer's deli section. If time can be used to reduce market costs, one would expect expenditure on food to fall and time spent on food production (shopping for food and preparing meals) to rise as households enter retirement. Actual consumption may not change despite the decline in expenditure.

To examine food expenditure, time spent on food production, and food consumption at the onset of retirement, we restrict both the CSFII and NHAPS samples to include only households with heads between the ages of 57 and 71 for which there is a full set of control variables (2,052 household heads and 1,308 individuals for the CSFII and NHAPS samples, respectively). The vast majority of households retire between 57 and 71. Less than 10% of the CSFII household heads are retired prior to the age of 57 and over 70% are retired by the age of 71. This number is similar to retirement propensities in the Health and Retirement Survey (HRS).

To begin, we document the "retirement consumption puzzle" using expenditure from the CSFII data sets. Figure 1 plots the average total expenditure on food for male household heads aged 57 - 71, by three year age ranges.[13] As retirement propensities increase with age, household expenditure declines sharply with age. The peak retirement age range for individuals is 63-65. Over 50% of all household heads retire within this age range. Between 60-62 (pre-peak retirement age) and 66-68 (post-peak retirement age), household expenditure on food declines by 13% for male headed households (p-value <0.01). Notice, prior to age 62, expenditure is constant. Figure 2 decomposes expenditure for all households (both male and female headed) in the CSFII sub-sample by retirement status. Households

[13] In Figure 1, we focus on only male household heads. We do this because the probability that a female is a household head increases with age (given differences in mortality rates across the sexes). Given that females eat less than males, we may observe consumption falling with age simply as a result of differences in sample composition. In all our regression work below, we focus on the full sample of household heads and include controls to account for changes in sample composition.

with a retired head spend 11% less on food than their non-retired counterparts ($377 vs. $423, p-value of difference <0.01).

The decline in consumption expenditures with age or at the time of retirement is robust to the inclusion of a rich set of controls designed to capture changing demographics and health among older households. The top portion of Table 1 reports the estimates to the following two regressions:

$$\ln(x_{it}) = \alpha_0 + \alpha_1 Retired_{it} + \alpha_2 Z_{it} + u_{it} \tag{3.1}$$

$$\ln(x_{it}) = \beta_0 + \beta_1 Age\_63_{it} + \beta_2 Z_{it} + v_{it} \tag{3.2}$$

where x_{it} is total food expenditure, expenditures on food "at home", or expenditures on food "away from home", depending on the specification, for household *i* in year *t*. $Retired_{it}$ is a dummy variable equal to 1 if the household head *i* is retired in year *t*, Age_63_{it} is a dummy variable equal to 1 if household head *i* is 63 years old or older in year *t*, and Z_{it} is the vector of year, region, demographic and health controls. Specifically, the *Z* vector includes a series of controls for household composition including family size, education dummies for the household head, a dummy variable equal to 1 if the household head is black, a dummy variable equal to 1 if the household head is male, dummies indicating census regions, and time dummies. The *Z* vector also includes all the health controls discussed in the Data Appendix.

Given that the timing of retirement can also be correlated with unmeasured variables which affect the household's expenditure decisions, we estimate (3.1) via an instrumental variable procedure. As is common in the literature, we use age as our instrument for retirement.[14] Age naturally has strong predictive power for the household head's retirement status. The adjusted R-squared of a regression of

[14] At a mechanical level, the research design we implement throughout this paper, via instrumenting for retirement status with age, compares the behavior households in their early 60s, where there is less than 20% of household heads retired, to households aged in their mid 60s, where over 70% of household heads are retired. The difference in sample composition from comparing essentially 62 year olds to essentially 66 year olds is small. According to the 1989-1991 U.S. Census Mortality Tables, the mortality rates for 62 year olds, 66 year olds, and 68 year olds, are, respectively, 1.4%, 2.0%, and 2.3%. Additionally, the differences in health status between retired and non-retired 57-71 year olds are also minimal. We document this in Appendix Table A2.

household retirement status on age controls is 0.19 (with an associated *F*-statistic of 119.0).[15] The top rows of Table 1 report that even after controlling for year, region, demographic and health controls, retired households spend 17% less on total food (p-value <0.01), 15% less on food at home (p-value = 0.01), and 31% less on food away from home (p-value = 0.01). The results are broadly consistent with the findings of Bernheim et al. (2001) and Haider and Stephens (2003).[16] For robustness, we estimate equation (3.2) via OLS with the variable of interest being a dummy variable indicating whether the household head is aged 63 or older. The results, reported in the second column of Table 1, yield qualitatively similar conclusions as the IV regressions reported in column I.[17]

While expenditure declines with retirement status, time spent on food production dramatically increases with retirement status, where we define food production as shopping for food and preparing meals. Figure 1 shows that male household heads aged 66-68 (post peak retirement years) spend 21% more time on food production than households aged 60-62 (pre-peak retirement years).[18] The pattern persists when directly comparing retired to non-retired households (Figure 2). Focusing on the NHAPS sub-sample of individuals aged 57-71, retired individuals spend 27% more time on food production than their non retired counterparts (47 minutes vs. 37 minutes, p-value of difference <0.01).

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[15] Haider and Stephens (2003) argue that self-reported retirement expectation is a better instrument for the timing of retirement than age. Using self-reported retirement status as their instrument, they still find that expenditure declines by 8-10% at the time of retirement. In the CSFII data, we only observe a cross section of households and retirement expectations are not asked.

[16] Lundberg et al. (2003), using data from the PSID, find that the decline in food expenditure at the time of retirement only occurs for married households. For single households in the PSID, expenditure remains constant through retirement. Using the Retirement History Survey, Haider and Stephens (2003) find that compared to married households, single households experience *greater* declines in expenditure at retirement. Using the CSFII data, we find that expenditure declines significantly for both single and married households, although the declines are larger for married households. The difference in results across the surveys is likely due to the small fraction of households that are of retirement age and are single.

[17] We have also run (3.1) including age and age squared as additional regressors. We continued using age dummies as our instruments for retirement status. Given that we have restricted the sample to near retirement-age adults, collinearity prevents the data from distinguishing the decline in expenditure at retirement from the decline in food expenditure that occurs between the ages of 60 and 66 (figure 1). Banks et al. (1998) have fit a quadratic over the entire lifecycle and identified a retirement effect. As a general point, any purely lifecycle pattern of expenditure can be fitted with a polynomial in age of high enough degree. This paper's innovation concerns a different point. As we document later in the paper, the pattern of actual food consumption remains stable over this age range, despite the sharp fall in expenditure. The differences between the lifecycle pattern of consumption and expenditure persist regardless of whether age and age squared are used as additional regressors. The home production model (and the corresponding changes in time use) reconciles these two findings.

[18] Households aged 54-56 (not shown on Figure 1) spend slightly more time on food production than households aged 57-59 (36 minutes/day vs. 34 minutes/day). The amount of time spent on food production by 54-56 year olds is essentially the same as the amount of time spent on food production by 60-62 year olds. The dramatic increase in time spent on food production occurs for households above the age of 62.

While women are more likely than men to engage in home production of food in any period, the increase in time spent on food production at retirement is most prominent for men. Retired female household heads spend 17% (51 vs. 60 minutes, *p*-value = 0.04) more time on food production than their working counterparts (not reported). Retired men, however, relative to working men, spend 46% more time on food production (18 vs. 29 minutes, *p*-value < 0.01).

The bottom rows of Table 1 shows that the effect of retirement on time spent on food production is even greater once we control for household demographics. Specifically, we estimate the following regressions:

$$h_{it} = \alpha_0 + \alpha_1 Retired_{it} + \alpha_2 Z_{it} + u_{it} \quad (3.3)$$

$$h_{it} = \beta_0 + \beta_1 Age\_63_{it} + \beta_2 Z_{it} + v_{it} \quad (3.4)$$

where h_{it} measures individual *i*'s propensity to shop for food or total daily time spent (in minutes) on food production. The CSFII data asks households whether they do their major shopping at least once a week. The NHAPS data, as discussed above, records time spent shopping for food and time spent preparing meals. For the NHAPS data, we also use as a dependent variable a dummy variable indicating whether time spent on food production is positive, and the log of time spent of food production, conditional on food production being positive as alternative measures for the dependent variable. *Retired, Age_63,* and *Z* are defined as above.[19] In all specifications, we instrument for retirement status using the household head's age. The adjusted R-squared of a regression of retirement status on age controls in the NHAPS sub-sample is 0.15 (*F*-statistic = 67.3).

The lower rows of Table 1 shows that retired households are 17 percentage points more likely to do their major food shopping on a weekly basis (p-value <0.01). Two thirds of households shop on a weekly basis implying that retired households are 25% more likely to shop for food at least once per week (0.16/0.66). Likewise, the NHAPS data shows that retired households spend 18 more minutes per day on

[19] Given that the demographic variables recorded in the NHAPS data are much more limited, the *Z* vector for time spent on food production include only year, region, sex, household size, education and race controls. The NHAPS dataset does not include any health measures.

food production (p-value = 0.02) and spend 53% more time on food production, conditional on food production being positive (p-value <0.01). The breakdown between shopping and preparation (not reported) indicates that retirees spend 42% more time shopping than nonretirees and 54% more time preparing food, conditional on demographics and positive time spent on the activity.

Our focus thus far has been on food expenditure and food consumption. However, the NHAPS data also tracks time spent shopping for non-grocery household goods. At the time of retirement, households increase their propensity to shop for other goods by 50% (0.22 vs 0.16, p-value of difference < 0.01) and their total time spent shopping for other goods by 64% (23 minutes per day vs. 14 minutes per day, p-value of difference = 0.01). This suggests that expenditure may not be an accurate measure of actual consumption for non-food goods. In summary, retired households spend more time shopping for food, more time preparing food, and more time shopping for other goods compared to their pre-retired counterparts. Given that both increasing search and increasing home production can reduce prices paid by households, it is not surprising that expenditure falls during retirement.

It should be noted that 18 minutes a day is a sizeable increase in time spent on food production. The 18 minutes per day (Table 1) translates into an additional 9 hours per month of food production. If households value their time during retirement at half the average pre-retirement wage, this would translate into an additional $81 per month of food production.[20] During retirement, total monthly expenditures on food, conditional on demographics, decline between $70 per month (our data) and $100 per month (Bernheim et al, 2001). That is, if one values the time of retired households at half their pre-retirement wage, the increase in time spent in food production for retired households is roughly the same as their decline in food expenditure.

The fact that time spent on home production increases with retirement status is consistent with the majority of work which examines time use. For example, Juster and Stafford (1985), in their treatise on time use, document thoroughly that time spent in home production is negatively correlated with the value

[20] The average hourly wage of working household heads between the ages of 57 and 71 in the CSFII sample is $18/hour. Half the hourly wage is $9/hour. 9 hours a month of extra food production valued at $9/hour results in an additional $81 per month of food production.

of time. Hurd and Rohwedder (2003) use self-reported data from HRS respondents to document that retired individuals aged 65-69 spend 100% more time shopping for *all* goods and 47% more time preparing meals compared to their non-retired counterparts. Blaylock (1989) finds that shopping frequency is an increasing function of age among older households. Lastly, Cronovich, Daneshvary, and Schwer (1997) show that coupon use increases significantly for households older than 65. Taken collectively, older households by clipping coupons, spending more time on food production, and shopping more frequently, reduce the price they pay for a given quantity of food consumption. In summary, previous research and our findings in Figures 1-3 and Table 1 suggest that expenditure is not an appropriate measure of consumption, especially for retired households were the value of time is changing. The substantial adjustment in time spent in shopping and home production implies that it is likely inappropriate to equate expenditure with consumption. In the next two sections, we use better measures when examining the behavior of consumption in retirement.

IV. Nutrition, Consumption Categories and Luxury Goods in Retirement

As noted above, the CSFII data provide tremendously detailed accounts of an individual's dietary habits. To assess whether an individual's food consumption changes in retirement, we explore the evidence in four ways. First, we examine the nutritional composition of the individual's diet. Secondly, we examine individual categories of food consumption. In both cases, we identify nutritional measures and consumption categories that exhibit strong income elasticities. This allows us to test whether retirees switch away from goods preferred by wealthy households. In other words, do retired households behave as if their permanent income has declined? Thirdly, we explore consumption goods that have an observable quality component. Specifically, we look at an individual's propensity to eat out at restaurants with table service, the individual's propensity to eat branded foods as oppose to store or generic brands, and the individual's propensity to eat lean cuts of meat as oppose to fattier cuts of meat. If an individual is unprepared for retirement, we would expect that individual to switch towards lower quality goods (fattier cuts of meat, generic brands) or to switch away from luxury goods (restaurants with table service).

Lastly, in Section V, we conduct a systematic test of the PIH using a formal model and an aggregate of a much larger set of consumption and expenditure measures.

The CSFII reports summary statistics for each individual's daily diet. This procedure is discussed in detail in the Data Appendix. We start our analysis by focusing on 8 nutritional measures: total calories, vitamin A, vitamin C, vitamin E, calcium, saturated fat, cholesterol, and protein. Our methodology has two components. First, we want to establish that these nutritional measures vary with lifetime resources. Second, we show whether the amount of these nutritional measures consumed changes with retirement status.

Table 2 shows the results of the analysis of nutritional measures. The first panel reports the income elasticity of these nutritional measures for a sample of household heads between the ages of 45 and 55 who are working full time.[21] To obtain this elasticity, we estimate an IV regression of the log of the nutrition measure on the log of income as well as controls for race, sex, family composition, height and health controls. We instrument current household income with occupation, education, education and occupation interactions, and sex and race interactions. In this sense, we only use the "permanent" component of variation in income. Aside from the log calories regression, all other regressions in panel I include log calories as an additional control. In the second panel, we regress this same dependent variable on a dummy variable equal to 1 if the household head is retired (instrumented with age dummies). This sample is the same used to compute the estimates in Table 1 (i.e., it includes all household heads aged 57 – 71). This regression also includes race, sex, year, region, household composition, and health controls.

Log calories vary slightly with permanent income within a cross section of middle aged, working households (Panel I of Table 2). Specifically, using the CSFII data, employed household heads with \$40,000 of labor income will consume approximately six percent less calories than employed households with \$80,000 of labor income. Even allowing for a more flexible functional form (i.e., including a cubic

[21] We also computed the income elasticities reported in Tables 2 and 3 for households working full time on two alternative samples: 1) households aged 25 – 55 and 2) households aged 57 – 71. The results for the former sample are discussed in Aguiar and Hurst (2004). The latter sample matches non-retired households analyzed in Table 1 and Panel II of Table 2. The estimated income elasticities were nearly identical across the three different samples we analyzed.

in permanent income), log calories does not respond much to changes in permanent income. This is consistent with the findings of Behrman and Deolalikar (1987). These results imply that even if households are financially unprepared for retirement, we may not expect caloric intake to differ substantially across retirement status for similar individuals.

While calories do not vary markedly with permanent income, other dietary components respond strongly to variation in income. Specifically, the income elasticities of vitamin A and vitamin C are over 0.40 (p-value < 0.01) and the income elasticities of vitamin E and calcium are 0.24 and 0.10, respectively (p-value of both < 0.01). Likewise, cholesterol and saturated fat are inferior goods (respectively, income elasticities equal to -0.22 and -0.10, p-value for both < 0.01). These elasticities are estimated controlling for total (log) caloric intake. The results are also robust to the inclusion of controls for whether the household head is taking specific vitamin supplements. Furthermore, nonlinear estimation (not reported) confirms that vitamins (either A, C, or E) are a strictly increasing function of income over all observed income ranges. Likewise, cholesterol is a strictly declining function of income over all observed income ranges. The results are consistent with individuals consuming inexpensive calories by switching their diet towards fat and cholesterol and away from vitamins and calcium. The suggestion that "fat" is cheap and "healthy diets" are expensive is consistent with a large literature on nutrition and income.[22, 23]

The results from panel I of Table 2 suggest that if an individual enters retirement with too few resources, we should observe the composition of their diet shifting away from vitamin-rich foods (which are expensive) towards fat and cholesterol (which are cheap). So, even though their total calories may not change, the quality of those calories consumed should fall for households who are forced to decrease their consumption at the time of retirement. As seen in panel II of Table 2, there is no evidence that the quality of a household's diet deteriorates as they become retired. Actually, retired households consume higher

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[22] See, for example, Subramanian and Deaton (1996) or Bhattacharya, Currie, and Haider (2001, 2003).

[23] One potential concern with the regression is that income may be correlated with nutritional literacy or other preferences for a healthy diet. To address this, we can make use of the CSFII measures of nutritional preference and nutritional literacy. In particular, households are specifically asked about their preference regarding a healthy diet and whether they are informed about the dangers of unhealthy diets (see the data appendix for the exact wording of the questions). We included a number of these controls in the specifications reported in Tables 2 and 3 and found little impact on the reported coefficients.

quality diets (as measured by more vitamins and less cholesterol) compared to their working counterparts. This result is also robust to the inclusion of controls which account for whether the individual was consuming vitamin supplements. If the decline in expenditure represented an actual decline in consumption, we would expect to observe either total calories declining or the quality of calories deteriorating. Neither of those predictions is borne out in the data.[24]

Moving beyond nutritional aggregates, we also observe detailed food intake for each individual. The CSFII data tracks the quantities consumed (in grams) in a given day using thousands of eight digit food codes. Appendix Table A3 shows the level of detail of these 8 digit codes for one food category – cheese. The structure of these food codes is similar to that of SIC occupation and industry codes. As a result, we can aggregate these food codes up to broader classifications. For much of our analysis, we use three digit food codes (e.g. natural cheeses, cottage cheeses, processed cheeses, imitation cheeses, etc.). The reason we do not always exploit the 8 digit food code categories is that often there are only a handful of households that consume any given specific type of food category on a given day. For example, many households may consume 'natural' cheeses on a given day, but only a few will actually consume brie. There are some instances below, however, where we do use the 8 digit food codes (like when discussing fat contents of meat or branded vs. generic cereals). We have explored hundreds of the individual 3 digit and 8 digit consumption categories. Table 3 reports the results from only a few of these categories. The categories we chose were ones which had strong income elasticities among working households or ones which were suggested to us by other researchers. While only a handful of the categories are presented, it should be stressed that we found no evidence that individuals experienced a systematic consumption decline upon retirement among all the goods we explored.

Table 3 has essentially the same structure as Table 2. The first panel measures the income semi-elasticity of the incidence of consuming a positive amount of a given food category. The sample and

[24] It should be noted that we find an 8% decline in calories for retired households with low wealth (p-value = 0.01). Low wealth households are defined as renters who report having less than $1,000 in liquid assets. Given the structure of the CSFII data, we are not able to define sharper definitions of household wealth. However, this finding is broadly consistent with the results of Bernheim et al. (2001) which document that low wealth households take a much more severe decline in consumption compared to households in the rest of the wealth distribution.

controls are identical to those of Table 2. The dependent variable is a dummy variable equal to 1 if the individual consumed any of the consumption category. We report seven food categories: fresh fruit, shellfish, wine, yogurt, oat/rye/multigrain bread, hot dogs/lunch meat and ground beef. As seen from Panel I of Table 3, the first five categories all exhibit strong positive income semi-elasticities. For example, a doubling of income increases the probability that a household eats fresh fruit by 23 percentage points (p-value < 0.01), where 65% of the sample consumed fresh fruit. Conversely, hot dogs/lunchmeat and ground beef have negative semi-elasticities. If an individual must decrease actual consumption at the time of retirement, one would expect such a household to switch away from food categories with high income semi-elasticities and toward cheap categories. However, as seen in the second panel of Table 3, there is no evidence that individuals switch away from goods with high income elasticities at the time of retirement. For these categories, the consumption patterns of retirees look very similar to their non-retired counterparts. The only statistically significant change suggests that retirees eat better in the sense we see a slight increase in the propensity to eat fruit.

The analysis so far may be subject to the criticism we are missing quality differences within categories. For example, it may be that household consumption of ground beef does not change at the time of retirement. But, instead, retired households consume cheaper, low quality ground beef while pre-retired households consume more expensive, higher quality ground beef. In Table 4, we examine goods with an observable measure of quality.

First, the CSFII data set tracks the location of where each meal is consumed. Specifically, if the meal is consumed away from home, we know if it is at a fast food restaurant, a cafeteria, a bar, or at a restaurant with table service. Eating at a restaurant with table service provides more ambiance and higher quality food than a fast food establishment. Although not included in the table, the "luxury good" quality of restaurants is clear in the data -- within a cross section of household heads aged 45-55 who are working full time, a doubling of income increases the incidence of eating at a restaurant with table service by 16% (p-value < 0.01).

However, there is no evidence that individuals decrease their propensity to eat at restaurants with table service upon retirement. In Table 4, we see that retired households are 18 percentage points less likely to eat away from home. This is consistent with the findings in Table 1 that expenditure on food away from home declines by 30% as individuals retire. But, from Table 4, we see that the decline in eating away from home is due to individuals ceasing to eat at fast food restaurants and cafeterias. In fact, the propensity to eat at a restaurant with table service is 29% for both individuals aged 60-62 (pre peak retirement years) and for individuals aged 66-68 (post peak retirement years). If an individual were truly unprepared for retirement, we would expect to see the incidence of eating at restaurants with table service to decline upon retirement.

Additionally, we can directly test whether individuals switch toward lower quality goods, within a given food category, upon retirement. For most food items, information on the "brand" of that good is unavailable. This is not the case, however, with cereals. For most cereals, we know both the manufacturer and the brand. For example, there are separate codes for Kellogg's Raisin Bran, Post Raisin Bran, Total Raisin Bran, or Generic (Store Brand) Raisin Bran. If households prefer "name brand" cereals, all else equal, we would expect households who are resource constrained to switch towards unbranded cereal. Unbranded cereals, on average, are of a slightly lower quality than their branded counter parts and, as a result, are sold at a reduced price. Table 4 shows that among cereal eaters, the propensity to eat branded cereal does not change with retirement status.[25]

Another quality characteristic for which we have data is the leanness of meat. Specifically, the 8 digit food codes distinguish between whether the household consumed regular ground beef, lean ground beef, or extra lean ground beef. While ground beef is an inferior good, the propensity to eat ground beef does not increase with retirement status (Table 3). Table 4 shows that for those who consume ground beef, the quality of ground beef consumed does not deteriorate as they enter retirement.

[25] Given the IV procedure and the relatively small sample sizes, it is not surprising that the standard errors are large for the brand vs. non-brand cereal regressions. Similar conclusions are drawn from analyzing the mean probability of eating generic cereal by retirement status. For household heads aged 57-71 who eat cereal, 13% percent of retired households eat non-branded cereal and 14% percent of non-retired households eat branded cereal (p-value of difference = 0.67).

V. A Formal Test of the Permanent Income Hypothesis

The preceding two sections documented that retirees' consumption patterns look essentially the same as their non-retired counterparts for a variety of individual food categories. This evidence strongly suggests that retirees do not experience a decline in food consumption at retirement. However, the categories highlighted in the analysis thus far represent only a small fraction of the CSFII data available for analysis. Moreover, we have not systematically linked the pattern of consumption to a formal test of the Permanent Income Hypothesis (PIH). The PIH predicts constant (discounted) marginal utility of wealth across predictable income shocks, not constant consumption. This section explores how we use a much richer set of consumption and expenditure controls to formally test the PIH.

To do this we reformulate the standard consumer's intertemporal problem in a framework that allows for home production. Home production can be interpreted generally as the transformation of time and expenditures into consumption goods. That is, consumption of good j, denoted c_j, is the output of a home production function that uses time h_j and expenditure x_j as inputs. To streamline the exposition, we focus on search as a particular form of home production, but below we will indicate how to extend the analysis to more general home production specifications. That is,

$$x_j = p_j(h_j)c_j \tag{5.1}$$

where $p_j(h_j)$ is the price paid for good j after having searched h_j units of time. We assume positive but diminishing returns to search: $p_j'(h_j) < 0,\ p_j''(h_j) > 0$. It would not change the derivation substantially to allow the price of good j to depend on time spent searching for other goods as well.

We assume that period utility is additively separable in consumption and leisure. One potential resolution for the retirement consumption puzzle is that consumption and leisure enter non-separably. That is, the additional leisure enjoyed in retirement induces less consumption. Our alternative explanation is that the decline in the value of time in retirement lowers the total cost of consumption. A key testable difference between the two resolutions is whether consumption (rather than expenditure) declines as leisure increases. We therefore cast our test in the traditional paradigm of separability and directly measure whether consumption remains constant, falls, or increases during retirement.[26]

The consumer's problem at time t can then be stated as follows (suppressing individual subscripts):

$$V(a_t, y_t, l_t, t) = \max_{\{c,h\}_{jt}} \left\{ u(c_{1t}, ..., c_{Jt}; \theta) + v(1 - \sum_j h_{jt} - l_t) + \beta E_t V(a_{t+1}, y_{t+1}, l_{t+1}, t+1) \right\} \quad (5.2)$$

subject to:

$$a_{t+1} = (1+r)(a_t + y_t - X_t) \quad (5.3)$$

where,

$$X_t = \sum_j p_{jt} c_{jt} \ . \quad (5.4)$$

and total time available has been normalized to one. Individuals receive utility from consuming a vector of J consumption goods denoted $c_1, ..., c_J$. Utility is also dependent upon "taste shifters", θ, to be discussed below.[27] Total resources at period t consists of financial assets, a_t, which carry the risk free interest rate r, plus labor income y_t. Total expenditure in period t, X_t, is the sum of the expenditure for all J goods in period t. β is the intertemporal discount factor and E_t represents expectation conditional on information through time t. Note that t is a state variable as well, representing the aging of the individual. In particular, age influences the evolution of income and hours worked.

The other state variable in the individual's problem is hours worked, l. We assume that the entire path of l is given exogenously. An alternative model with similar empirical implications is to treat the wage as the state variable and let agents endogenously chose labor supply. However, since our empirical analysis will focus on retirement/unemployment (l = 0) versus full-time employment, an exogenous transition between employed and non-employed states is more transparent.[28]

[26] We also follow the usual empirical practice by assuming food consumption is separable from the consumption of other goods.
[27] To the extent that the taste parameters vary stochastically over time, they would also be considered a state variable in the consumer's value function.
[28] In particular, our empirical implementation would be the same if we let workers choose hours worked in response to exogenous wage movements and set $y_t = w_t l_t$. The latter approach would imply an additional first order condition linking the marginal utility of leisure to the wage. As the wage falls, agents substitute away from market work and towards leisure and

The first order conditions from the above maximization are:

$$\frac{\partial u}{\partial c_j} = p_j(1+r)\beta E_t \frac{\partial V}{\partial a_{t+1}} \tag{5.5}$$

$$\frac{\partial v}{\partial h_j} = -p'(h_j)c_j(1+r)\beta E_t \frac{\partial V}{\partial a_{t+1}} \tag{5.6}$$

The first condition sets the marginal utility with respect to good j equal to the price of good j times the marginal utility of an additional dollar. The second equates the marginal utility of leisure to the marginal value (in dollars) of additional search for good j times the marginal utility of an additional dollar. The second first order condition implies that, all else equal, a non-employed individual will spend more time in search and, as a result, will pay lower prices.

The envelope condition implies:

$$\frac{\partial V}{\partial a_t} = \beta(1+r)E_t \frac{\partial V}{\partial a_{t+1}} \tag{5.7}$$

One could formulate PIH tests on a good-by-good basis using the individual good's first order condition (5.5) and the envelope condition. However, two issues arise when attempting to implement such a strategy. First, the consumer maximizes utility over many goods. In terms of our data, we could literally check the response of over 1,000 individual goods. The second issue is that the consumption of each individual good depends on that good's price. Most micro data sets, including the CSFII data, do not include information on the price paid for each individual good. This is problematic since agents in retirement or unemployment face a lower opportunity cost of time (lower marginal utility of leisure) and therefore will search more intensively and pay a lower price. Typically, studies using micro expenditure data assume agents face common prices. The theory of search/home production implies that this is not a

search/home production. Either approach has the same implication for the first order condition for consumption, which is the only condition used in the estimation.

valid assumption. A goal of this study is to show empirically that this consideration is quantitatively important.[29]

We can overcome the fact that individual food category prices are not observed by reformulating the first order condition in terms of the entire basket of expenditure. To see this, first multiply both sides of (5.5) by c_j:

$$\frac{\partial u}{\partial c_j} c_j = p_j c_j \beta(1+r) E_t \frac{\partial V}{\partial a_{t+1}} \tag{5.8}$$

As this holds for all goods, we can sum (5.8) over j:

$$\sum_j \frac{\partial u}{\partial c_j} c_j = \beta(1+r) E_t \frac{\partial V}{\partial a_{t+1}} \sum_j p_j c_j \tag{5.9}$$

where we have pulled the marginal value of wealth through the summation of goods. Denoting the marginal value of wealth in period t as $\lambda_t = \partial V / \partial a_t$, we can reformulate (5.9) and the envelope condition as:

$$\lambda_t = \frac{\sum_j \frac{\partial u}{\partial c_j} c_j}{X_t} \tag{5.10}$$

This expression states that the marginal value of an additional unit of wealth equals the marginal utility of consuming more of each good in our consumption basket divided by the total cost of our consumption basket. The intuition is the same as that of the first order condition for an individual good, but aggregated up to the entire consumption basket. The important point empirically is that even though we do not observe individual prices in our CSFII data, we do observe X for each household in our sample (as well as the consumption of each individual good).

[29] Note that prices paid for goods will vary with hours worked through the second first order condition. Extending this to first order condition (5.5) implies that the amount consumed will vary with the opportunity cost of time. In this manner, consumption may vary with temporary fluctuations in the wage or hours worked, consistent with the large literature on the "excess sensitivity" of consumption to predictable or temporary shocks to income. In a quantitative model of home production, Baxter and Jermann (1999) demonstrated that the excess sensitivity puzzle could be resolved by incorporating home production.

It should be noted that the above derivation is robust to more general forms of home production. In particular, our search formulation is an important special case of Becker's (1965) general model of home production: $c_j=f(x_j,h_j)$. Any such home production function which is homogenous of arbitrary degree in expenditure has a similar empirical implication as that derived above.[30]

We assume households have standard preferences over aggregate consumption (C) such that:

$$u(C,\theta)=\frac{C^{1-\sigma}}{1-\sigma}e^{\theta} \tag{5.11}$$

where

$$C=C(c_1,.....c_J). \tag{5.12}$$

We assume the aggregator function C is constant returns to scale.

Substituting (5.11) and (5.12) into (5.10), we can express the first order condition as:

$$\lambda_t=\frac{C_t^{1-\sigma}}{X_t}e^{\theta_t} \tag{5.13}$$

where we have used the fact that C is constant returns to scale, implying $\sum\frac{\partial u}{\partial c_j}c_j=(1-\sigma)u$ (if $\sigma=1$, $\sum\frac{\partial u}{\partial c_j}c_j=e^{\theta}$) According to the permanent income hypothesis, if there is no news about changes in lifetime resources associated with retirement, the discounted marginal utility of wealth should be constant as a household transitions into retirement. This implies that conditional on lifetime resources, the expression on the right hand side of equation (5.13), which is a function of observables, should not vary across retirement status. This implication will be the foundation of our test of the PIH.

In order to infer marginal utility from consumption, we must first estimate the parameters of the utility function and the consumption index C. To do this, we assume that prime-aged, fully-employed

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[30] The first order condition with respect to expenditure for good j is $f_{x_j}\partial u/\partial c_j=\beta(1+r)E_t\partial V/\partial a_{t+1}$. Euler's formula states that $xf_x=sf\ (=sc_j)$ if f is homogenous of degree s in expenditure. Multiplying both sides of the FOC by x_j and applying Euler's formula yields an expression that differs from (5.9) only by the constant s.

household heads satisfy the first order condition (5.13). The left hand side of (5.13) represents the marginal value of wealth. This in turn is a function of lifetime resources, labor supply, and age. For estimation, we assume that the cross section variation in lifetime resources is due to differences in labor income (that is, agents start off with similar financial wealth and face the same rates of return and time preference). We therefore approximate the log of the marginal utility of wealth as being a linear function of log permanent income and a polynomial in age and employment hours such that:

$$\ln(\lambda_t) \approx \varphi_0 + \varphi_y \ln(y^{perm}) + \varphi_1(age_t) + \varphi_2(age_t^2) + \varphi_3(hours_t) + \varphi(hours_t^2) \qquad (5.14)$$

To assess the robustness of this approximation, we discuss alternative specifications in Appendix 2. To obtain the parameters of the consumption aggregator, we combine (5.14) together with the log of the first order condition (5.13) and rearrange:

$$\begin{aligned}\ln(y^{perm,i}) = \beta_0 + \alpha_1 c_{1,t}^i + ... + \alpha_J c_{J,t}^i + \beta_X \ln(X_t) + \beta_\theta \theta_t^i \\ + \beta_{age} age_t^i + \beta_{age^2}(age_t^i)^2 + \beta_{hours} hours_t^i + \beta_{hours^2}(hours_t^i)^2 + \varepsilon_t^i\end{aligned} \qquad (5.15)$$

There are a number of issues related to (5.15) that should be noted. Firstly, we have linearized the term $(1-\sigma)/\varphi_y ln(C)$ over the individual components $c_1 ... c_J$. This approximation will be close given that each consumption good is essentially a zero/one variable. Individuals, on any given day, only consume a handful of goods out of the hundreds of potential food items. Most of the variation across individuals in the CSFII food intake data comes from whether or not an individual eats a particular item, not how much of the item the individual consumes. In this sense, our estimation essentially traces out a step function over the individual goods. In Appendix 2, we discuss alternate specifications of the aggregate consumption function.

A second issue concerns the residual. Equation (5.13) is a first order condition and will hold exactly in theory. However, in practice we will not observe an exact relationship for several reasons. One source of error is that we are approximating life-time resources (5.14). However, within (5.15), there is no reason to suspect that the measurement error inherent in our dependent variable will be correlated with any of our right hand side variables. Perhaps of greater concern is the presence of choice variables (i.e., consumption measures) on the right hand side. To the extent that the residual captures idiosyncratic tastes, it will be correlated with our measures of consumption. The vector of taste shifters, θ, controls for some observable variation in tastes. Specifically, we include a sex dummy, race dummies, household composition dummies, the individual's height, and the full vector of household health controls discussed in the Data Appendix. Any remaining unobserved variation in tastes may still pose an issue. To the extent that the residual taste variation is idiosyncratic, we can remove it by averaging over individuals. In the same way, averaging will also help mitigate idiosyncratic measurement error in our right hand side variables. In Appendix 2 we discuss how we estimate (5.15) using group level data. The results presented below and those presented in Appendix 2 are nearly identical.

Thirdly, (5.15) is modeled such that permanent income is our numeraire. This defines the units of our consumption index ($\alpha_1 c_1 + ... + \alpha_J c_J$) in terms of permanent income dollars – a one unit increase in our consumption index is comparable to a one percent increase in permanent income.

We find it useful to consider an alternative interpretation of (5.15). In essence, we are projecting an individual's permanent income on their food intake and expenditure (along with demographic and work intensity controls). In this sense, (5.15) provides the least-squares forecast of permanent income conditional on an individual's diet. To explore how well food consumption predicts permanent income among individuals who are working full time, we split the sample into two. We start by estimating (5.15) for full-time employed individuals aged 25-55 in the *odd* years of our survey. The R-squared of this regression was 0.53. Food consumption items on their own explain 21% of the variation in permanent income, while the incremental R-squared of the addition of the food variables to the expenditure and demographic controls was 0.12. Using the regression coefficients, we predicted permanent income out-of-sample for full-time employed individuals aged 25-55 in the *even* years of the sample. We then run our predicted permanent income on the individual's actual permanent income. The R-squared from this regression was 0.42 (omitting demographics and expenditure and using food alone to predict permanent income produced an out-of-sample R-squared of 0.09). This out-of-sample forecasting power indicates that diet is fairly informative regarding permanent income.

We estimate equation (5.15) using a sample of households aged 25-55 who report working full time. All regressions were run with and without year and region dummies with no change in results. Restricting the estimation of (5.15) to a sample of household heads aged 25-55 who report themselves employed full time leaves us with 2,966 individuals. The permanent income for each employed household head is estimated as in section 4. For a list of the food controls included in the regression see Appendix Table A4.

From the estimation of (5.15), we obtained the parameters of the aggregation function and, as a result, can form $\ln \hat{C} \equiv \hat{\alpha}_1 c_1 + ... + \hat{\alpha}_J c_J$ for each individual (including retired households).[31] Figure 1 plots $\ln \hat{C}$ for all household heads in the CSFII data between the ages of 57 and 71, by three year age ranges. While expenditure falls dramatically for households in the peak retirement age, the consumption index remains essentially constant. This result is consistent with the results from section 4. Households do not appear to change their diet in any discernable way as they enter retirement. Figure 2 breaks down households by retirement status rather than age and tells a similar story. For comparison, Appendix figure A1 plots aggregated consumption and expenditure over the working-age life-cycle for full-time employed household heads. Expenditure, despite being purged of household size effects,[32] displays the familiar hump shape. On the other hand, consumption itself increases relatively sharply between the ages of 25 and 37, then remains relatively stable thereafter.[33] We leave exploration of expenditure and consumption early in the lifecycle for future research.

With the parameters estimated from equation (5.15) in hand, we are now ready to formally test the permanent income hypothesis with regard to retirement. Specifically, we use the reported consumption

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[31] Note that we use the term $\ln \widehat{C}$ to refer to the estimated counterpart of the model's $(1-\sigma)/\varphi_y \ln(C)$, where concavity of the value function implies φ_y <0 and conventional wisdom holds that σ>1.

[32] Specifically, expenditure in Figure A1 is the residual from regressing log expenditure on dummy variables indicating household size.

[33] Note that expenditure and consumption in figure A1 are in different units. Consumption is normalized by the elasticity of permanent income with respect to consumption. However, this normalization does not influence the *shape* of the consumption profile.

and expenditure measures to form the fitted values of $\ln \hat{C} + \widehat{\beta}_x \ln X + \widehat{\beta}_\theta \theta = \hat{\alpha}_1 c_1 + ... + \hat{\alpha}_J c_J + \widehat{\beta}_x \ln X + \widehat{\beta}_\theta \theta$. From the model's derivation, this measure is inversely proportional to the log marginal utility of wealth and we therefore denote it $\ln(\widehat{1/\lambda})$. The PIH implies that conditional on life-time resources, this measure should not vary with retirement status. To test this proposition, we estimate the following regression:

$$\ln(\widehat{1/\lambda_t}) = \delta_0 + \delta_1 Retired_t^i + \delta_z Z_t^i + \eta_t^i \qquad (5.16)$$

where Z is a vector of variables controlling for lifetime resources, namely dummies for sex, race, education, household size, region, residence in an urban area, and year. As usual, we instrument retirement status with age dummies. Table 5 reports the results. The first row of Table 5 reports the coefficient on retirement from specification (5.16). The second row replaces the retirement dummy with a dummy variable indicating whether the household head is aged 63 years or older. To account for the multiple steps in generating our dependent variable, we bootstrap standard errors using 500 simulations. The sample used for the estimation is the same as the sample used to estimate the regressions in Tables 1 and 4 and panel 2 of Tables 2 and 3. The regressions in Table 5, like those in earlier tables, are cross sectional in nature. In essence, we estimate whether the marginal utility of wealth differs between non-retired and retired households after controlling for expected lifetime resources and demographics between the two households. The results are striking: retired household heads (row 1) and heads older than 63 (row 2) have the same marginal utility of wealth as their younger, non-retired counterparts (the difference being -0.006 and -0.003, respectively).

The specifications underlying the first two rows of Table 5 relate the level of the marginal utility of wealth to retirement status, controlling for determinants of lifetime resources. A common alternative in the consumption literature tests for changes in marginal utility by examining consumption Euler equations. Given the CSFII data, this task is complicated by the absence of a panel. However, by averaging over similar individuals (i.e., creating synthetic cohorts), we can follow representative individuals as they age through their life cycle.[34] With this constructed panel and our measure of consumption, we can test the log-linearized Euler equation:[35]

$$\Delta \ln(C^{i}_{t,t+1}) = \omega_{0,t} + \omega_1 \Delta Retired^{i}_{t,t+1} + \omega_x \Delta \ln(X^{i}_{t,t+1}) + \omega_\theta \Delta \theta^{i}_{t,t+1} + \varepsilon^{i}_{t+1} \qquad (5.17)$$

The advantage of this procedure is that we relate changes in consumption directly to changes in retirement status. We also eliminate some of the error associated with the individual level data. The downside of course is we lose the informative individual variation as well. The results of estimating (5.17) are reported in third row of Table 5. Our estimate of ω_1 is -0.002 (standard error = 0.01), implying that the transition into retirement is not associated with an abrupt change in the marginal utility of actual consumption intake.[36]

Note that equation (5.17) differs from the typical Euler Equation in that we make a distinction between consumption and expenditure. A useful check on our panel construction is to test for a decline in *expenditure* at retirement, a fact already documented in the literature using synthetic panel data (e.g., Banks et al. (1998)). Regressing expenditure growth on a retirement dummy (with and without additional taste controls) using our synthetic panel yields a coefficient on the retirement dummy of -0.08 (standard error = 0.04). In other words, households experience an 8% decline in expenditure at the incidence of retirement. This is close to the range of estimates outlined in Section III. More importantly, we see a

[34] More precisely, we define *i* to represent a group defined by sex, race, household size, and education. Let *k* represent employment status (full-time and retired), and *t* denote age. The sample is restricted to full-time or retired household heads between the ages of 57 and 71. We construct $\ln \hat{C}^{i,k}_{t}$ by averaging $\ln \hat{C}$ across individuals with a common triplet *(i,k,t)*. Our dependent variable is $\Delta \ln \hat{C}^{i,k,k'}_{t,t+1} = \ln \hat{C}^{i,k}_{t+1} - \ln \hat{C}^{i,k'}_{t}$. The retirement dummy takes a one if *k=retired* and *k'=full-time* and zero otherwise (we omit the case where *k=full-time* and *k'=retired,* i.e. the transition out of retirement).

[35] Notice that (5.17) is nearly identical to the standard consumption Euler Equation for a model with no home production (see, for example, Zeldes (1989)). It only differs in that it is formed over a consumption aggregate *C* and it controls directly for changes in log total expenditures. The derivation of (5.17) is straightforward by taking the log of (5.13), using the envelope condition, and expressing consumption in terms of aggregate consumption.

[36] The specification reported in Table 5 does not include controls for health and other demographics. We constructed group-level taste and demographic controls by averaging dummy variables within groups. That is, the percentage of a group which report having high blood pressure etc. Including within-group differences (across age) as additional regressors does not change the result. The estimated coefficient on retirement was -0.005 with a standard error of 0.01. We also ran (5.17) omitting expenditure and found a retirement coefficient of -0.003 with a standard error of 0.01.

stark contrast between the properly specified Euler Equation and one that replaces consumption with expenditure.

The results reported in Table 5 are robust to alternative samples and functional form assumptions. In Appendix 2, we discuss a series of alternate specifications for (5.15). As seen in Appendix Table A5, the alternate specifications yield nearly identical results to those reported in Table 5.

A typical concern with finding that a variable has no effect is the power of the test: that is, are we confident that our procedure would detect a significant effect if one indeed existed in the population. The fact that our measure of the marginal utility of wealth based on consumption and expenditure predicts permanent income out of sample is one argument against this concern. Secondly, our measure of the marginal utility of wealth includes expenditure directly, implying that if our food consumption measures were meaningless, our index would simply track expenditure. Retirement clearly predicts a drop in expenditure, suggesting our consumption measures are playing a significant role in the analysis.[37] Finally, as we discuss in the next section, our consumption-based measure of marginal utility responds to unemployment status. Given that there is news about changes in permanent income associated with unemployment, we would expect the consumption index to respond to job displacement. We shall see the test of the PIH introduced in this section is one powerful enough to recognize unemployment as a shock to permanent income.

VI. Consumption Changes during Unemployment

As retirement is an essentially anticipated change in employment, it provides a clean test of the PIH. The evidence presented in the previous two sections strongly indicates that the PIH, augmented with search/home production, is consistent with the well-documented drop in expenditure on food at retirement. In this section, we use the data and methodology developed in the previous sections to analyze the change in the marginal utility of consumption when workers become unemployed. To the

[37] Our measure of marginal utility includes log expenditure, which enters multiplied by the elasticity of permanent income with respect to expenditure. As intuition would suggest, this elasticity is positive and statistically significant. Of course, multiplying log expenditures by a constant does not alter the statistical significance of the effect of retirement on expenditure.

extent that unemployment represents an unanticipated shock to lifetime resources, the PIH does not predict that consumption will remain constant across unemployment status. However, theory does suggest that unemployed agents should spend more time in search/home production to reduce the price paid for a unit of consumption.

In this section, we explore the behavior of expenditure, time use and consumption across employment status for the working age population. Our analysis focuses on the sample of household heads between the ages of 25 and 55 that are either employed full-time or unemployed. When analyzing the unemployed, we do not exclude the over sample of the poor from the 1989-91 CSFII survey. The over-sample provides us with many more unemployed individual. As a result, our CSFII sample consists of 3,874 household heads, 7% of which report being unemployed. For time use, we restrict the NHAPS sample to working age individuals who are either employed full-time or unemployed and report less than 6 hours of food production. This leaves a sample of 3,364 individuals, 4.6% of which are unemployed.

As with retirement, we first document that unemployed households spend less on food than their employed counterparts. Figure 3 indicates that monthly expenditure falls by a little more than \$100 in unemployment, or 20% of the average employed food bill of \$530.[38] To control for other observables, we estimate

$$\ln(x_{it}) = \beta_0 + \beta_1 Unemployed_{it} + \beta_2 Z_{it} + v_{it} \qquad (6.1)$$

where x_{it} is total food expenditure, expenditures on food "at home", or expenditures on food "away from home", depending on the specification, for household *i* in year *t*. $Unemployed_{it}$ is a dummy variable equal to 1 if household head *i* is unemployed in year *t*. As before, the *Z* vector includes the same series of health and demographic controls included when estimating (3.1).

[38] Using the PSID, Stephens (2001) finds that household food expenditure declines by roughly 10% following involuntary job loss of the household head. Using the British Family Expenditure survey, Banks, Blundell, and Tanner (1998) find unemployed households experience a 7.6% decline in food at home and domestic energy and a 52% decline in work-related expenses which include restaurant meals, transport, and adult clothing.

The results of estimating (6.1) are reported in the top panel of Table 6. Total expenditure on food falls by 19% in unemployment (p-value <0.01), with food at home falling by 9% (p-value =0.02) and food away from home falling by 42% (p-value <0.01). These numbers are comparable in magnitude to those reported by Banks et al. (1998).

As predicted by theory, unemployed households spend more time shopping and preparing food. Figure 3 shows that average time spent in home production increases by 15 minutes per day (p-value<0.01), or roughly 50% more than the average time spent by employed individuals. Table 6 reports regressions of time use on unemployment status, controlling for demographics. Unemployed individuals spend, on average, 12 minutes more than employed individuals in food production (p-value <0.01), or 28% more time conditional on reporting a positive amount of time (p-value <0.01). The data suggest that most of the increase in home production takes place in food preparation and not shopping: unemployed households are just as likely to shop at least once a week as their employed counterparts (p-value of difference = 0.49). Conditional on demographics, the increase in time spent on shopping and food preparation in unemployment is less than that observed in retirement. This is not surprising assuming that the unemployed are actively looking for a job.

The final panel of Figure 3 and the last row of Table 6 indicate that unemployed households experience significant changes in consumption (Figure 3) and the marginal utility of wealth (Table 6). As discussed in section 5, we form our consumption index, $\ln \hat{C}$, and the marginal utility of wealth by using the coefficients from (5.15). Conditional on our full vector of health, demographic, and education variables, Table 6 reports that unemployed household heads experience an implied drop of 5% in lifetime resources (p-value <0.01). In other words, our consumption and expenditure measures imply a difference in the marginal value of wealth between employed and unemployed household heads that is equivalent to a difference of 5% in permanent income, all else equal. We perform the same robustness checks for unemployment as we did for retirement in terms of specification (discussed in Appendix 2). Over the alternative specifications, the estimated drop in implied lifetime resources for the unemployed ranged from 5% to 8%.[39] In each case, we were able to reject a zero change in our consumption index at standard confidence levels.

Finally, we look more closely at the effect of unemployment on food away from home. As noted above, expenditure in this category drops roughly 40%, ten points more than the 30% decline observed in retirement. Recall that retiree's decline in the propensity to eat away from home was largely confined to the reduced frequency of fast food and cafeteria meals. Table 7 breaks down the propensity to eat food away from home by type of establishment for the unemployed, controlling for the full set of demographics and health variables. The first row reports that the probability of eating out declines 25 percentage points in unemployment, compared to a sample mean of 70 percent. As with retirees, the probability of eating fast food or cafeteria meals show dramatic declines in unemployment, with fast food declining 17 percentage points (vs. a sample mean of 45%) and cafeterias declining 10 points (vs. a sample mean of 12%). Both declines are statistically significant at the 1% level. However, unemployed household heads also experience a large decline in visits to restaurants with table service. The incidence of dining out at such establishments declines 18 percentage points (p-value <0.01) in unemployment, with a sample mean frequency of 34%. In contrast to the retirees, the unemployed therefore experience a significant loss in terms of the quality of their consumption of meals away from home.

Consistent with the decline in the composite consumption index and the decline in the propensity to eat at restaurants with table service, unemployed households experience declines in food consumption quality along other dimensions.[40] Specifically, relative to their employed counterparts, unemployed households consumed 16% less vitamin C, 12% less vitamin A, and 14% less vitamin E. Additionally, unemployed households were 5 percentage points more likely to consume hotdogs, 3 percentage points less likely to consume shellfish, and 9 percentage points less likely to consume fresh fruit. The vitamin, shellfish, and fresh fruit differences were significant at the 5% level.

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[39] The decline in the implied lifetime resources was not due to the inclusion of the over sample of low income households from the 1989-91 CSFII. Excluding the over sample results in an estimated decline in the marginal utility of wealth equivalent to a 5% drop in permanent income as well.

[40] Estimates not included in tables to conserve space.

The data on the quality and quantity of food consumed indicate that unemployed households experience a measurable drop in utility. The decline in lifetime resources implied by the pattern of consumption and expenditure is roughly 5 to 6% (Tables 6 and A5). This number is similar to the estimates of the shock to permanent income due to job loss. For example, Huff-Stevens estimates that job displacement reduces earnings (relative to pre-unemployment) by roughly 9% six or more years after the onset of an unemployment spell.[41] In short, the results on unemployment indicate that households do experience a drop in utility due to unemployment, consistent with the PIH combined with the absence of perfect social insurance. Moreover, the change in consumption during unemployment provides an interesting counterpoint to the notable absence of such a decline during retirement. This further suggests that if there were a meaningful decline in consumption associated with retirement, our tests have enough power to detect it.

VII. Discussion and Conclusion

The data on food consumption analyzed in this paper indicate that consumption is much more stable across individuals with similar permanent income but different current income than are expenditures. The evidence suggests that agents are able to maintain a smooth consumption profile, in part, by substituting time for expenditures. One concern with our study is that we are analyzing cross sections of individuals when the model predicts the behavior of a given individual over time. We have a fairly rich set of demographic and health variables that help control for individual heterogeneity. More importantly, we find fluctuations across individuals in expenditures that are not present in consumption. In particular, we quantitatively match the behavior of expenditures during retirement and unemployment that have been documented by other researchers with panel datasets, while at the same time documenting that consumption behaves much differently than expenditures.

[41] Similarly, Topel (1991) finds a mean decline in earnings within five years of job loss of 14%. He also finds that the decline increases with job tenure. Consistent with this last fact, we find that our decline in implied lifetime resources associated with unemployment increases with age.

The key issue is whether our measures of food intake capture the utility of food consumption. Throughout the paper, we measure food quantity and quality along a number of dimensions. All of the measures tell a consistent story. The individual income elasticities, the out-of-sample checks, and the fact that the unemployed show a consumption decline confirm that our measures are able to detect a decline in permanent income when present. Our analysis indicates that consumption is stable, both absolutely and relative to expenditures, during anticipated shocks to income such as retirement.

While food consumption represents only a portion of the household's total consumption bundle, the ability to shop for bargains and utilize other means of home production applies to much broader classes of goods. Although we do not have direct data on consumption of other goods, the analysis in this paper suggests that expenditure may be a misleading measure of consumption more generally. This is supported by the fact that time shopping for non-food items increase by 60% during retirement. However, what we can conclude directly from the evidence in this paper is that any decline in total consumption due to temporary or anticipated fluctuations in income occurs along dimensions other than food. This is perhaps expected given the fact that food is a necessary good and amenable to home production. However, it provides an important contrast to conclusions drawn from studies using food expenditures.

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Appendix 1: Data Appendix

For our primary analysis, we use data from the *Continuing Survey of Food Intakes by Individuals* (CSFII) collected by the U.S. Department of Agriculture. Since the 1930's, the U.S. Department of Agriculture has conducted nationwide food surveys in order to monitor the health and dietary habits of the U.S. population. The survey is cross sectional in design and is administered at the household level. We make use of the two most recent cross sectional surveys; the first interviewed households between 1989 and 1991 (CSFII_89) and the second interviewed households between 1994 and 1996 (CSFII_94). The two CSFII datasets collect information on the kinds and amounts of foods eaten by Americans at home and away from home. Information on food eaten is collected via an in-person interview on 2 (for the CSFII_94) or 3 (for the CSFII_89) nonconsecutive days. Each day's information is collected using a 24-hour dietary recall.

Households were randomly chosen to participate in the survey. The entire sample of the CSFII_94 and the main sample of the CSFII_89 were designed to be nationally representative. The CSFII_89 included an over-sample of the poor. Unless we were specifically looking at low-income households (including the unemployed), we restricted our analysis to the CSFII_89's main sample. In conducting both surveys, interviewers visited every sample address in person to inspect visually and to determine whether the location represented a residential housing unit. In general, all selected households were eligible to participate in the basic survey. However, households with nine or more persons unrelated to the head of household were considered group quarters and were not eligible. All related individuals in the selected household were eligible to participate in the survey (roomers, borders, and employees were excluded). Persons who were living away at school, traveling during the survey period, in military barracks, or in institutions were also excluded.

The survey was conducted in stages. During the first stage, the interviewer (in person) recorded household level data. This data included: age, educational levels, employment status, race, and sex of each individual in the household; household size, housing tenure, household income, food assistance program participation, and some other food-related practices. During this interview, respondents were also asked to identify the "male household head" (if present) and the "female household head" (if present). The main meal planner for the household was also asked to report their usual expenditures on food. Specifically, the following three questions were asked:

1. During the last three months, how much money has this household spent per week (or per month) at grocery stores, including the stores' salad bars, soup bars, delis. etc.? Include purchases made with food stamps.

2. During the last three months, how much has this household spent per week (or per month) on food at specialty stores – such as bakeries, liquor stores, delicatessens, meat markets, vegetable stands, health food stores, and other similar places – when the food was brought into your home?

3. During the last three months, what has been this household's usual amount of money spent per week (or per month) for food bought and eaten away from the home? Include food and beverages that never entered your home, that is, eaten at restaurants, fast food places, cafeterias at work or at school or purchased from vending machines, for all household members?

During the CSFII_94, households were also explicitly asked to separate out fast food expenditures from other food expenditures away from home. For our work, we computed three food expenditure measures: total food expenditures, food expenditures at home and food expenditures away from home. The total food expenditures summed together all three of the above food expenditure questions; food at home summed only the first two questions; and the third question represented food away from home. All food expenditures were converted into monthly expenditures represented in 1996 dollars.

Aside from the expenditure questions, the CSFII respondents were asked to provide detailed health questions. First, each individual was asked to self assess their own health. This question is nearly identical in design to the self assessed health question asked of Panel Study of Income Dynamic respondents. Specifically, the question reads "In generally, would you say your health is excellent, very good, good, fair or poor?"

Aside from self assessing their own health, individuals were asked detailed questions about their health history. In particular, the questionnaire includes “Has a doctor every told you that you have diabetes?", and the same question repeated for high blood pressure, heart disease, cancer, osteoporosis, high blood cholesterol, and stroke. Lastly, individuals were asked to discuss past and current smoking behavior, report their current height and weight, and indicate how much they exercise.

The main part of the CSFII data centers on the detailed food diaries. After collecting the background information, the interviewer returned to the household within the next few weeks to help the respondents complete a detailed food diary of the previous day. The respondent was asked to report everything they ate or drank during the previous 24 hour period (starting at midnight of the prior day). Specifically, each individual provided:

1. Detailed descriptions of all foods and beverages consumed (including brands);
2. Quantities eaten;
3. Time each eating occasion began;
4. Name of each eating occasion;
5. With whom the food was eaten;
6. Source of the food (from home food supply or obtained and eaten away from home).
7. Place from which food was obtained; and
8. Use of fat, salt, etc. in the food preparation (asked only of the main meal planner/preparer).

The interviewers used standard household measuring cups and spoons and a ruler during the interview to help each individual estimate quantities of foods and beverages consumed. Under each food/drink category, there was a list of probing questions that the interviewer was required to ask in order to collect enough detail for the food to be properly coded. For example, probes included: "What was the brand name?", "Was your (food item) regular, reduced calorie, high fiber, or something else?", or "Did you add any spice or condiment to the food?". Additionally, the interviewer was directed to ask for the ingredients to some food consumption (for example, what foods comprised homemade soups, tacos, sandwiches, salads, casseroles, etc.). For each individual in the survey, they completed multiple food diaries (three for the CSFII_89 and two for the CSFII_94). The subsequent interviews were conducted similarly to the first. Households were nominally compensated for their participation in the survey. Upon completion of the survey, the Department of Agriculture converted the food diaries into more tangible measures of nutrition (calories, protein (in grams), etc.). For the methodology and software used for the conversion see www.barc.usda.gov/bhnrc/foodsurvey/home.htm. For the work in this paper, we only used the multi-day average of nutritional measures for each household. Lastly, it should be noted that it was required that at least 10% of the food diaries covered every day of the week.

Given that the CSFII datasets are household surveys, we focus our analysis on the expenditure and consumption behavior of the household head. As noted above, expenditure is a household level variable while our consumption measures are at the individual level. For most married couples, both the husband and the wife report themselves as being a household head. In such instances, we follow the definition of "household head" used in the Panel Study of Income Dynamics (PSID) and include only the male household head in our analysis sample. Like the PSID, a female is only considered a head of household if no male household head is present. This restriction 1) ensures that we include only one member of each household in our empirical work and 2) makes our work directly comparable to results found using the PSID.

Appendix Table A1 compares the pooled CSFII_89 and CSFII_94 data sets to the 1993 PSID. We focus on the PSID given that a large fraction of consumption research uses that survey's food data. For comparison purposes, we restrict both samples to include only household heads with ages between 22 and 65. The resulting sample sizes were 7,350 for the pooled CSFII samples and 6,108 for the 1993 PSID sample. The demographic composition of both samples closely mirrors each other. Appendix Table A1 shows that the composition of households in the CSFII datasets is very similar to the composition of households in the PSID.

We reestimated all of the regressions in Tables 2, 3 and 4 with the inclusion of questions from the CSFII data set measuring a household's preference for high nutrition diets. Specifically, we use the following questions: "Now think about buying food. When you buy food, how important is nutrition?"; "Now think about your diet. How important is it to you that you choose a diet with plenty of vegetables?"; "Now think about your diet. How important is it to you that you choose a diet with plenty of fruits?"; and "Have you heard of any health problems that may be related to being overweight?". The first three questions are asked on scales ranging from very important to not important at all. The latter question is a yes or no question. The CSFII_94 combines the fruit and vegetable questions into one question. We experimented with other nutritional literacy questions. The questions are too numerous to list. None of the nutritional literacy or nutritional preference questions affected the nutritional income elasticities reported in Tables 2 and 3.

Appendix 2: Empirical Robustness of Formal Test of PIH

In this appendix we discuss the empirical robustness of the tests of the PIH discussed in sections 5 and 6. Recall that our model implies agents equate the marginal utility of wealth to the marginal utility of the consumption basket divided by total expenditure (equation (5.13)). We used an approximation to this first order condition as a basis for estimating the parameters of the consumption aggregator. We repeat our estimation equation ((5.15)) below:

$$\begin{aligned} \ln(y^{perm,i}) = \beta_0 + \alpha_1 c_{1,t}^i + \dots + \alpha_J c_{J,t}^i + \beta_X \ln(X_t) + \beta_\theta \theta_t^i \\ + \beta_{age} age_t^i + \beta_{age^2} (age_t^i)^2 + \beta_{hours} hours_t^i + \beta_{hours^2} (hours_t^i)^2 + \varepsilon_t^i \end{aligned} \quad (5.15)$$

To check whether our results are sensitive to the particular approximation chosen, we perform the analysis using several alternatives. That is, we estimate variants of (5.15), and then use the estimated parameters to form alternative measures of the marginal utility of wealth. As in sections 5 and 6, we then complete the analysis by regressing these measures of marginal utility on dummy variables indicating retirement, age greater than or equal to 63, and unemployment.

The results are reported in Table A5 with bootstrapped standard errors. The first row replaces log expenditures with a quartic polynomial in expenditure in (5.15). The second row restricts the sample for estimating (5.15) to fulltime workers who report working between 40 and 50 hours per week (to eliminate any variation in employment hours within the class of full-time employed). The third row includes all 188 3-digit food categories (to allow a richer set of controls for consumption at the cost of overfitting within sample). The fourth row replaces the quantity of each food item consumed with zero-one dummy variables indicating a positive amount consumed. The fifth row includes an age*hours interaction term. The sixth row restricts the analysis to white male household heads to control for the fact that both tastes and incomes vary with race and sex. The final row estimates (5.15) using averages across individuals within groups to mitigate the role of idiosyncratic tastes and measurement error. Specifically, we run a “between effects” regression across groups defined by sex, race, education, age, household size, and region, where we use the number of individuals in each group to weight the averaged observations. The results are stable across the alternative specifications/samples, indicating that the analysis is not sensitive to reasonable alternative functional forms or sample selection.

Table 1: Food Expenditure, Shopping Frequency, and Time Spent on Food Production Among Older Households by Age and Retirement Status, with Demographic and Health Controls

	I. IV Regression	II. OLS Regression
Dependent Variable	Coefficient on Retirement Dummy	Coefficient on Age ≥ 63 Dummy
Expenditure		
Log Total Food Expenditure	-0.17 (0.05)	-0.06 (0.02)
Log Food Expenditure "At Home"	-0.15 (0.05)	-0.06 (0.02)
Log Food Expenditure "Away from Home"	-0.31 (0.11)	-0.09 (0.05)
Shopping Frequency		
Dummy: Shop for food at least once per week	0.17 (0.05)	0.07 (0.02)
Time Spent on Food Production		
Total Time Spent on Food Production (in minutes)	18.3 (7.7)	7.7 (3.0)
Dummy: Time Spent on Food Production is Positive	0.07 (0.06)	0.02 (0.03)
Log of Time Spent on Food Production, Conditional on Time Spent Being Positive	0.53 (0.18)	0.25 (0.07)

Notes – Expenditure and shopping frequency data are from the pooled 1989-1991 and 1994-1996 cross sections of the Continuing Survey of the Food Intake of Individuals. The sample is restricted to include only households with heads between the age of 57 and 71 (2,052 households). Log specifications restricted to subset of sample which reports strictly positive value for dependent variable. Shopping frequency refers to the question "On average, how often does someone do a major (grocery) shopping for this household?" The sample mean of the dummy variable for shopping at least once per week is 0.66. Time Use data are from the National Human Activity Pattern Survey (NHAPS). Food production (measured in minutes) is the sum of time spent 'shopping for food' and time spent 'preparing food'. Sample restricts individuals in the NHAPS to be between the ages of 57 and 71 who had time spent on food production less than 6 hours (1,308 observations). Only 8 individuals in the sample had daily food production in excess of 6 hours. Column I reports the results from an IV regression of the dependent variable on a dummy variable indicating whether the household head retired and a vector of demographic, health, region, time, and education controls. One year age dummies of the household head are used to instrument for retirement status. Column II reports the results from an OLS regression of the dependent variable on a dummy variable indicating whether the household head is 63 years or older and a vector of demographic, health, region, time, and education controls. See text for the full definition of demographic, health, region, time and education controls included. Huber-White standard errors are presented in parenthesis.

Table 2: Income Elasticity of Nutritional Measures among Working Households and Change in Nutritional Measures Across Retirement

	I. Estimated Income Elasticity Sample: Heads Working Full Time Aged Between 45 and 55		II. Estimated Retirement Effect Sample: All Household Heads Aged Between 57 and 71
Dependent Variable	Coefficient on Log Permanent Income	Mean of Dependent Variable	IV Coefficient on Retirement Status Dummy
Log Calories	0.06 (0.03)	7.59	-0.02 (0.03)
Log Vitamin A	0.54 (0.08)	8.48	0.36 (0.09)
Log Vitamin C	0.41 (0.08)	4.22	0.33 (0.09)
Log Vitamin E	0.24 (0.04)	2.03	0.11 (0.04)
Log Calcium	0.10 (0.04)	6.51	0.13 (0.04)
Log Cholesterol	-0.22 (0.05)	5.55	-0.09 (0.05)
Log Saturated Fat	-0.10 (0.03)	3.18	-0.07 (0.03)
Log Protein	0.004 (0.02)	4.38	-0.03 (0.02)

Sample: Data comes from pooled CSFII_89 and CSFII_94 datasets. Sample sizes for partitions I and II, respectively, are 1,101 household heads and 2,052 household heads. All nutritional measures, aside from calories, protein and saturated fat are measured in milligrams. Saturated fat and protein are measured in grams. The first column in partition I reports the coefficient on log income from an IV regression of the nutritional measure on log income and race, sex, height, health, year and region controls, where indicators of permanent income are used as instruments for log income. The instruments include occupation, education, education and occupation interactions, and sex and race interactions. Huber-White standard errors are in parentheses. In some specifications for the regressions in Partition I (not reported), we included measures of the household's preference for nutrition and/or their nutritional literacy. See text for discussion. Partition II reports the coefficient on a dummy variable indicating whether the household head was retired from an IV regression of the nutritional variable on the retirement dummy, demographic and health controls. Retirement status was instrumented with age dummies. All regressions in both partition I and II, aside from when log calories is the dependent variable, include log calories as an additional control.

Table 3: Income Semi-Elasticity of Food Categories among Working Households and Change in Propensity to Consume Food Categories in Retirement

	I. Estimated Semi-Income Elasticity Sample: Heads Working Full Time Aged Between 45 and 55		II. Estimated Retirement Effect Sample: All Household Heads Aged Between 57 and 71
Dependent Variable	Coefficient on Log Permanent Income	Mean of Dependent Variable	IV Coefficient on Retirement Status Dummy
Dummy: Eat Fruit	0.23	0.65	0.14
	(0.05)		(0.04)
Dummy: Eat Shellfish	0.06	0.06	-0.02
	(0.02)		(0.02)
Dummy: Drink Wine	0.15	0.09	-0.03
	(0.03)		(0.03)
Dummy: Eat Yogurt	0.17	0.10	0.01
	(0.03)		(0.03)
Dummy: Eat Oat/Rye/Multigrain Bread	0.12	0.13	0.06
	(0.03)		(0.04)
Dummy: Eat Hotdog/Lunch Meat	-0.16	0.50	-0.06
	(0.05)		(0.05)
Dummy: Eat Ground Beef	-0.11	0.20	-0.01
	(0.04)		(0.04)

Sample: Data comes from pooled CSFII_89 and CSFII_94 datasets. Sample sizes for partitions I and II, respectively, are 1,101 household heads and 2,052 household heads. All nutritional measures, aside from calories, protein and saturated fat are measured in milligrams. Saturated fat and protein are measured in grams. The first column in partition I reports the coefficient on log income from an IV regression of the nutritional measure on log income and race, sex, height, health, year and region controls, where indicators of permanent income are used as instruments for log income. The instruments include occupation, education, education and occupation interactions, and sex and race interactions. Huber-White standard errors are in parentheses. In some specifications for the regressions in Partition I (not reported), we included measures of the household's preference for nutrition and/or their nutritional literacy. See text for discussion. Partition II reports the coefficient on a dummy variable indicating whether the household head was retired from an IV regression of the nutritional variable on the retirement dummy, demographic and health controls. Retirement status was instrumented with age dummies. All regressions in both partition I and II, aside from when log calories is the dependent variable, include log calories as an additional control.

Table 4: Propensity to Switch Away from Restaurants with Table Service and High Quality Food, by Age and Retirement Status

Dependent Variable	*IV Regression Coefficient on Retirement Dummy*	*Mean of Dependent Variable*
Propensity to Eat Away from Home		
Dummy: Individual Eats Away From Home (all establishments)	-0.18 (0.05)	0.52
Dummy: Individual Eats at a Cafeteria	-0.07 (0.03)	0.08
Dummy: Individual Eats at a Fast Food Establishment	-0.16 (0.04)	0.25
Dummy: Individual Eats at a Restaurant w/Table Service	-0.03 (0.05)	0.31
Propensity to Switch Away from High Quality		
Dummy: Individual Eats "Lean" or "Extra-Lean" Ground Beef [a]	0.13 (0.13)	0.67
Propensity to Switch Towards Generic Brands		
Dummy: Individual Eats "Store Brand" Cereal [b]	0.03 (0.05)	0.13

Notes – Data is from the pooled 1989-1991 and 1994-1996 cross sections of the Continuing Survey of the Food Intake of Individuals. The sample is restricted to include only households with heads between the age of 57 and 71 (2,052 households). Eating away from home is defined as eating any meal at a cafeteria, bar, fast food establishment, or restaurant with table service. The first column reports the results from an IV regression of the dependent variable on a dummy variable indicating whether the household head is retired and a vector of demographic, health, region, time, and education controls. Age dummies are used to instrument for retirement status. See text for the full definition of demographic, health, region, time and education controls included. Huber-White standard errors are in parentheses. The 8 digit food codes categorize whether the beef consumed by individuals was lean or not. For ground beef, the categories include "lean", "extra lean", or "neither lean nor extra-lean". Cereals is the only food category where specific brand information is provided. The 8 digit codes for cereals are extremely detailed and include "store"/generic brands.

a – Sample additionally restricted to include only those household heads aged between 57 and 71 who reported eating ground beef (270 heads).
b – Sample additionally restricted to include only those household heads aged between 57 and 71 who reported eat cereal (853 heads).

Table 5: Response of Inverse Marginal Utility of Wealth and Consumption Growth by Retirement Status

Specification:		Coefficient
1.	Response of Inverse Marginal Utility of Wealth to Dummy Indicating Retirement (cross sectional estimation)	-0.006 (0.02)
2.	Response of Inverse Marginal Utility of Wealth to Dummy Indicating Aged 63 or Older (cross sectional estimation)	-0.003 (0.01)
3.	Response of Consumption Growth to Changes in Retirement Status (synthetic panel estimation).	-0.002 (0.01)

Notes –Dependent variable for columns one and two is the log (inverse) marginal utility of wealth implied by consumption and expenditures. See text for details. The reported coefficient for rows 1 and 2 are δ_I from **(5.16)** in the text. Data for rows 1 and 2 from the pooled 1989-1991 and 1994-1996 cross sections of the Continuing Survey of the Food Intake of Individuals (CSFII). The sample is restricted to include only households with heads between the age of 57 and 71 (2,052 households). Data for row 3 is from a synthetic panel comprised of individuals from the 1989-1991 and 1994-1996 cross sections of the CSFII. See text and footnote 34 for details. This procedure left us with a panel of 277 representative households covering 491 observations. The reported coefficient for row 3 is from (5.17) in the text. Detailed list of additional controls in the regression are reported in Section 5 of the text. Bootstrap standard errors from 500 repetitions are reported in parentheses.

Table 6: Expenditure, Time Use and Marginal Utility of Wealth Among Working Age Households by Unemployment Status, with Demographic and Health Controls

Dependent Variable	*Coefficient on Dummy Indicating Unemployment*
<u>*Expenditure*</u>	
Log Total Food Expenditure	-0.19 (0.03)
Log Food Expenditure "At Home"	-0.09 (0.03)
Log Food Expenditure "Away from Home"	-0.42 (0.07)
<u>*Shopping Frequency*</u>	
Dummy: Shop for food at least once per week	-0.03 (0.03)
<u>*Time Spent on Food Production*</u>	
Total Time Spent on Food Production (in minutes)	11.6 (3.6)
Dummy Variable – Spend Positive Time on Food Production	0.08 (0.04)
Log of Time Spent on Food Production, Conditional on Time Spent Being Positive	0.28 (0.10)
<u>*Consumption*</u>	
Implied Inverse Marginal Utility of Wealth	-0.05 (0.01)

Notes: Expenditure and Consumption data from the CSFII data sets. The sample was restricted to include households with heads between the ages of 25 and 55 who were either working full time or were are unemployed. The additional sample of low income households from the 1989/91 survey is also included. Sample size is 3,874 household heads. Log specifications include only those households with a strictly positive dependent variable. See text for additional details. The data on time use comes from the NHAPS data (3,364 observations). This sample was restricted to include individuals between the ages of 25 and 55 who were either working full time or were are unemployed Food production refers to shopping for food or preparing meals. Coefficients come from an OLS regression of the dependent variable on an unemployment dummy and a series of demographic, year, region, health and education controls. See text for a full description of variables included. Huber-White standard errors are in parentheses. The standard error for the marginal utility of wealth is from a bootstrap of over 500 repetitions.

Table 7: Propensity to Eat "Away from Home" Among Working Age Households, By Unemployment Status

Dependent Variable	*Coefficient on Unemployment Dummy*	*Mean of Dependent Variable*
Total:		
Dummy: Household Eat Away From Home (all establishments)	-0.25 (0.03)	0.70
By Component:		
Dummy: Household Eat at Restaurant w/Table Service	-0.18 (0.02)	0.34
Dummy: Household Eats at a Cafeteria	-0.10 (0.01)	0.12
Dummy: Household Eats at a Fast Food Establishment	-0.17 (0.03)	0.45

Notes – Data is from the pooled 1989-1991 and 1994-1996 cross sections of the Continuing Survey of the Food Intake of Individuals, collected by the Department of Agriculture, excluding the over sample of low income households. Sample restricted to include households with heads between the ages of 25 and 55 who were either working full time or were are unemployed. The additional sample of poorer households from the 1989/91 survey is included. Data refers to the consumption patterns of only the household head (3,874 individuals). Eating away from home is defined as eating any meal at a cafeteria, bar, fast food establishment, or restaurant with table service. Column I reports the results from an OLS regression of a dummy variable indicating whether the household ate a meal away from home on a dummy variable indicating whether the household head was unemployed and a vector of demographic, health, region, time, and education controls. See text for the full definition of demographic, health, region, time and education controls included. Huber-White standard errors are presented in parentheses.

Appendix Table A1: Comparison of CSFII Data with PSID Data
Household Heads between the Ages of 22 and 65

Variable	*CSFII Sample*	*PSID Sample*
Age of the Household Head	43	42
Dummy: Male Household Head	0.75	0.74
Dummy: Black Household Head	0.13	0.14
Dummy: Household Head has less than High School Education	0.21	0.13
Dummy: Household Head has High School Education	0.35	0.36
Dummy: Household Head has Some College Education	0.20	0.23
Dummy: Household Head has College or More Education	0.24	0.28
Dummy: Household Head is a Homeowner	0.60	0.60
Dummy: Household Head is Employed	0.75	0.81
Dummy: Household Head is Unemployed	0.04	0.06
Dummy: Household Head is Retired	0.07	0.06
Dummy: Household Head is Disabled	0.07	0.03
Dummy: Household Head is a Student	0.02	0.01
Dummy: Household Head is a Homemaker	0.05	0.03
Total Year Household Expenditure on Food	$5,600	$5,400
Dummy: Household Family Size = 1	0.20	0.28
Dummy: Household Family Size = 2	0.30	0.28
Dummy: Household Family Size = 3	0.19	0.17
Dummy: Household Family Size = 4	0.17	0.18
Dummy: Household Family Size = 5	0.09	0.07
Dummy: Self Reported Head's Health = Excellent	0.23	0.25
Dummy: Self Reported Head's Health = Very Good	0.32	0.36
Dummy: Self Reported Head's Health = Good	0.30	0.27
Dummy: Self Reported Head's Health = Fair	0.12	0.09
Dummy: Self Reported Head's Health = Poor	0.03	0.03
Sample Size	7,350	6,108

Notes: The first column of Table A1 reports the descriptive statistics for a sample of CSFII household heads between the ages of 22 and 65. The second column reports the descriptive statistics for a sample of PSID household heads between the ages of 22 and 65. The CSFII data uses both the 1989-1991 and the 1994-1996 cross sections. The PSID data is from the 1993 survey (wave XXVI).

Appendix Table A2: Health Comparison between Retired and Non-Retired Male Household Heads

	Health Comparison By Age			Health Comparison By Retirement Status		
Health Variable of Household Head	Age < 63	Age ≥ 63	*p*-value of difference	Non-Retired	Retired	*p*-value of difference
Percent Self Reporting Health Status as Excellent	0.18	0.15	0.15	0.18	0.15	0.12
Percent Self Reporting Health Status as Very Good	0.27	0.26	0.52	0.30	0.23	<0.01
Percent Self Reporting Health Status as Good	0.32	0.36	0.12	0.32	0.38	0.02
Percent Ever Having Diabetes	0.13	0.13	0.84	0.12	0.14	0.17
Percent Ever Having High Blood Pressure	0.35	0.39	0.15	0.35	0.39	0.10
Percent Ever Having Heart Disease	0.13	0.25	<0.01	0.15	0.25	<0.01
Percent Ever Having Cancer	0.07	0.11	<0.01	0.08	0.11	0.16
Percent Ever Having Osteoporosis	0.02	0.02	0.71	0.02	0.02	0.60
Percent Ever Having High Blood Cholesterol	0.23	0.26	0.20	0.22	0.28	<0.01
Percent Ever Having a Stroke	0.03	0.06	<0.01	0.04	0.07	0.01
Percent Currently Smoking	0.29	0.21	<0.01	0.26	0.21	0.02
Current Weight (lbs)	186	182	0.03	183	183	0.76
Sample Size	592	920		751	761	

Notes – Data is from the pooled 1989-1991 and 1994-1996 cross sections of the Continuing Survey of the Food Intake of Individuals, collected by the Department of Agriculture, excluding the over sample of low income households. Sample is restricted to include only households with male heads who are between the age of 57 and 71 (1,512 households). See data appendix for the full definitions of all health variables in the CSFII data set.

Appendix Table A3: Sample of Detail of 8-Digit Food Categories in the CSFII

3-Digit Code	Food Category
14010000	CHEESE, NFS
14010100	CHEESE,CHEDDAR/AMERICAN TYPE,NS NATURAL OR PROCESSED
14100100	CHEESE, NATURAL, NFS
14101010	CHEESE, BLUE OR ROQUEFORT
14102010	CHEESE, BRICK
14102110	CHEESE, BRICK, W/ SALAMI
14103010	CHEESE, CAMEMBERT
14103020	CHEESE, BRIE
14104010	CHEESE, NATURAL, CHEDDAR OR AMERICAN TYPE
14104020	CHEESE, CHEDDAR OR AMERICAN TYPE, DRY, GRATED
14104200	CHEESE, COLBY
14104250	CHEESE, COLBY JACK
14104400	CHEESE, FETA (INCLUDE GOAT CHEESE)
14104600	CHEESE, FONTINA
14104700	CHEESE, GOAT
14105010	CHEESE, GOUDA OR EDAM
14105200	CHEESE, GRUYERE
14106010	CHEESE, LIMBURGER
14106200	CHEESE, MONTEREY
14106500	CHEESE, MONTEREY, LOWFAT
14107010	CHEESE, MOZZARELLA, NFS (INCLUDE PIZZA CHEESE)
14107020	CHEESE, MOZZARELLA, WHOLE MILK
14107030	CHEESE, MOZZARELLA, PART SKIM (INCL ""LOWFAT"")
14107040	CHEESE, MOZZARELLA, LOW SODIUM
14107060	CHEESE, MOZZARELLA, NONFAT OR FAT FREE
14107200	CHEESE, MUENSTER
14107210	CHEESE, MUENSTER, LOW SODIUM
14107250	CHEESE, MUENSTER, LOWFAT
14108010	CHEESE, PARMESAN, DRY, GRATED (INCLUDE ROMANO)
14108020	CHEESE, PARMESAN, HARD (INCLUDE ROMANO)
14108050	CHEESE, PARMESAN, LOW SODIUM
14108060	PARMESAN CHEESE TOPPING, FAT FREE
14108200	CHEESE, PORT DU SALUT
14108400	CHEESE, PROVOLONE
14108410	CHEESE, PROVOLONE, REDUCED FAT & SODIUM
14108800	CHEESE, SEMI-SOFT, LOW SODIUM
14109010	CHEESE, SWISS
14109020	CHEESE, SWISS, LOW SODIUM
14109030	CHEESE, SWISS, LOWFAT
14110010	CHEESE, CHEDDAR OR COLBY, LOW SODIUM
14110020	CHEESE, CHEDDAR OR COLBY, LOW SODIUM, LOWFAT
14110030	CHEESE, CHEDDAR OR COLBY, LOWFAT
14131000	QUESO ANEJO (AGED MEXICAN CHEESE)
14131500	QUESO ASADERO (INCL OAXACAN-STYLE STRING CHEESE)
14132000	QUESO CHIHUAHUA (INCL MENNONITE CHEESE)
14133000	QUESO FRESCO (HISPANIC-STYLE FARMER CHEESE)
14200100	CHEESE, COTTAGE, NFS

Appendix Table A3: Sample of Detail of 8-Digit Food Categories in the CSFII

3-Digit Code	Food Category
14201010	CHEESE, COTTAGE, CREAMED
14201200	COTTAGE CHEESE, FARMER'S
14201500	CHEESE, RICOTTA
14202010	CHEESE, COTTAGE, W/ FRUIT
14202020	CHEESE, COTTAGE, W/ VEGETABLES
14203010	CHEESE, COTTAGE, DRY CURD
14203020	CHEESE, COTTAGE, SALTED, DRY CURD
14203510	P.R. WHITE CHEESE (QUESO DEL PAIS, BLANCO)
14204010	CHEESE, COTTAGE, LOWFAT
14204020	CHEESE, COTTAGE, LOWFAT, W/ FRUIT
14204030	CHEESE, COTTAGE, LOWFAT, W/ VEGETABLES
14205010	CHEESE, COTTAGE, LOW SODIUM
14206010	CHEESE, COTTAGE, LOWFAT, LOW SODIUM
14207010	CHEESE, COTTAGE, LOWFAT, LACTOSE REDUCED
14210000	CHEESE, YOGURT, NFS
14220000	COTTAGE CHEESE, W/ FRUIT, BABY, NS AS TO STR OR JR
14301010	CHEESE, CREAM
14303010	CHEESE, CREAM, LOWFAT
14410100	CHEESE, PROCESSED, AMERICAN & SWISS BLENDS
14410200	CHEESE, PROCESSED, AMERICAN/CHEDDAR TYPE
14410210	CHEESE, PROCESSED, AMERICAN/CHEDDAR, LOW SODIUM
14410300	CHEESE, PROCESSED, AMERICAN/CHEDDAR TYPE, LOWFAT
14410310	CHEESE, PROCESSED, AMERICAN, LOWFAT, LOW SODIUM
14410330	CHEESE, PROC CHEESE PRODUCT, AMER/CHED, RED FAT
14410340	CHEESE,PROC CHEESE PROD,AMER/CHED,RED FAT & SODIU
14410350	CHEESE, PROCESSED, AMERICAN/CHEDDAR TYPE, NONFAT
14410380	CHEESE, PROCESSED CREAM CHEESE PRODUCT, NONFAT
14410400	CHEESE, PROCESSED, SWISS
14410410	CHEESE, PROCESSED, SWISS, LOW SODIUM
14410420	CHEESE, PROCESSED, SWISS, LOW FAT
14410440	CHEESE, PROCESSED, SWISS, LOW FAT, LOW SODIUM
14410450	CHEESE, PROCESSED CHEESE PRODUCT, SWISS, REDUCED FAT
14410500	CHEESE, PROCESSED, CHEESE FOOD
14410600	CHEESE, PROCESSED, W/VEGETABLES(INCL PEPPER CHEESE)
14410620	CHEESE, PROCESSED, W/ WINE
14410710	CHEESE, PROCESSED, MOZZARELLA, LOW SODIUM
14410830	CHEESE, PROCESSED, MUENSTER, LOWFAT, LOW SODIUM
14420000	CHEESE SPREAD, NFS
14420100	CHEESE SPREAD, AMERICAN OR CHEDDAR CHEESE BASE
14420140	CHEESE SPREAD, AMER/CHED BASE, LOW FAT, LOW SODIUM
14420160	CHEESE SPREAD, SWISS CHEESE BASE
14420200	CHEESE SPREAD, CREAM CHEESE OR NEUFCHATEL BASE
14420300	CHEESE SPREAD, PRESSURIZED CAN
14501010	IMITATION CREAM CHEESE
14502010	IMITATION CHEESE, AMERICAN OR CHEDDAR TYPE
14502040	IMITATION CHEESE, AMER/CHEDDAR TYPE, LOW CHOLESTERO
14503010	IMITATION CHEESE SPREAD (INCLUDE COUNT DOWN)
14504010	IMITATION MOZZARELLA CHEESE (INCL PIZZA MATE)

Appendix Table A4: 3-Digit Food Categories Included in the Consumption Index

3-Digit Code	Food Category
111	Milk, fluid (regular; filled; buttermilk; and dry reconstituted)
114	Yogurt
121	Sweet dairy cream
122	Cream substitutes
123	Sour cream
131	Milk desserts, frozen
132	Puddings, custards, and other milk desserts
141	Natural cheeses
142	Cottage cheeses
143	Cream cheeses
144	Processed cheeses and cheese spreads
211	Beef steak
214	Beef roasts, stew meat, corned beef, beef brisket, sandwich steaks
215	Ground beef, beef patties, beef meatballs
216	Other beef items (beef bacon; dried beef; pastrami)
223	Ham
224	Pork roasts
226	Bacon, salt pork
227	Other pork items (spareribs; cracklings; skin; miscellaneous parts)
241	Chicken (breast; leg; drumstick; wing; back; neck or ribs; misc.)
242	Turkey
243	Duck
251	Organ meats and mixtures (liver; hearts; sweetbreads; brains; tongue)
252	Frankfurters, sausages, lunchmeats, meat spreads
261	Finfish
262	Other seafood
263	Shellfish
275	Sandwiches with meat, poultry, fish
281	Frozen or shelf-stable plate meals with meat, poultry, fish as major ingredient
311	Chicken eggs
421	Nuts
422	Nut butters
423	Nut butter sandwiches
511	White breads, rolls
512	Whole wheat breads, rolls
513	Wheat, cracked wheat breads, rolls
514	Rye breads, rolls
515	Oat breads
516	Multigrain breads, rolls
521	Biscuits
522	Cornbread, corn muffins, tortillas
531	Cakes
532	Cookies
533	Pies (fruit pies; pie tarts; cream, custard, chiffon pies; miscellaneous pies)
534	Cobblers, eclairs, turnovers, other pastries
535	Danish, breakfast pastries, doughnuts, granola bars

Appendix Table A4 (cont): 3-Digit Food Categories Included in the Consumption Index

3-Digit Code	Food Category
551	Pancakes
552	Waffles
553	French toast
554	Crepes
561	Pastas
562	Cooked cereals, rice
571	Ready-to-eat cereals
576	Cereal grains, not cooked
611	Citrus fruits
621	Dried fruits
631	Fruits, excluding berries
632	Berries
633	Mixtures of two or more fruits
711	White potatoes, baked and boiled
712	White potatoes, chips and sticks
713	White potatoes, creamed, scalloped, au gratin
714	White potatoes, fried
715	White potatoes, mashed, stuffed, puffs
721	Dark-green leafy vegetables
722	Dark-green nonleafy vegetables
744	Tomato sauces
751	Other vegetables, raw
752	Other vegetables, cooked
811	Table fats
812	Cooking fats
813	Other fats
831	Regular salad dressings
832	Low-calorie and reduced calorie salad dressings
931	Beers and ales
932	Cordials and liqueurs
933	Cocktails
934	Wines
935	Distilled liquors

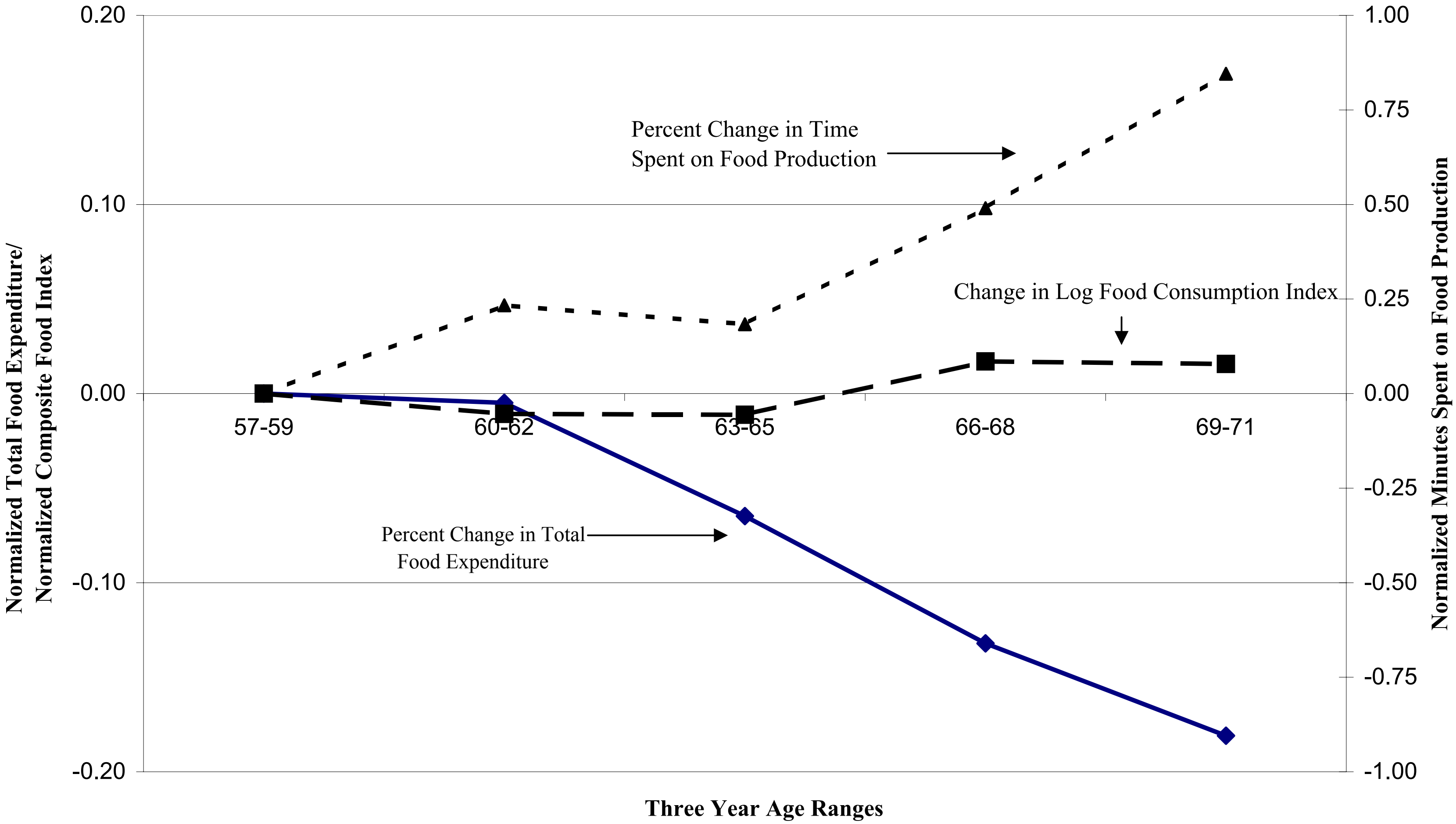
	Nutritional Measures Included
	Total Calories
	Protein
	Cholesterol
	Vitamin A
	Total Fat
	Calcium
	Vitamin C
	Vitamin E
	Saturated Fat

Appendix Table A5: Robustness Specifications for Inverse Marginal Utility of Wealth Results

Specification/Sample for Estimation of Consumption Aggregator (Equation (5.15))	I. IV Regression Coefficient on Retirement Dummy	II. OLS Regression Coefficient on Age ≥ 63 Dummy	III. OLS Regression Coefficient on Unemployment Dummy
Include Non-Linear Function of Expenditure	-0.007	-0.003	-0.052
	(0.025)	(0.012)	(0.012)
Restrict to Households Working 40-50 Hours	-0.015	-0.007	-0.054
	(0.027)	(0.012)	(0.013)
Include all 3-digit Food Categories	-0.023	-0.015	-0.058
	(0.050)	(0.026)	(0.019)
Include Food Category Dummies	0.002	0.001	-0.062
	(0.024)	(0.011)	(0.012)
Include age*hours interaction term	-0.006	-0.003	-0.054
	(0.025)	(0.012)	(0.012)
Sample of White/Male Heads	-0.014	-0.005	-0.051
	(0.030)	(0.014)	(0.016)
Averaged across similar individuals	0.016	0.006	-0.077
	(0.041)	(0.019)	(0.020)

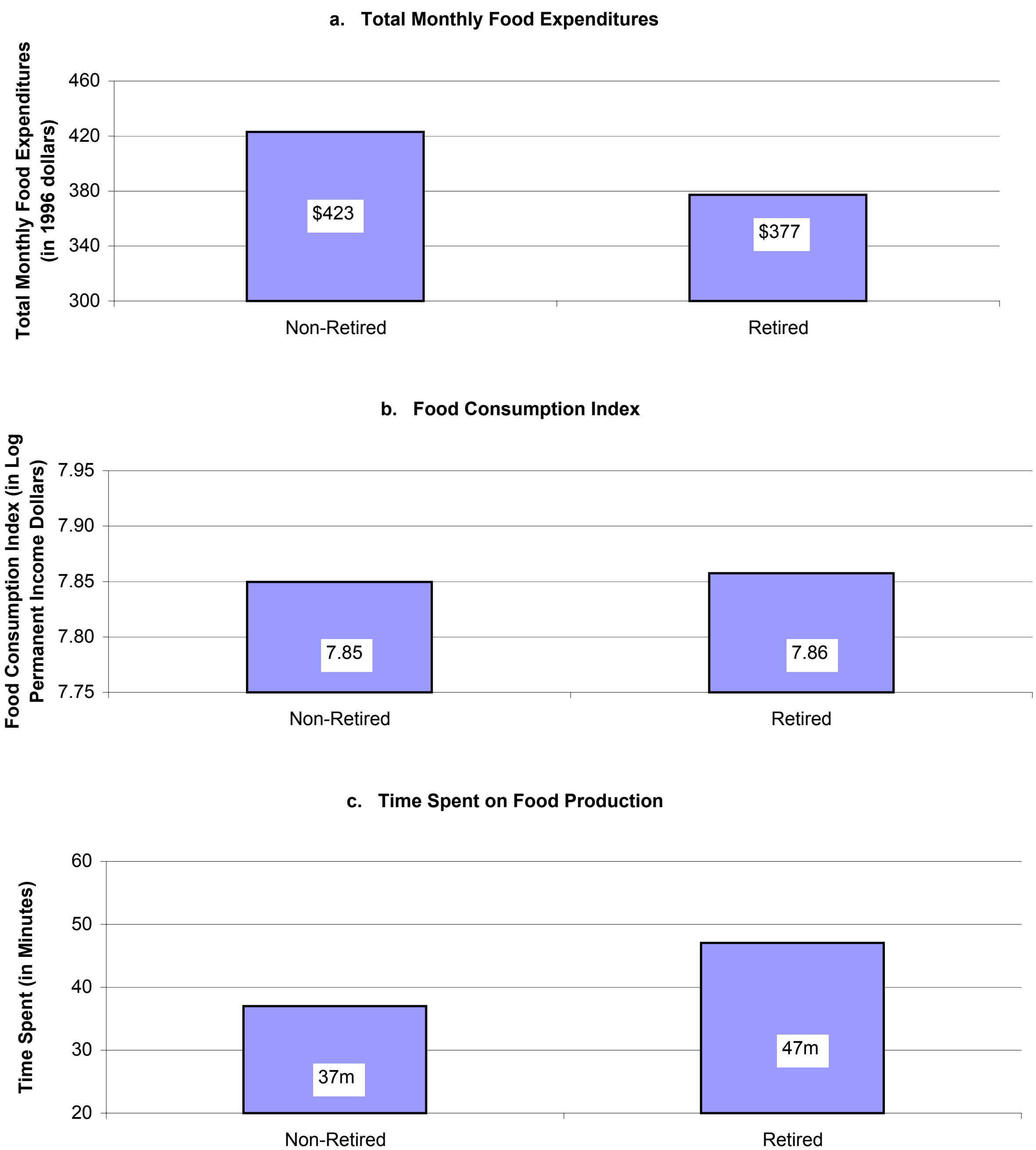
Notes –See Appendix 2 for full details. Data from the pooled 1989-1991 and 1994-1996 cross sections of the Continuing Survey of the Food Intake of Individuals. The sample is restricted to include only households with heads between the age of 57 and 71 (2,052 households) for columns I and II and to households with heads between the ages of 25 and 55 who were either working full time or were are unemployed for column III (3,874 households). The additional sample of poorer households from the 1989/91 survey is included for column III. The "White/Male" sample is restricted to white, male household heads between the age of 57 and 71 (1,387 households) for columns I and II and to white, male household heads between the age of 25 and 55 who were either working full time or were unemployed for column III (2,990 households). The last row estimates (5.15) using averages across individuals within groups defined by sex, race, education, age, household size, and region, weighting observations by the size of the group. . Bootstrap standard errors from 500 repetitions are reported in parentheses.

Figure 1: Percentage Change in Food Expenditure, Composite Food Index, and Time Spent on Food Production for Male Household Heads by Three Year Age Ranges



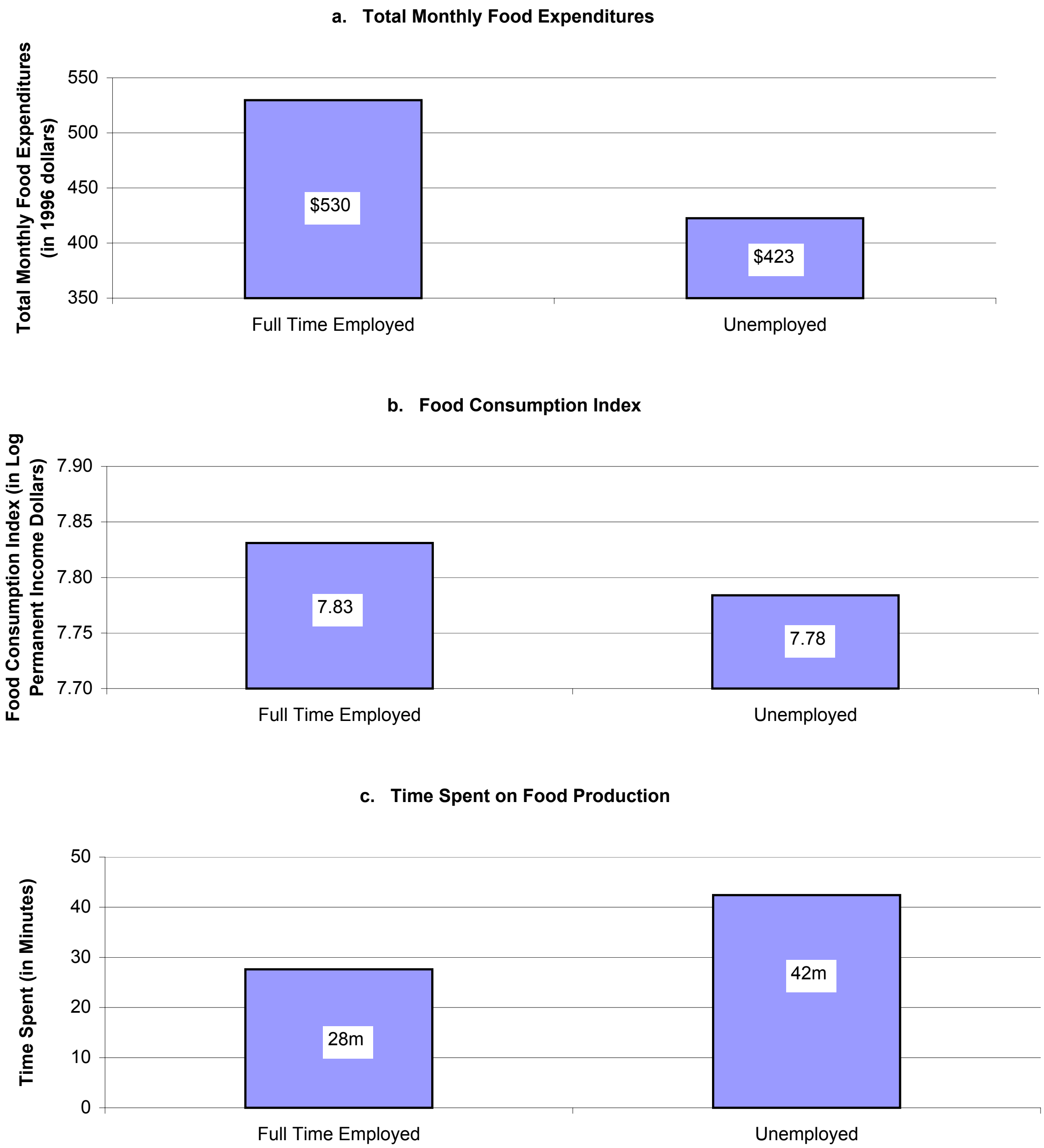
Notes: Data is from the pooled 1989-1991 and 1994-1996 cross sections of the Continuing Survey of Food Intake of Individuals, collected by the Department of Agriculture, excluding the over sample of low income households. Sample restricted to only male household heads. Expenditure data and composite food index were both normalized by the average levels for households aged 57-59. All subsequent years are the percentage deviations from the age 57-59 levels. See text for details of data and derivation.

Figure 2: Mean Food Expenditure, Food Consumption, and Time Spent on Food Production Among Older Households by Retirement Status
Sample: Household Heads Aged 57 - 71

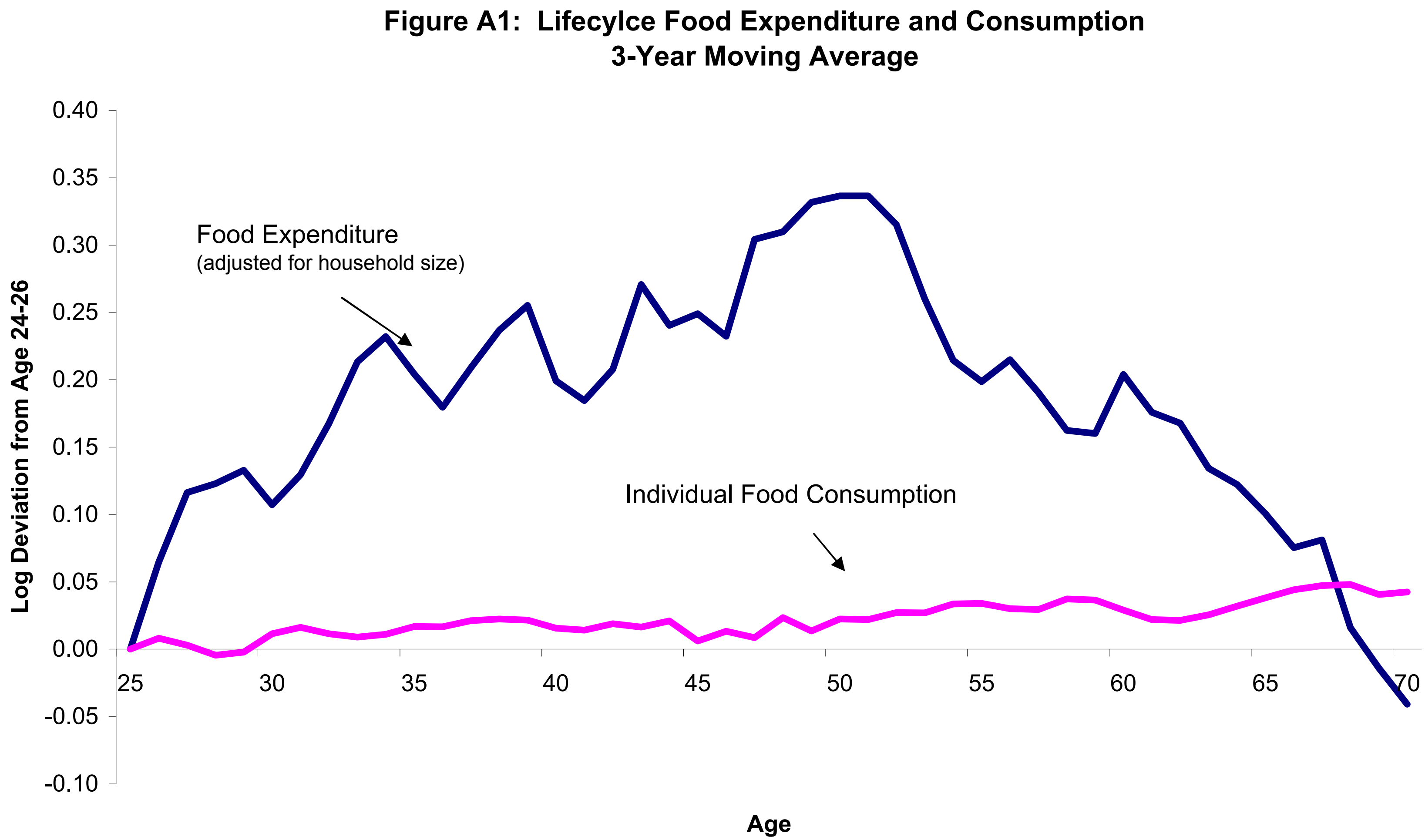


Notes: Expenditure and Consumption data from the CSFII data sets. CSFII sample restricted to households with heads between ages of 57 and 71 (2,052 households). Food consumption index refers to aggregate consumption measure using weights estimated as discussed in section 5. See text for additional details. Time use data is from the NHAPS data set. NHAPS sample restricted to households with heads between the ages of 57 and 71 who spent less than 6 hours on food production (1,332 households). Food production is defined as time spent shopping for food and time spent preparing food.

Figure 3: Mean Food Expenditure, Food Consumption, and Time Spent on Food Production Among Working Age Households: By Unemployment Status



Notes: Expenditure and Consumption data from the CSFII data sets. CSFII sample restricted to households with heads between ages of 25 and 55 who were either employed full time or unemployed (3,874 households).
Time use data is from the NHAPS data set. NHAPS sample restricted to households with heads between the ages of 25 and 55 who were either employed full time or were unemployed and who spent less than 6 hours on food production (1,332 households). Food production is defined as time spent shopping for food and time spent preparing food.



Food Expenditure is the residual from a regression of log food expenditure on dummy variables indicating household size. Consumption index is the aggregate consumption index estimated and described in section 5 of the text. See text for details. Both lines are 3-year moving averages and expressed as differences from the average over ages 24-26. Sample is restricted to household heads who are employed full time, students, or retired.