

# Consumption vs. Expenditure

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Very Preliminary, Comments Welcome

## *Abstract*

Standard tests of the permanent income hypothesis (PIH) using data on nondurables typically equate expenditures with consumption. We revisit this literature from the viewpoint of Becker (1965), who stressed that consumption is the output of a “home production” function that uses both market goods and time as inputs. To do so, we exploit a novel dataset that distinguishes between food expenditure and food consumption. We find that large movements in food expenditures mask a significant degree of consumption smoothing, validating the PIH and home production paradigms. As predicted by models of home production, we find that agents with a higher opportunity cost of time spend more on food expenditures and less time in food preparation for the equivalent quantity of food consumption. With this in mind, we address two major stylized facts in the PIH literature: expenditures on food drop significantly during both retirement and unemployment. We document that individuals in retirement and unemployment experience negligible changes in the quantity or quality of food consumption, despite substantial changes in expenditure. The decline in expenditures during retirement and unemployment are accompanied by large increases in time spent in food preparation. While many authors have provided evidence of a “retirement consumption puzzle” when focusing on expenditures, we conclude that no such puzzle exists for actual consumption.

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## I. Introduction

Standard tests of the permanent income hypothesis (PIH) using data on nondurables typically equate consumption with expenditure.<sup>1</sup> However, as noted by Becker (1965), consumption is the output of “home production” which uses as inputs both market expenditures and time.<sup>2</sup> To the extent possible, individuals will substitute away from market expenditures towards time spent in home production as the relative price of time falls. Expenditures, therefore, may be 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 smooth consumption – but not necessarily expenditures – as predicted by the standard PIH model augmented with home production.

Specifically, we find that individuals with a relatively high opportunity cost of time spend more money but less time on food preparation for an equivalent quantity and quality of food consumption. Using the CSFII data, we estimate the elasticity of expenditures with respect to the opportunity cost of time (labor market wage), controlling for various measures of food consumption. Our measures of food consumption include average daily caloric intake and the average grams of protein, fat, carbohydrates, cholesterol, vitamin C, and calcium consumed. These measures all respond significantly to the wealth/permanent income of households, making

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<sup>1</sup> This literature is vast. See surveys by Browning and Lusardi (1996) and Attanasio (1999).

<sup>2</sup> Becker’s insight was revived and expanded by Benhabib, Rogerson, and Wright (1991), Greenwood and Hercowitz (1991), and Rios-Rull (1993), among others. Most closely related to our work on consumption is Baxter and Jermann (1999), discussed in Section III. Rupert, Rogerson and Wright (1995,2000) and McGrattan, Rogerson, and Wright (1997) provide additional empirical evidence documenting the importance of home production.

them relevant measures of food consumption. We find that a 10% drop in the hourly wage leads to a 2.7% drop in expenditure holding constant food consumption. At the same time, a 10% decline in the hourly wage leads to approximately a 20% increase in time spent shopping for and preparing food. These estimates suggest that consumers will vary market expenditures with fluctuations in income, regardless of whether such income changes are expected or temporary. Such results support the theoretical predictions of Baxter and Jermann (1999), who demonstrate that a quantitative model with PIH consumers and home production can result in consumption growth that responds to predictable income changes.

With these results in mind, we explore two major stylized facts in the household consumption literature: household non-durable consumption drops significantly during an unemployment spell (Banks, Blundell, and Tanner (1998), Stephens (2001)) and household non-durable consumption drops significantly at the onset of retirement (Banks, Blundell, and Tanner (1998); Bernheim, Skinner, and Weinberg (2001)). The majority of researchers documenting these stylized facts use food expenditures as their measure of non-durable consumption.

This decline in food expenditures during an unemployment spell has been interpreted as a failure of public or private insurance (Cochrane (1991) and Gruber (1997)). However, as discussed above, food expenditure is not necessarily a good measure of food consumption when home production is important and the opportunity cost of time changes. Using the CSFII data, we find that households experience a 14% decline in food expenditures when the household head becomes unemployed.<sup>3</sup> This decline in expenditure is accompanied by a 44% increase in time spent on home production of food by the unemployed individual. However, using the calorie and nutritional composition data from the CSFII, we find that actual food consumption remains essentially constant during an unemployment spell. Specifically, we find that in unemployment total calories consumed falls by less than 1% and total protein consumed increases by 2%.

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<sup>3</sup> Stephens (2001), using data from the Panel Study of Income Dynamics (PSID), finds a 10% decline in food expenditure among unemployed households.

We find similar results for consumption changes in retirement. Many authors have documented the “retirement consumption puzzle” in which consumption expenditures fall sharply for the average household at the onset of retirement. Some authors have interpreted this finding as being evidence that households do not plan sufficiently for retirement (Bernheim et. al. (2001)) while others interpret this fact as evidence that household preferences are time inconsistent (Angeletos et al. (2001)). Using the CSFII data, we find that consumption expenditures fall by 17% at the onset of retirement.<sup>4</sup> This decline is accompanied by a 47% increase in time spent in home production by household heads during retirement. However, despite the decline in food expenditures, the quantity and the quality of food consumption remains constant through retirement.

While home production allows individuals to substitute time for expenditures, this transformation has its limits. Regardless of the time spent on food production, a certain amount of expenditure is needed to sustain actual food intake. Households with limited financial resources, therefore, may experience a consumption decline during anticipated or transitory periods of low income. Consistent with this prediction, we find that unemployed and retired household heads at the very bottom of the wealth distribution experience declines of 8% and 14%, respectively, in caloric intake relative to their working or non-retired (low wealth) counterparts. This decline occurs despite the increase in time spent shopping for and preparing food, suggesting reasonable limits to the amount of smoothing that can be achieved solely through the substitution of time for expenditures in home production.

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

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<sup>4</sup> Bernheim et. al. (2001) find similar food expenditure declines upon retirement in a sample of PSID households.

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 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 households smooth consumption in practice.

## **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\_91) and the second interviewed households between 1994 and 1996 (CSFII\_96). Despite presenting a unique opportunity to study household consumption patterns, the CSFII data sets have been relatively unexploited by economists.<sup>5</sup>

The CSFII\_91 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\_96 was designed to obtain a nationally representative sample of non-institutionalized persons residing in households within the United States. The

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<sup>5</sup> See Shapiro (2003) for an exception. In his paper, Shapiro examines whether food intake differs among welfare recipients within a given month.

CSFII\_96 differed slightly in design from the CSFII\_91 in the sense that it did not over-sample the poor.<sup>6</sup> 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 PSID. The CSFII\_91 interviewed 15,192 individuals in 6,718 distinct households while the CSFII\_96 interviewed 16,103 individuals in 8,067 distinct households.<sup>7</sup> For all the analysis below, we pool the CSFII\_91 and the CSFII\_96 datasets.

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 Agriculture's 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 *Panel Study of Income Dynamics* (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

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<sup>6</sup> See the Data Appendix for a discussion of the sampling techniques used in the CSFII\_91 and the CSFII\_96.

<sup>7</sup> The response rates for both surveys were high (over 85%). The CSFII data does, however, include weights to control for differential response probabilities across the population. All our analysis was done with and without the use of sampling weights. Our results were in no way sensitive to whether or not we used the sampling weights. All the results that follow were computed without the use of sampling weights.

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'.

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 CSFII\_91 required households to fill out comprehensive food diaries on three days. The CSFII\_96 had households fill out detailed food diaries on two non-consecutive days. The Data Appendix discusses the methodology of the food diary in much greater detail. The Department of Agriculture converts these food diaries into measures of daily caloric intake and daily consumption of protein, cholesterol, vitamin A, vitamin C, vitamin D, calcium, total fat, caffeine, thiamin, and iron, among others. In the empirical work that follows, we average each of these daily food intake measures over all the days for which the individual completed the food diary (i.e., over three days for the CSFII\_91 and over two days for the CSFII\_96).

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 Panel Study of Income Dynamics (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 food expenditure in the CSFII (\$5,600/year, in 1996 dollars) is essentially the same as the average yearly household 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.

One drawback of the CSFII data for our study is that it 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.<sup>8</sup>

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<sup>8</sup> 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 until late 2004.

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.<sup>9</sup> In this paper, we use two of these aggregate time use categories: "minutes spent preparing food" and "minutes spent shopping for food". In addition 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.

### III. Consumption vs. Expenditure with Home Production

#### A. A Model of Consumption with Home Production

Following Becker (1965), consider a consumer who enjoys utility over commodities  $z_i, i = 1, \dots, I$ . Each commodity, in turn, is the output of a home production function,  $f_i$ , which uses a market good,  $x_i$ , and time,  $h_i$ , as inputs.<sup>10</sup> The consumer's problem at time  $t$ , in recursive form, is:

$$\begin{aligned}
 V(a_t, w_t, \{p_{it}\}_{i=1, \dots, I}) &= \max_{\{x_i, h_i\}} \left\{ U(z_1, \dots, z_I) + \beta E_t V(a_{t+1}, w_{t+1}, \{p_{i,t+1}\}_{i=1, \dots, I}) \right\} \\
 s.t. \quad \sum_i p_{it} x_i + a_{t+1} &\leq w_t h_m + (1+r)a_t \\
 z_i &= f_i(x_i, h_i), \quad \forall i \\
 \sum_i h_i + h_m &= 1 \\
 h_m, h_i, x_i &\geq 0, \quad \forall i
 \end{aligned} \tag{3.1}$$

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

<sup>10</sup> The market input for good  $i$ ,  $x_i$ , may be considered a composite of several market goods.

where  $a_t$  denotes financial assets,  $w_t$  the market wage,  $p_{it}$  the market price of one unit of  $x_i$  in period  $t$  and  $h_m$  the time spent in the labor market. We normalize total time to one.

A strict interpretation of this notation implies all consumption goods are produced via home production. However, some market inputs may be converted into consumption goods immediately with no time input, i.e.  $z_i = x_i$ . Similarly, leisure may be considered a consumption good that is produced one for one with the time input.

Substituting out the constraints, the following first order conditions for an interior solution can be derived:

$$\begin{aligned} U_i \frac{\partial f_i}{\partial x_i} &= p_i \beta E V_1 \\ U_i \frac{\partial f_i}{\partial h_i} &= w_i \beta E V_1 \end{aligned} \tag{3.2}$$

where  $U_i$  represents the derivative of  $U$  with respect to  $z_i$  and  $V_1$  represents the derivative of  $V$  with respect to  $a$ .<sup>11</sup> Using the envelope condition to derive  $V_1$ , we can express the first order condition with respect to  $x_i$  as the following Euler equation:

$$U_{i,t} \frac{\partial f_{i,t}}{\partial x_i} = E \left\{ \beta(1+r) \frac{p_{i,t}}{p_{i,t+1}} U_{i,t+1} \frac{\partial f_{i,t+1}}{\partial x_i} \right\}. \tag{3.3}$$

The first order conditions also imply that the marginal rate of transformation in home production equals the relative price of inputs:

$$\frac{\frac{\partial f_i}{\partial h_i}}{\frac{\partial f_i}{\partial x_i}} = \frac{w_i}{p_i} \tag{3.4}$$

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<sup>11</sup> The first order condition for time spent in home production can also be expressed as:  $U_i \partial f_i / \partial h_i =$  marginal utility of leisure, which will hold even if the market wage is zero.

If the consumption good of interest does not require home production (i.e.,  $\frac{\partial f_{i,t}}{\partial x_i} = 1$ ), the

model yields the following familiar Euler equation:

$$U_{i,t} = E \left\{ \beta(1+r) \frac{P_{i,t}}{P_{i,t+1}} U_{i,t+1} \right\}. \quad (3.5)$$

The standard approach to testing this equation involves using the ratio of consumption expenditures in  $t$  and  $t+1$  as proxies for the ratio of marginal utilities (for surveys of this approach see Browning and Lusardi (1996) and Attanasio (1999)). Estimating (3.5) to test for whether actual household behavior is consistent with the model outlined in (3.1) relies on assumptions of separability and homotheticity.<sup>12</sup>

Baxter and Jermann (1999) put forth a critique of standard tests of (3.5) based on home production. To do so, they follow Benhabib et al (1991) and Greenwood and Hercowitz (1991) and treat the market good and the home-produced good as distinct goods that enter nonseparably in the utility function. This approach is essentially equivalent to ours, except that the substitution between time and expenditures resides in the utility function rather than the home production function.<sup>13</sup> From equations (3.3) and (3.4), we see that movements in wages will influence the consumption/production of the home good. Given nonseparability, this in turn suggests that the ratio of marginal utility of consumption of the market good will vary with movements in the wage, including predictable movements in income. Using a calibrated model of maximizing consumers with home production, Baxter and Jermann simulate estimates of (3.5) via standard methods assuming PIH consumers. Their simulations provide positive and significant

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<sup>12</sup> Attanasio and Browning (1995) estimate (3.5) adjusting for some potential nonseparabilities by controlling for shifts in the marginal rate of substitution that are functions of demographic and labor supply variables.

<sup>13</sup> As discussed in Greenwood, Rogerson and Wright (1995), one can use the first order conditions regarding home production and derive a reduced form utility function that has only market variables and leisure as arguments. The value of incorporating home production explicitly is in terms of interpretation and defining reasonable parameters, especially regarding substitution between consumption and leisure within a period and the intertemporal substitution of market expenditures.

coefficients on predictable income changes in a regression of log consumption growth, similar to those found empirically using micro data sets.

### B. *Empirical Specification of the Home Production Function*

As noted above, we recast the Beckerian critique in terms of the home production function rather than the nonseparability in the utility function. In particular, we consider a single consumption good – food – as the output of home production that uses time and food expenditures as inputs. This approach lends itself directly to our empirical implementation. Specifically, consider (3.4), which represents the first order condition for cost minimization in home production. This first order condition implies the existence of a demand curve for market expenditures,  $x_i = x(z_i, w, p_i)$ . Note that this demand function is based solely on cost minimization within a period -- preferences and financial resources beyond the current wage rate are captured by  $z$ , which represents the household's optimal level of consumption solved for using the dynamic model above.<sup>14</sup> Dropping the  $t$  and  $i$  subscripts, the total differentiation of (3.4) yields the following quasi-Slutsky equation for the demand for market expenditures:

$$\frac{dx}{dw} = \left. \frac{\partial x}{\partial w} \right|_z + \frac{\partial x}{\partial z} \frac{\partial z}{\partial w}. \quad (3.6)$$

In the terminology of basic microeconomics, the total change in expenditure on market goods involves a movement along the isoquant  $\left( \left. \frac{\partial x}{\partial w} \right|_z \right)$ , and movement across isoquants. The first represents a substitution effect away from market expenditure towards time spent in home production, holding the level of consumption constant. The latter is the income effect on consumption associated with fluctuations in the current wage. In testing consumption models, we

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<sup>14</sup> One caveat is that home production itself may involve preferences. For example, the process of cooking may enter utility directly in addition to the food produced. As long as the variation in preferences over food preparation are orthogonal to the market wage (once controlling for demographics like sex and weight), it will not bias our estimates.

are interested in changes in  $z$  as wages change, holding life time resources constant. Typically, we only observe  $dx/dw$  in the data. Empirical tests using consumption expenditures then confound changes in expenditure with the individual’s substitution between time and market goods in the production function.

Approximating  $x(z,w,p)$  for household  $j$  at time  $t$  as linear in logs (henceforth dropping the  $i$  subscript), we have the relationship

$$\ln(x_{jt}) = \beta_0 + \beta_1 \ln(z_{jt}) + \beta_2 \ln(w_{jt}) + \beta_3 \ln(p_{jt}) + \gamma X_{jt} + \varepsilon_{jt} \quad (3.7)$$

where  $X$  is a vector of controls for household  $j$  which can affect their desired demand for household expenditures,  $x$ , holding  $z$  and  $w$  constant. In the following sub-section, we estimate (3.7) using the CSFII data.

### C. *Estimating the Home Production Function*

The CSFII data discussed above provides measures of household income, household monthly expenditures on food, and daily individual food intake. To examine the household home production function, we restrict the CSFII sample to households with employed household heads between the ages of 25 and 51. These restrictions leave us with a sample of 2,736 household heads. In the following sections, we examine the home production function for unemployed households and households older than 51.

For our food intake measures,  $z$ , we use the log of average daily total calories consumed and the log of average daily consumption (in grams) of protein, total fat, carbohydrates, cholesterol, vitamin C and calcium.<sup>15</sup> Log total monthly food expenditures (including both expenditures at home and away from home) is our measure of  $x$ . The wage rate is annual household labor income divided by reported “usual hours worked per week” times 52 weeks. Given the measurement error inherent in this calculation, we instrument for the household head’s

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<sup>15</sup> In the next section we document that these variables vary with household wealth to confirm that they are relevant measures of the quantity and quality of food consumption.

wage using race, education, and occupation dummies. For the sample defined above, the average hourly wage is \$16 and the average log wage is 2.6 with a standard deviation of 0.7.

The price of food,  $p$ , is not reported in our sample. However, we assume that all agents face the same price schedule for market goods sold in the same location at the same time. We therefore capture intertemporal and cross-sectional movements in the price of food with time-region interaction dummies.<sup>16</sup> The home production function, in reality, is defined at the household level. Our wage and expenditure variables are household level variables. Our consumption measure, however, is an individual level variable. To control for composition differences across households, we include dummies for household size in our  $X$  vector. Additionally, we check for the stability of our estimates by restricting our sample only to single household heads with no children. To account for additional demand shifters, the vector  $X$  also includes controls for age, sex and health of the household head, including the respondent's height and weight. Full descriptions of the health measures included in this regression are provided in the Data Appendix.

We are particularly interested in the coefficient on the wage rate ( $\beta_2$ ) from (3.7). This captures the change in food expenditures due to changes in the opportunity cost of time *holding consumption (i.e., home production output) constant*. That is, the coefficient  $\beta_2$  represents the movement along the isoquant of the home production function. As household wages increase, the cost of spending time on home production increases causing households to substitute away from home production. In order to keep total consumption constant, they will have to increase expenditure. A standard (convex) production function, therefore, implies  $\beta_2$  should be positive.

Table 1 reports the coefficient on  $\beta_2$  for different specifications of (3.7). The first row includes all the consumption measures discussed above as the  $z$  controls. The second row only includes log average daily calories as the consumption control. Column I includes no demographic and health controls while column II includes the demographic and health controls

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<sup>16</sup> The CSFII data specifies four Census regions: Northeast, Midwest, South and West.

discussed above. The estimated elasticity ranges between 0.24 (column I with no demographic and health controls and calories as the sole consumption control) and 0.29 (column II with demographic and health controls, full consumption controls). These results suggest that a consumer seeking to maintain a constant level of consumption will reduce food expenditures by approximately 2.4% to 2.9% when faced with a 10% decline in wages. The results are only slightly higher when restricting to single individuals with no children ( $\beta_2 = 0.32$ ,  $p$ -value  $< 0.01$ ).

The final row of Table 1 reports the elasticity of expenditure with respect to wage without holding food intake constant. This “total derivative” is approximately equal to the partial derivative holding  $z$  constant, indicating that much of the movement in expenditures represents movements along an isoquant. In other words, the third term in the quasi-Slutsky equation discussed in (3.6) is small.

These elasticities suggest a fairly large response of expenditures to fluctuations in wages absent a corresponding movement in consumption. It is also consistent with the existing empirical work on the “excess sensitivity” of food expenditure to income. The survey by Browning and Lussardi (1996) reports that elasticities of food expenditure with respect to predictable income range between 0.10 and 0.56. Moreover, the calibrated model of Baxter and Jermann (1999) finds this elasticity should be roughly 0.3. Table 1’s result suggest that static cost minimization of home production should yield an elasticity of 0.24 - 0.29 along a perfectly flat consumption path.<sup>17</sup>

The interpretation of (3.7) and the results reported in Table 1 rests on the premise that agents optimally substitute time for expenditures as the price of time declines. We can directly measure changes in time spent on food production using the NHAPS time-use dataset.

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<sup>17</sup> There is nothing from the analysis to suggest that consumption should be constant across time. From (3.3), the marginal utility of food consumption will vary with the intertemporal ratio of prices, where the price of food is a function of both market expenditures and the opportunity cost of time. In this sense, a household expecting a drop in the wage rate may actually delay food consumption. However, how food consumption itself varies over time will depend on the curvature of the utility function as well as movements in the consumption of other goods that enter nonseparably with food. We take a relatively conservative view and, in the subsequent sections, test whether food consumption falls in response to temporary or expected declines in income.

Unfortunately, this dataset does not report wage rates. However, we can proxy for wages with education. Restricting the sample to employed respondents between the ages of 25 and 51, the median amount of time spent in food preparation (conditional on reporting a nonzero amount) is 45 minutes for those with a high-school education or less, compared with 30 minutes for those with a post-secondary education (p-value of difference  $<0.01$ ). If we consider “total food production” as the sum of food preparation plus food shopping, the respective medians are 45 minutes versus 32 minutes (p-value  $<0.01$ ). More formally, we regress the log of time spent in food preparation and total food production on a dummy for post-secondary education, controlling for sex, age, and year. We find that having a post-secondary education leads to a 21% drop in time spent in food preparation (p-value  $< 0.01$ ) and a 19% drop (p-value  $< 0.01$ ) in total food production.<sup>18</sup>

These elasticities are estimated conditional on positive time spent in food production. Not all individuals engage in home production on any given day. This is not surprising given that food production in the NHAPS data is measured at the individual level. On any given day, food production may be allocated to only one member of the household. Fifty-six percent of the sample reports positive time spent on total food production in the previous day. However, the probability of reporting positive time on food production does not vary with education – a respondent with more than a high school education is 0.3% more likely to report positive time for total food production (t-stat 0.21). This suggests the impact of education occurs predominantly on the intensive margin of home production.

The above results imply that individuals substitute toward home production of food as the opportunity cost of time declines. This suggests the need to reevaluate tests of consumption smoothing that use expenditures. Given the cross-sectional nature of the CSFII dataset, it is difficult to separate temporary vs. permanent income shocks for employed workers. This was not

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<sup>18</sup> Rios-Rull (1993) finds similar patterns for general house work as a function of wage. See also Juster and Stafford (1985) and Rupert, Rogerson, and Wright (1995, 2000).

an issue in estimating (3.7) as that equation represented static cost minimization *given* a level of log consumption. However, to test for changes in consumption due to fluctuations in income, we need to proxy for temporary or expected changes in income while holding permanent income constant. In the next two sections, we address two important cases where we can identify shocks to income – unemployment and retirement.

#### **IV. Consumption vs. Expenditure in Unemployment**

Using the PSID, Stephens (2001) finds that household food expenditure declines by roughly 10% following involuntary job loss of the household head. Cochrane (1991) uses PSID food expenditure to reject full consumption insurance across some types of job loss. Gruber (1997) uses PSID food expenditure data to examine the extent to which public insurance helps to smooth consumption profiles of unemployed workers. All of these papers find that unemployed households suffer expenditure declines during their period of job loss. With these stylized facts, the authors make conclusions about the extent of risk sharing that occurs across households, the benefits of the public welfare system, and the utility loss associated with unemployment. But, to the extent that food expenditure can be replaced with time spent in home production, we would expect to observe a decline in food expenditures during job loss as the value of time is temporarily reduced.

In this section, we use the CSFII and NHAPS data sets to examine the response of expenditure, home production, and consumption to unemployment. For both data sets, we restrict our analysis samples to include only household heads (CSFII data) or individuals (NHAPS data) in the labor force between the ages of 25 and 51 (3,389 household heads in the CSFII sample and 3,433 individuals in the NHAPS sample). Respondents are defined to be in the labor force if they are currently working (full or part time) or they are unemployed and looking for work. 4.7% of household heads in the CSFII sample and 5.4% of individuals in the NHAPS sample reported being unemployed.

Table 2 reports mean monthly consumption expenditure (from the CSFII data) and mean time spent on food production (from the NHAPS data) for both full time employed and unemployed households. As above, we define the time spent on food production as the sum of the time spent shopping for food and the time spent preparing meals. Employed household heads spend, on average, \$540 per month on food for their household while unemployed household heads spend only \$463 per month on food for their household ( $p$ -value of difference  $<0.01$ ). As predicted by a theory of home production, the declining expenditure in unemployment is associated with an increase in time spent on food production. Unemployed individuals spend 59% more time shopping for and preparing food compared to their employed counterparts (43 minutes vs. 27 minutes,  $p$ -value of difference  $<0.01$ ). The NHAPS data allow us to disentangle time spent on food production into two components: the probability of having positive time spent on food production and the amount of time spent on food production, conditional on time spent being positive. Unemployed individuals increase their time spent on food production along both the extensive and intensive margins (Table 2).

Comparing unconditional means between unemployed and employed household heads may be misleading given that household heads who are unemployed at any given time may be different in type than employed household heads. For example, low educated households are more likely to be unemployed and also have lower permanent income. As a first step to control for differences in type across households, we compare food expenditures and time use between unemployed and employed households within education classes. Table 2 shows that the decline in expenditure in unemployment occurs for both high educated and low educated household heads. Low educated, unemployed household heads spend 13% less on food than low educated employed household heads ( $p$ -value = 0.01). The comparable decline in spending for the few high educated, unemployed households is 10% ( $p$ -value = 0.24). The pattern in time use is also similar once conditioning on education. Low educated unemployed household heads spend 60% more time on food production than low educated employed household heads ( $p$ -value  $< 0.01$ ).

Likewise, high educated unemployed households spend 42% more time on food production than high educated full time workers ( $p$ -value = 0.02).

To study the impact of unemployment on expenditure, time use, and consumption more formally, we estimate a series of regressions:

$$\begin{aligned}\ln(x_{jt}) &= \alpha_0 + \alpha_1 Unemp_{jt} + \alpha_3 X_{jt} + \eta_{jt} \\ h_{jt} &= \beta_0 + \beta_1 Unemp_{jt} + \beta_3 X_{jt} + \varepsilon_{jt} \\ \ln(z_{jt}) &= \gamma_0 + \gamma_1 Unemp_{jt} + \gamma_3 X_{jt} + v_{jt}\end{aligned}\tag{4.1}$$

where  $x_{jt}$ ,  $h_{jt}$ ,  $z_{jt}$  measure, respectively, total monthly household food expenditures, daily time spent on food production by the individual, and daily measures of food consumption of the household head.  $Unemp_{jt}$  is a dummy variable equal to 1 if the household head  $j$  is unemployed at time  $t$ .  $X_{jt}$  is a vector of additional year, region, demographic and health controls. The demographic controls include age, dummies for household size, race, level of educational attainment, and sex. The health controls are defined in the data appendix and include the household head's height and weight, self reported health status, and controls for major afflictions. For the time use regressions,  $X_{jt}$  excludes the health controls since health variables were not asked as part of the NHAPS survey. The coefficients  $\alpha_1$ ,  $\beta_1$  and  $\gamma_1$  represent the difference in expenditure, time use, and consumption between unemployed and employed household heads.

Table 3 provides the results of an OLS estimation of (4.1). The top portion of Table 3 confirms the results in Table 2. Even after controlling for time, region, health and demographic variables, unemployed household heads spend 14% less on total monthly food expenditures ( $p$ -value < 0.01). This estimate is in line with the estimates provided in Stephens (2001) using food expenditure data from the PSID.<sup>19</sup> Unemployed individuals also spend 25% more time in home

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<sup>19</sup> Banks, Blundell, and Tanner (1998) also find declines in consumption upon retirement using the British Family Expenditure survey. Specifically, they find unemployed households experience a 7.6% decline in food at home and

production than their employed counterparts, conditional on reporting a nonzero amount. Combining both the extensive and intensive margins, total time spent on food production increases by almost 13 minutes per day when the household head is unemployed. In other words, unemployed households spend, on average, 6½ hours more per month on food production than their employed counterpart.

The results (not shown) indicate that both unemployed men and unemployed women spend more time in food production than their working counterparts. On any given day, only 44% of men in the labor force engage in home production compared to 70% of women in the labor force. Conditional on the  $X$  vector of controls discussed above, the probability of engaging in home production for women increases by 11 percentage points during an unemployment spell ( $p$ -value = 0.01) and 4 percentage points for men ( $p$ -value = 0.55). While men do not appear to adjust their time spent on food production on the extensive margin, they dramatically increase their time spent on food production on the intensive margin. Conditional on spending positive time on food production and controlling for demographics, both men and women increase their time spent in food production, respectively, by 27% ( $p$ -value = 0.10) and 22% ( $p$ -value = 0.06). This latter result indicates that both unemployed men and unemployed women spend more time on food production than their employed counterparts.

Our estimates reported in Table 1 indicate that a 14% drop in food expenditures will be associated with a constant level of consumption if the opportunity cost of time falls by roughly 50% during unemployment (0.14/0.29). While this drop in the value of time strikes us as reasonable, we can directly test whether consumption falls during unemployment using the CSFII data. Table 3 provides the results of estimating (4.1) with log average daily calories consumed as our measure of consumption. Despite the large decline in food expenditures, unemployed

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domestic energy and a 52% decline in work-related expenses which include restaurant meals, transport, and adult clothing.

households consume similar amounts of calories compared to employed households (coefficient = -1%,  $p$ -value = 0.80).

One concern with this measure of consumption is that households may substitute toward “cheap” calories during unemployment – consuming the same quantity of calories, but lower quality. We can control for this possibility by using the nutritional content of the individual’s diet as reported in the CSFII data. We choose six such measures of nutrition: total protein, total fat, total cholesterol, total carbohydrates, total calcium and total vitamin C. We choose these six measures somewhat arbitrarily, trying to pick measures that emphasize the quality of the individual’s diet. We can document that these characteristics are important to consumers by comparing consumption levels across wealth categories. Specifically, we examine the full sample of CSFII household heads between the ages of 25 and 71 (6,713 household heads). Within the sample, we define household heads as either being low, medium, or high wealth.<sup>20</sup> To examine whether our consumption measures covary positively with household economic status, we regress these measures on dummy variables indicating household wealth status (medium wealth is the omitted category) plus our full set demographic, health and employment status controls. The demographic and health status are identical to those discussed above. The employment status controls include dummies indicating whether the household head is employed full time, employed part time, unemployed, disabled, a homemaker, a student or retired. For measures other than calories, we include log calories as an additional control.

Table 4 reports the results of these regressions. On average, wealthier household heads consume 3% ( $p$ -value <0.01) more calories and poor household heads consume 3% ( $p$ -value=0.01) less calories than comparable medium wealth households. We also find that calories

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<sup>20</sup> Low wealth is defined as non-homeowners with less than \$1,000 in liquid assets. High wealth is defined as homeowners with more than \$5,000 in liquid assets and reporting dividend or interest income over the last year. Medium wealth is the remaining households. Low, medium, and high wealth households comprise 19%, 60%, and 21% of the sample, respectively.

have a 3% elasticity (p-value <0.01) with respect to income (not reported).<sup>21</sup> We prefer specifications using wealth rather than income to document how our consumption measures respond to permanent income as current income also reflects the opportunity cost of time. Controlling for calories, wealthy households consume more vitamin C, more calcium, and more carbohydrates. Wealthier households eat 2% less fat and 8% less cholesterol than medium wealth households (p-value = 0.04 and <0.01, respectively). Correspondingly, low wealth households consume less vitamin C and calcium and more cholesterol. Protein does not appear to respond strongly to wealth conditional on total calories; however, without log calories as a control, the wealthy consume significantly more protein and the poor significantly less. Overall, the results of Table 4 confirm our intuition that “expensive” calories have less fat and cholesterol and more nutritional content.<sup>22</sup>

The remaining rows of Table 3 report how consumption of these additional measures of food quality vary with unemployment. We include total calories as an additional control to compare the nutritional composition of the individual’s diet for a given level of calories. Regardless of the measure used, the results presented in Table 3 indicate a dramatic absence of consumption declines during unemployment. The point estimates on the majority of the nutritional measures are essentially zero. Protein, total fat, cholesterol and carbohydrate intake do not change as a household becomes unemployed (point estimates range from -2% to +2%). Unemployed households consume slightly more calcium and slightly less vitamin C. The results in Table 3 indicate that unemployed households do not substitute towards cheap calories. Collectively, the CSFII data suggest that household food consumption remains essentially

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<sup>21</sup> Subramanian and Deaton (1996) document an elasticity of calories with respect to expenditures in rural India that is roughly 0.3 – 0.5. Given the relative wealth of our sample it is not surprising that we find a much smaller elasticity. However, we can easily reject an elasticity of zero.

<sup>22</sup> One could argue that the causation between total fat or cholesterol and wealth goes in the opposite direction. For example, individuals that consume less fat may expect to live longer and as a result, accumulate more wealth. Or, educated households eat less cholesterol because they are aware of the dangers of high cholesterol. On average, high educated individuals have higher wealth than low educated individuals. To the extent that our demographic, education and health controls (which include whether the individual has high cholesterol and the individual's height and weight) proxies for such differences, the reverse causation concern is mitigated.

constant during unemployment, despite the fact that food expenditure falls dramatically.<sup>23</sup> The two facts can be reconciled given that unemployed individuals spend, on average, 48% more time per day on food production.

It should be noted that the CSFII data provides up to 20 additional measures of an individual's diet including intake of fiber, sodium, vitamin A, vitamin D, vitamin E, carotene, thiamin, iron, zinc, and riboflavin. We examined all of these measures individually. The results of these additional variables (not reported) are essentially the same as those reported in Table 3. For essentially all of the variables, there was no economic or statistical difference in consumption between employed and unemployed households.

While home production allows agents to substitute time for expenditures, this transformation has its limits. Regardless of the time spent on food production, a certain amount of expenditure is needed to sustain actual food intake. We would expect that unemployed households with limited access to financial resources may be forced to decrease their consumption during periods of temporarily low income. The CSFII data verifies this proposition. We re-estimate (4.1) on a sample of low wealth households. Low wealth households are more likely to be liquidity constrained given their inability to self insure themselves when income is temporarily low (Zeldes (1989), Jappelli et. al. (1999)).

As noted above, the CSFII does not directly ask their respondents to report the value of their net worth. Given this data limitation, we define low wealth households as being households which do not own their own home and have less than \$1,000 in liquid assets. As with the full sample, low wealth households experience a 15% decline in expenditure during unemployment ( $p$ -value < 0.01). However, despite increasing their time spent on food production, low wealth households experience an 8% decline in caloric intake when the household head becomes

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<sup>23</sup> The results do not differ if log calories are omitted as a control when nutritional measures are used as the dependent variable. For example, the estimate of  $\gamma_1$  from (4.1) with Log(Total Protein) as the dependent variable and the exclusion of log calories as a control is 0.008 (standard error = 0.03). The same pattern of results held for all the other nutritional measures.

unemployed ( $p$ -value = 0.04).<sup>24</sup> This result suggests that individuals cannot perfectly smooth their consumption solely through switching towards home production. Some minimum level of expenditure is needed to sustain consumption during periods of temporarily low income.

The results presented in this section confirm that expenditures are a misleading proxy for consumption in analyzing the welfare consequences of unemployment. The estimates indicate that aside from the very poorest households, agents are able to smooth food consumption by substituting time for expenditures. Moreover, the results demonstrate that one cannot infer a failure of capital markets or public insurance from the observed drop in *expenditures* during unemployment.

## V. Consumption vs. Expenditure in Retirement

One complication of exploring consumption responses to job loss is that unemployment may result in an unanticipated fall in permanent income. The average unemployed household has 10% lower earnings six years after the onset of an unemployment spell compared to their pre-unemployment earnings (Topel (1991), Huff-Stevens (1997)). To the extent that unemployment is unpredictable, job loss may mix a decline in permanent income with a temporary change in the value of time. The results of the previous section indicate that if there is a permanent income component to job loss, agents nevertheless maintain stable food consumption. However, we would like to examine changes in the value of time when there is no unexpected change to permanent income. Examining a household's transition into retirement provides such an environment. Retirement, for most households, is a discreet, planned event (Haider and Stephens (2003)).

Moreover, by focusing on retirement, we can directly address the "retirement consumption puzzle" which has been widely documented in the literature during the last decade (Banks, Blundell, and Tanner (1998), Bernheim, Skinner and Weinberg (2001), Miniaci, Monfardini and

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<sup>24</sup> There were 983 households in the CSFII data that met our low wealth definition.

Weber (2002), Haider and Stephens (2003), and Hurd and Rohwedder (2003)). The puzzle centers on the fact that expenditures decline precipitously at the time of retirement. For example, using PSID data, Bernheim et. al. (2001) find that total food expenditure declines by about 30% between the pre and post retirement periods for the average household. They report similar declines in expenditure for both "food at home" and "food away from home". Banks, Blundell and Tanner (1998), using British data, Miniaci, Monfardini and Weber (2002), using Italian data, and Haider and Stephens (2003), using the Retirement History Survey, all find evidence of large expenditure declines at the time of retirement. Some authors have interpreted the decline in expenditure at retirement as being evidence that households do not plan sufficiently for retirement (Bernheim et. al. (2001)) while others interpret this fact as evidence that household preferences are time inconsistent (Angeletos et al. (2001)).<sup>25</sup>

In this section, 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. To examine expenditure, home production, and consumption at the onset of retirement, we restrict both samples to include all households with heads between the ages of 57 and 71 for which there is a full set of control variables. Less than 10% of the CSFII household heads retire 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). The above restrictions resulted in a sample of 2,058 households for our CSFII sample and 1,336 individuals for our NHAPS sample.

Consistent with the existing literature, the CSFII data find that retirees spend less on food, all else equal. Figure 1 plots the average total food expenditure, food expenditure "at home" and food expenditure "away from home" by age using the CSFII data. We define "peak retirement age" as being when the household head is between 63 and 65 years of age. Institutional designs

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<sup>25</sup> 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.

on the part of private firms and the Federal government create large incentives for individuals to retire between the ages of 63 and 65. In fact, the majority of retired households in the HRS retired between the ages of 63 and 65. The CSFII data show that prior to the average retirement age (households aged 60-62) and after the average retirement age (households aged 66-68), household expenditure on total food, food at home, and food away from home declines by 17%, 16%, and 20%, respectively.

The decline in consumption expenditures at retirement is robust to the inclusion of a rich set of controls designed to capture changing demographics and health among older households. Table 4 reports the estimates to the following equation:

$$\ln(x_{jt}) = \alpha_0 + \alpha_1 Retired_{jt} + \alpha_2 X_{jt} + u_{jt} \quad (5.1)$$

where  $x_{jt}$  is total food expenditure, expenditures on food “at home”, or expenditures on food “away from home”, depending on the specification, for household  $j$  in year  $t$ .  $Retired_{jt}$  is a dummy variable equal to 1 if the household head  $j$  is retired in year  $t$ , and  $X_{jt}$  is the vector of year, region, demographic and health controls discussed in section IV.

Given that the timing of retirement can also be correlated with unmeasured variables which affect the household's expenditure decisions, we estimate (5.1) via an instrumental variable procedure. We use age as an instrument for retirement. Age naturally has strong predictive power for the household head's retirement status. The adjusted R-squared of a regression of household retirement status on age controls is 0.19 (with an associated  $F$ -statistic of 119.0). One concern is that age may independently influence food expenditure and/or consumption. However, when estimating (5.1), we include a full set of controls for the health of the household head. If there is a residual correlation, one would expect that older individuals consume less on average. If so, our IV results would be biased towards finding a drop in consumption at retirement. Moreover, the effect would be present in both the expenditure and consumption regressions.

Table 5 reports the value of  $\alpha_1$  from equation (5.1). Controlling for retirement status directly and including the rich set of demographic, location, time, health and education controls leaves the conclusions from Figure 1 unaltered. There is still an unexplained 17% decline in expenditure associated with retirement ( $p$ -value  $< 0.01$ ). This decline in expenditure is quantitatively consistent with the “retirement consumption puzzle” documented by many other researchers using different data sets.

Two additional results are of note from Table 5. First, expenditures on both food at home and food away from home are reduced during retirement. If the total decline in consumption expenditure associated with retirement was due to work related expenses, one would not expect to observe food expenditures at home declining. Second, the decline in food expenditure is comparable across wealthy and poorer households. To identify wealthy households, we restrict the sample to those who own a home, have more than \$5,000 in liquid assets, and received dividend or interest income in the previous year.<sup>26</sup> Our sample of poor households is constructed as in section IV (i.e., non-homeowners with less than \$1,000 in liquid assets). The resulting sample size of the wealthy household and poor household sample are 695 households and 377 households, respectively.<sup>27, 28</sup>

On average, wealthy households experienced a 23% decline in total food expenditure ( $p$ -value = 0.02), a 25% decline in food expenditures at home ( $p$ -value = 0.02), and a 17% decline in food expenditures away from home ( $p$ -value = 0.44). Such results are consistent with the findings of Bernheim et. al. (2001), using PSID data. However, the fact that high wealth

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<sup>26</sup> The question in the CSFII survey directly assessing wealth reads "Now, consider cash, saving, or checking accounts, stocks, bonds, mutual funds and certificates of deposit. Do the members of this household have more than \$5,000 of such savings or cash assets at this time?" If the household respondent reported owning less than \$5,000 of liquid assets, they were asked to provide the actual amount of liquid assets which they currently owned (including zero).

<sup>27</sup> The corresponding income levels of households in the wealthy and poor sample suggest that that the selection criteria were valid. The annual total income for the all high wealth households, the non-retired high wealth households and the retired high wealth households were, respectively, \$55,700, \$61,400, and \$51,100. The annual total income for all low wealth households, the non-retired low wealth households and the retired low wealth households were, respectively, \$12,700, \$14,100, and \$10,800. The income measure include all earnings from wages, salary, social security, private pensions, welfare programs and other income, including asset income.

<sup>28</sup> When defining the poor sample, we included the over sample of low income households into our sample if they did not own a home, had less than \$1,000 in liquid assets and received no dividend or interest income in the prior year.

households, on average, experience a decline in expenditure is difficult to reconcile with a lack of planning explanation. Poor households, upon retirement, experienced a similar decline in total food consumption expenditure (25%) and food expenditure at home (16%). However, compared with wealthy households, poor households experienced a far greater decline in food expenditures away from home upon retirement (a 73% decline;  $p$ -value 0.03).

Table 6 shows that the decline in expenditure occurs precipitously during peak retirement years. Given that the CSFII data is not in panel form, it is impossible to control for the immediate transition into retirement. That is, we do not observe how long an individual has been retired. To address whether there is a consumption decline at the onset of retirement, we compare household prior to the peak retirement years with similar households immediately after the peak retirement years. Formally, we re-estimate (5.1) using OLS and replacing the retirement variable with a series of three year age range dummies. The dummy indicating that the household head was between the ages of 60 and 62 was the omitted variable. The results of Table 6 confirm the results of Figure 1: expenditure declines sharply during the peak retirement years. Households with heads aged 63-65 or 66-68 consume 6% and 8% less than households with heads aged 60-62 ( $p$ -values equal, respectively, 0.02 and  $<0.01$ ). The consumption of households with heads aged 57-59 is statistically identical to households with heads aged 60-62. The results of Table 6 confirm that the decline in consumption occurs during the peak retirement years.

Assuming that the opportunity cost of time declines in retirement, retirees will use less market goods and more time in the home production of food.<sup>29</sup> To test this hypothesis, we use the sub-sample of NHAPS individuals between the age of 57 and 71, discussed above. Table 7 shows that individuals who are retired spend 28% more time on food production than non-retired individuals (46 minutes vs. 36 minutes,  $p$ -value of difference  $< 0.01$ ).<sup>30</sup> As was the case with

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<sup>29</sup> As discussed in section III, the opportunity cost of time will be captured by the marginal utility of leisure whether or not the agent currently participates in the labor force.

<sup>30</sup> Our NHAPS sample limits the individuals to have less than 5 hours of daily food production. There are 8 individuals who have extremely large time spent of food production (more than 5 hours and upwards of 8 hours). Their

working households in section III, not all individuals engage in home production on any given day. Specifically, only 58% of non-retired individuals spend any time on food production during the previous day. Consistent with the time use theory outlined above, retired households are much more likely to engage in any home production during a given day (67% vs. 58%,  $p$ -value of difference  $< 0.01$ ). The average time spent on home production, conditional on home production being positive, also increases during retirement (from 62 minutes to 69 minutes,  $p$ -value of difference = 0.10). While the size of this last increase is relatively small, we will see below that its magnitude becomes much greater once we control for demographics, particularly sex.

While women are more likely than men to engage in home production of food in any period, the change at retirement is most prominent for men. Retired female household heads spend 16% ( $p$ -value = 0.05) more time on food production than their working counterparts. As seen in Table 7, retired men relative to their working counterparts spend 50% more time on food production ( $p$ -value  $< 0.01$ ) and are more likely to report a nonzero amount of time spent on food production (42% vs. 49%,  $p$ -value of difference = 0.10). Conditional on spending nonzero time on food production, retired men spend 31% ( $p$ -value = 0.03) more time on food production than working men.

Table 8 shows that the effect of retirement on time spent on food production is even greater once we control for household demographics. Specifically, we use IV to estimate the following equation:

$$h_{jt} = \beta_0 + \beta_1 \text{Retired}_{jt} + \beta_2 X_{jt} + \eta_{jt} \quad (5.2)$$

where  $h_{jt}$  measures individual  $j$ 's time spent (in minutes) on food production on the day prior to completing the survey. We also use a dummy variable indicating whether  $h_{jt}$  is positive and  $\ln(h_{jt})$  as alternative measures for the dependent variable. *Retired* takes the value one if retired.

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inclusion dramatically decreases the precision of our estimates (although the difference in means between the two groups is unaltered). Removing these 8 individuals from our analysis reduces our sample size to 1,328 individuals.

The dummy variables represented by  $X_{jt}$  control for year, region, sex, household size, education and race. As above, we instrument for retirement behavior using the household head's age. The adjusted R-squared of a regression of retirement status on age controls is 0.15 ( $F$ -statistic = 67.3) for the NHAPS sub-sample.

Table 8 reports the IV estimates of  $\beta_l$  from (5.2) using three different measures for  $h_{jt}$ . In the first row of Table 8, the dependent variable is the amount of time (minutes) spent on food production; in the second row, the dependent variable is whether the individual had any positive time spent on home production; and in the third row, the dependent variable is the log of time spent on food production, conditional on food production being positive. On average, food production increases by 17 minutes per week ( $p$ -value = 0.02) during retirement. Conditional on engaging in any food production, retired households spend 62% more time on food production ( $p$ -value < 0.01). Interestingly, once we control for demographics, retirees are no more likely to engage in nonzero home production than nonretirees; as was the case with working households in section III, the substitution toward time in home production occurs primarily on the intensive margin.

While the NHAPS data does not include wealth or income measures, we can examine the behavior of high educated home owners, which, on average, should be wealthier than the rest of the population. The results (not shown) find that the increase in time spent in home production, conditional on home production being positive, found among high educated home owners is larger than the increase among the full sample (93% vs. 66%). It may not be surprising that educated workers exhibit a greater increase in time spent in home production upon retirement. Educated workers have a higher wage before retirement and spend less time in home production while working (see Section III). These workers are thus likely to face a larger change in the cost of time upon retirement. Moreover, this indicates that the substitution toward time in food production is not limited to low wealth retirees.

The data on food expenditures and time use discussed above already suggest that consumption may not differ across retirement status. From Table 5, we observe a 17% decline in expenditures during retirement. The estimates of section III (Table 1) suggest that maintaining a constant level of consumption, given a 17% drop in food expenditure, requires an approximately 60% ( $0.17/0.29=0.59$ ) drop in the opportunity cost of time. This implies that the drop in expenditures upon retirement may be plausibly offset by the decline in the cost of time, leaving consumption unchanged. We now test this proposition directly using data on food consumption.

Figure 2 plots the average daily calories consumed by household heads against three-year household age ranges for all households (solid line) and male-headed households (dashed line). Compared to Figure 1, the results are striking. The average male household head consumes nearly 2,000 calories per day in the years prior (age 60-62) to the peak retirement age range. This is nearly the exact same amount of calories consumed by male household heads after (age 66-68) the peak retirement age range. While household spending on food falls by roughly 17% between the ages of 60 and 66, total calories consumed remains essentially constant.

Column (I) in Table 9 reports an OLS regression of log calories consumed by the household head on a dummy variable indicating whether the household head is 63 years old or older and a vector of additional controls. Column (II) reports an IV regression of log calories consumed by the household head on a dummy variable indicating whether the household head is retired and a vector of additional controls. As before, retirement status is instrumented using household age. The demographic, year, region, education and health controls included in the regressions in Table 9 are exactly the same as the controls included in Tables 5 and 6. The estimated coefficients reported in Table 9 confirm the conclusions from Figure 2: caloric intake does not decline in retirement.

As in section IV, we can test whether consumers are substituting toward lower quality food by looking at additional measures of food intake. Figure 3 explores two such dietary components: the grams of protein consumed per day and the grams of fat consumed per day.

The amount of protein and total fat consumed by male household heads decline slightly across the peak retirement ages (1.1% and 3.0%, respectively). However, as seen in Table 10, conditioning on the full vector of demographic, education and health controls, as well as total calories consumed, dietary composition remains essentially unchanged during retirement. During the head's peak retirement years (ages 63 – 65), household consumption of protein, fat, cholesterol and carbohydrates remain essentially constant (a change of -0.1%, -1%, -2%, and 1%, respectively).<sup>31</sup> Like total calories consumed, the consumption of total protein does not vary with household age for households aged 57 to 68, conditional on demographic and health variables. Relative to household heads in their early 60s, household heads aged 66-71 consume slightly more carbohydrates, vitamin C, and calcium and slightly less total fat and cholesterol.

The CSFII data provide no evidence that household consumption switches towards "cheap" calories during retirement. This is consistent with the results that high wealth household heads experience a decline in expenditures (Table 5) and an increase in time spent in home production (Table 7) as they enter retirement. Given that high wealth households should not be forced to consume inferior products in retirement, coupled with the fact that high wealth households dramatically increase their time input into food preparation during retirement suggests that the decline in expenditure results from a substitution toward time spent in home production and not a substitution toward inferior store brand products with similar nutritional composition.

Smoothing via home production is not without limits. Like their unemployed counterparts, low wealth households experience a drop in calories consumed during retirement. As seen in Table 9, high wealth households do not adjust their calories upon retirement. However, low wealth households experience between a 7% decline (OLS regression,  $p$ -value = 0.09) and a 14% decline (IV regression,  $p$ -value = 0.12) in calories during retirement. This implies that while the average household smoothes food consumption during retirement, low wealth households do, in

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<sup>31</sup> Using retirement (instrumented with age) as our independent variable yields similar results. The one exception is that log protein declines significantly by 4% during retirement, although this decline disappears entirely if caloric intake is not included among the regressors.

fact, experience a consumption decline. This result is consistent with recent papers arguing that a small fraction of households do not adequately save for retirement (Engen, Gale, and Uccello (1999); Ameriks, Caplin and Leahy (2002); Hurst (2003)).

One potential problem with examining age (retirement) effects in repeated cross sections among older households is that mortality can have sizeable effects on sample composition. If mortality is correlated with food intake and/or dietary composition, the repeated cross sections can yield biased estimates of retirement effects on our consumption measures. If individuals who eat high calories, high fat, or high cholesterol diets die earlier, we may observe a decline in calories, fat and cholesterol consumed as households age. Such concerns about the change in sample composition with our study are mitigated for four reasons. First, the change in sample composition should bias us towards finding a decline in calories, total fat and cholesterol associated with retirement. We find no decline. Second, appendix Table A2 shows that the pre and post retired sample look very similar along health dimensions. There is no evidence that our pre-retirement sample is less healthy than our post retirement sample. Third, to the extent that health does differ, we have extensive health controls in all our regressions. Finally, the age range in which we are focusing is only from 57 to 71. Mortality concerns are much more problematic among populations of even older households.

The results presented in this section resolve the “retirement consumption puzzle”, at least in regard to food consumption for the average household, by adequately distinguishing between consumption and expenditures. Agents appear to consume roughly the same quality and quantity of food during retirement as they do while working by substituting away from market expenditures and toward time spent in home production.

## **VI. 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. Perhaps 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 unemployment and retirement that have been documented with panel datasets, while at the same time documenting that consumption behaves much differently than expenditures. In addition, we find a fairly large response of household expenditures to household wages holding constant household consumption, an implication of the model that rests on static cost minimization and not intertemporal tradeoffs.

An additional concern is whether our measures of food intake capture the utility of food consumption. As robustness checks, we measure food quantity and quality along a number of dimensions. All of the measures tell a consistent story. The fact that the very poor show a consumption decline confirms that we are measuring a “good” that individual value. The fact that our food consumption measures vary with wealth in predictable ways (Table 4) also support this conclusion. However, the utility of food consumption may also depend on location – a meal in a restaurant may generate higher utility than the same meal eaten at home. In regard to this issue, the existing literature, as well as our data, document that expenditure for both food consumed at home and away from home declines during unemployment and retirement. That is, agents do not just substitute between two types of expenditures. Moreover, the CSFII data reports where meals were consumed. The data indicate that a majority of the decline in meals away from home concerns fast food and cafeteria establishments, not dinners at restaurants with table service. In fact, retired individuals are just as likely to consume a restaurant dinner as their nonretired counterparts, but 10% less likely to eat at a fast food restaurant or cafeteria, all else equal. The unemployed are 8% less likely to consume a restaurant dinner, but this difference is dwarfed by

the 21% decline in the propensity to eat fast food/cafeteria meals. Given that fast food establishments are not known for their ambiance, the data suggest that much of the expenditures on food away from home concern meals that would likely provide the same utility if consumed at home.

Our analysis indicates that consumption is stable, both absolutely and relative to expenditures, during anticipated or transitory shocks to income, except for the poorest households. However, as discussed above, we cannot conclude that utility is unaffected. It is an obvious outcome of the maximization problem that an agent with a higher wage can achieve greater utility, all else equal. To the extent that retirement or unemployment is voluntary, we cannot make any conclusions about utility without a more complete set of assumptions. Furthermore, food consumption represents only a portion of the household's total consumption bundle. What we can conclude, however, 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 expenditures.

## **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\_91) and the second interviewed households between 1994 and 1996 (CSFII\_96). 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 in an in-person interview on 2 (for the CSFII\_96) or 3 (for the CSFII\_91) 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\_96 and the main sample of the CSFII\_91 were designed to be nationally representative. The CSFII\_91 included an over-sample of the poor. Unless we were specifically looking at low-income households, we restricted our analysis to the CSFII\_91'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, boarders, 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\_96, 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. 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\_91 and two for the CSFII\_96). Households were nominally compensated for their participation in the survey. Upon completion of the survey, the Department of Agriculture converted the food diaries into measures more tangible measures of nutrition (calories, protein (in grams), etc.). For the methodology and software used for the conversion see <http://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.

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\_91 and CSFII\_96 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.

## References

- Angeletos, George-Marios, David Laibson, Jeremy Tobacman, Andrea Repetto and Stephen Weinberg (2001), "The Hyperbolic Consumption Model: Calibration, Simulation, and Empirical Evaluation," *Journal of Economic Perspectives*, August 2001, Vol 15 (3)
- Ameriks, John, Andrew Caplin and John Leahy (2002), "Retirement Consumption: Insights from a Survey," NBER Working Paper 8735
- Attanasio, Orazio P. (1999), "Consumption", in John Taylor and Michael Woodford, ed. *Handbook of Macroeconomics Vol 1B*, Elsevier 1999.
- Attanasio, Orazio and Martin Browning (1995), "Consumption over the Life Cycle and over the Business Cycle", *American Economic Review*, 85, 1118-1137.
- Banks, James, Richard Blundell, and Sarah Tanner (1998), "Is There a Retirement-Savings Puzzle?", *American Economic Review*, Vol. 88 (4), pp. 769-788.
- Baxter, Marianne and Urban J. Jermann (1999), "Household Production and the Excess Sensitivity of Consumption to Current Income", *American Economic Review*, Vol. 89 (4), pp. 902-920.
- Becker, Gary (1965), "A Theory of the Allocation of Time", *Economic Journal* 75 (299), pp. 493-508.
- Benhabib, Jess, Richard Rogerson, and Randall Wright (1991), "Homework in Macroeconomics: Household Production and Aggregate Fluctuations", *Journal of Political Economy*, Vol 99 (6), pp. 1166-1187.
- Bernheim, B. Douglas, Jonathan Skinner, and Steven Weinberg (2001), "What Accounts for the Variation in Retirement Wealth among U.S. Households?", *American Economic Review*, Vol. 91 (4), pp. 832-857.
- Browning, Martin and Annamaria Lusardi (1996), "Household Savings: Micro Theories and Micro Facts", *Journal of Economic Literature*, Vol. 34 (4), pp. 1797-1855.
- Cochrane, John (1991), "A Simple Test of Consumption Insurance," *Journal of Political Economy*, Vol. 99 (5), pp. 957-976.
- Engen, Eric, William Gale and Cori Uccello, "The Adequacy of Household Saving." *Brookings Papers on Economic Activity* 2, 1999, pp. 65-165.
- Greenwood, Jeremy and Zvi Hercowitz (1991), "The Allocation of Capital and Time over the Business Cycle," *Journal of Political Economy*, Vol 99 (6), 1188-1214.
- Greenwood, Rogerson, and Wright (1995), "Household Production in Real Business Cycle Theory", in Thomas Cooley, ed., *Frontiers of Business Cycle Research*, Princeton University Press, 1995.
- Gruber, Jonathan (1997), "The Consumption Smoothing Benefits of Unemployment Insurance", *American Economic Review*, Vol. 87 (1), pp. 192-205.

- Steven Haider and Mel Stephens (2003), "Can Unexpected Retirement Expectations Explain the Retirement Consumption Puzzle? Evidence from Subjective Retirement Expectations" Carnegie Mellon Working Paper.
- Huff-Stevens, Ann(1997), "Persistent Effects of Job Displacement: The Importance of Multiple Job Losses", *Journal of Labor* 15, 1, 165-88.
- Hurd, Michael and Susann Rohwedder (2003), "The Retirement-Consumption Puzzle: Anticipated and Actual Declines in Spending at Retirement", NBER Working Paper 9586,
- Hurst, Erik (2003), "Grasshoppers, Ants and Pre-Retirement Wealth: A Test of Permanent Income Consumers", working paper.
- Jappelli, Tullio, Jorn-Steffen Pichke, and Nicolas Souleles (1998). "Testing for Liquidity Constraints in Euler Equations with Complementary Data Sources", *Review of Economics and Statistics*, 80 (2), pp. 251-62.
- Juster, F. Thomas and Frank Stafford (1985), ed. *Time, Goods, and Well Being*, University of Michigan Press, 1985.
- McGrattan, Ellen, Richard Rogerson, and Randall Wright (1997), "An Equilibrium Model of the Business Cycle with Household Production and Fiscal Policy", *International Economic Review*, Vol 38 (2), pp. 267-290.
- Miniaci, Raffaele, Guglielmo Weber, and Chiara Monfardini (2002), "Is There a Retirement Consumption Puzzle in Italy", working paper.
- Rios-Rull, Jose-Victor (1993), "Working in the Market, Working at Home, and the Acquisition of Skills: A General-Equilibrium Approach", *American Economic Review*, Vol 83 (4), pp. 893-907.
- Rupert, Peter, Richard Rogerson, and Randall Wright (1995), "Estimating Substitution Elasticities in Household Production Models", *Economic Theory*, Vol 6, pp. 179-193.
- Rupert, Peter, Richard Rogerson, and Randall Wright (2000), "Homework in Labor Economics: Household Production and Intertemporal Substitution", *Journal of Monetary Economics*, Vol 46, pp. 557-579.
- Subramanian; Shankar and Angus Deaton (1996), "The Demand for Food and Calories", *Journal of Political Economy*, Vol. 104 (1), pp. 133-162.
- Stephens, Mel (2001), "The Long-Run Consumption Effects of Earnings Shocks", *Review of Economics and Statistics*, Vol.83 (1), pp.28-36
- Topel, Robert (1991), "Specific Capital, Mobility, and Wages: Wages Rise with Job Seniority" *Journal of Political Economy*, Vol. 99 (1), pp. 145-176.
- Zeldes, Stephen (1989), "Consumption and Liquidity Constraints: An Empirical Investigation.", *Journal of Political Economy*, Vol. 97 (2), pp. 305-346.

**Table 1: IV Estimation of Food Expenditure as a Function of Wage and Total Daily Food Consumption, Including Demographic, Health, Time, and Region Controls**

|  | <i>Model I</i> | <i>Model II</i> | <i>Model III</i> |
|--|----------------|-----------------|------------------|
| Consumption Controls                           | $\beta_2$      | $\beta_2$       | $\beta_2$        |
| Consumption Controls: All Consumption Controls | 0.25<br>(0.03) | 0.29<br>(0.03)  | 0.32<br>(0.09)   |
| Consumption Controls: Only Calories            | 0.24<br>(0.03) | 0.27<br>(0.03)  | 0.34<br>(0.09)   |
| Consumption Controls: No Consumption Controls  | 0.26<br>(0.03) | 0.27<br>(0.03)  | 0.34<br>(0.09)   |
| Include Year/Region Controls?                  | Yes            | Yes             | Yes              |
| Include Demographic/Family Size Controls?      | No             | Yes             | Yes              |
| Include Health Controls?                       | No             | Yes             | Yes              |
| Restrict Sample to Family Size = 1             | No             | No              | Yes              |

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. The sample is restricted to include only households with employed heads between the age of 25 and 51 (2,736 households, of which 383 households had family size equal 1). Log wage is computed as described in text. Instruments for log wage consist of race, education, and occupation dummies. All regressions include time/region dummies (including interactions). Demographic/Health controls consist of sex, age, household size, and health controls. See text for the full definition of variables included. Huber-White standard errors are presented in parenthesis.

**Table 2: Comparison of Food Expenditures and Food Production between Full Time Employed and Unemployed Individuals, by Educational Attainment**

| <i>Variable by sample</i>   | <i>Full Time Employed</i> | <i>Unemployed</i> | <i>Difference</i>   | <i>p-value of difference</i> |
|---|---------------------------|-------------------|---------------------|------------------------------|
| <u><i>All Prime Age Individuals in Labor Force</i></u>                    |                           |                   |                     |                              |
| Total Food Expenditure <sup>a</sup>                                       | \$540                     | \$463             | -14%                | <0.01                        |
| Total Time Spent on Food Production <sup>b</sup>                          | 27 minutes                | 43 minutes        | 59%                 | <0.01                        |
| Probability of Having Positive Time Spent on Food Production <sup>b</sup> | 0.55                      | 0.66              | 11 percentage point | 0.01                         |
| Conditional Time Spent on Food Production <sup>b</sup>                    | 49 minutes                | 66 minutes        | 35%                 | <0.01                        |
| <u><i>Prime Age Individuals in Labor Force with Education ≤ 12</i></u>    |                           |                   |                     |                              |
| Total Food Expenditure <sup>a</sup>                                       | \$511                     | \$445             | -13%                | 0.01                         |
| Total Time Spent on Food Production <sup>b</sup>                          | 30 minutes                | 48 minutes        | 60%                 | <0.01                        |
| Probability of Having Positive Time Spent on Food Production <sup>b</sup> | 0.54                      | 0.68              | 14 percentage point | 0.02                         |
| Conditional Time Spent on Food Production <sup>b</sup>                    | 55 minutes                | 71 minutes        | 29%                 | 0.02                         |
| <u><i>Prime Age Individuals in Labor Force with Education &gt; 12</i></u> |                           |                   |                     |                              |
| Total Food Expenditure <sup>a</sup>                                       | \$565                     | \$508             | -10%                | 0.24                         |
| Total Time Spent on Food Production <sup>b</sup>                          | 26 minutes                | 37 minutes        | 42%                 | 0.02                         |
| Probability of Having Positive Time Spent on Food Production <sup>b</sup> | 0.56                      | 0.63              | 7 percentage point  | 0.25                         |
| Conditional Time Spent on Food Production <sup>b</sup>                    | 46 minutes                | 59 minutes        | 28%                 | 0.07                         |

Notes: Prime aged individuals are defined as individuals between the ages of 25 and 51. Individuals in the labor force are required to be currently working or unemployed and currently looking for work. Table compares full time employed workers to unemployed workers (part time workers are excluded). Conditional time spent on food production refers to the average time spent on food production, conditional on food production being positive. All dollar measures are in 1996 dollars.

<sup>a</sup> Data from the CSFII data set. Sample includes 3,389 household heads, of which 1,554 attained 12 or less years of schooling. The percent unemployed for the CSFII samples above are 4.7% for the total sample, 7.3% for the low educated sample and 2.6% for the high educated sample.

<sup>b</sup> Data from the NHAPS data set. Sample used above includes 3,433 individuals, of which 1,274 attained 12 or less years of schooling. The percent unemployed for the NHAPS samples above are 5.4% for the total sample, 8.7% for the low educated sample and 3.6% for the high educated sample.

**Table 3: OLS Regressions of Expenditure, Time Use and Consumption on Unemployment Status, with Demographic, Year, Region, Health and Education Controls**

| <i>Dependent Variable</i>                           | <i>Coefficient on Dummy<br/>Indicating<br/>Unemployment</i> | <i>Standard<br/>Error</i> |
|---|---|---------------------------|
| <i>Expenditure</i>                                  |   |                           |
| Log(Total Food Expenditure)                         | -0.14   | 0.05                      |
| <i>Time Use</i>                                     |   |                           |
| Level of Time Spent on Food Production (in minutes) | 12.7  | 4.2                       |
| Dummy: Positive Time Spent on Food Production       | 0.08  | 0.04                      |
| Log(Conditional Time Spent on Food Production)      | 0.25  | 0.10                      |
| <i>Consumption</i>                                  |   |                           |
| Log(Total Calories Consumed)                        | -0.01   | 0.03                      |
| Log(Total Protein) <sup>a</sup>                     | 0.01  | 0.02                      |
| Log(Total Fat) <sup>a</sup>                         | -0.01   | 0.02                      |
| Log(Total Cholesterol) <sup>a</sup>                 | 0.04  | 0.04                      |
| Log(Total Carbohydrates) <sup>a</sup>               | -0.02   | 0.02                      |
| Log(Total Vitamin C) <sup>a</sup>                   | -0.12   | 0.06                      |
| Log(Total Calcium) <sup>a</sup>                     | 0.09  | 0.04                      |
| Include Demographic/Family Size Controls?           | Yes   |                           |
| Include Year/Region Controls?                       | Yes   |                           |
| Include Health Controls?                            | Yes   |                           |
| Include Education Controls                          | Yes   |                           |

Notes: Sample includes between the ages of 25 and 51 who are currently in the labor force. Individuals in the labor force are required to be either currently working or unemployed and currently looking for work. The expenditure and nutritional intake measures come from the CSFII data (3,389 observations). The data on time use comes from the NHAPS data (3,433 observations). Conditional time spend on food production refers to the average time spent on food production, conditional on food production being positive. Coefficients in Table 3 come from an OLS regression of either log total consumption, log time spent on food production, or log of nutritional intake 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 included in the second column.

<sup>a</sup> Regression also includes Log(Total Calories Consumed) as an independent variable.

**Table 4: Quantity and Quality of Diet as a Function of Wealth, with Demographic, Year, Region, Health, Education, and Employment Status Controls  
(Medium Wealth Omitted Group)**

| <i>Dependent Variable</i>             | <i>Coefficient on<br/>Dummy Indicating<br/>High Wealth</i> | <i>Coefficient on<br/>Dummy Indicating<br/>Low Wealth</i> |
|---------------------------------------|--|---|
| Log(Total Calories Consumed)          | 0.03<br>(0.01)   | -0.03<br>(0.01)   |
| Log(Total Protein) <sup>a</sup>       | -0.001<br>(0.01)   | -0.01<br>(0.01)   |
| Log(Total Fat) <sup>a</sup>           | -0.02<br>(0.01)  | -0.01<br>(0.01)   |
| Log(Total Cholesterol) <sup>a</sup>   | -0.08<br>(0.02)  | 0.03<br>(0.02)  |
| Log(Total Carbohydrates) <sup>a</sup> | 0.013<br>(0.006)   | -0.004<br>(0.01)  |
| Log(Total Vitamin C) <sup>a</sup>     | 0.11<br>(0.03)   | -0.14<br>(0.03)   |
| Log(Total Calcium) <sup>a</sup>       | 0.02<br>(0.01)   | -0.027<br>(0.015)   |

Notes: Sample includes all CSFII household heads between the ages of 25 and 71 (6,713 household heads). Results in Table 4 are from a regression of log consumption measure on a dummy variable indicating whether the household comes from a high wealth household and a dummy variable indicating whether the household head comes from a low wealth household (household heads from a medium wealth household comprise the omitted group). The coefficient on the high wealth dummy is presented in column I and the coefficient on the low wealth dummy is presented in column II. The dependent variables for these regressions are our different consumption measures (calories, protein, fat, etc). All regressions include a series of demographic, year, region, health, education, and employment status controls. See text for a full description of variables included. Low wealth households are defined as non-homeowners having less than \$1,000 in liquid financial assets. High wealth households are defined as homeowners with more than \$5,000 in liquid assets who received some dividend or interest income in the prior year. Huber-White standard errors included in parentheses.

<sup>a</sup> Regression also includes Log(Total Calories Consumed) as an independent variable.

**Table 5: IV Estimation of Food Expenditure as a Function of Household Retirement Status, with Demographic, Region, Time, Health and Education Controls**

| Dependent Variable by Sample                   | Coefficient on Retirement Dummy |
|--|---------------------------------|
| <i>Sample 1: Main Retirement Sample</i>        |                                 |
| Total Food Expenditure                         | -0.17<br>(0.06)                 |
| Food Expenditure "At Home"                     | -0.15<br>(0.06)                 |
| Food Expenditure "Away from Home"              | -0.27<br>(0.12)                 |
| <i>Sample 2: High Wealth Retirement Sample</i> |                                 |
| Total Food Expenditure                         | -0.23<br>(0.10)                 |
| Food Expenditure "At Home"                     | -0.25<br>(0.11)                 |
| Food Expenditure "Away from Home"              | -0.17<br>(0.22)                 |
| <i>Sample 3: Low Wealth Retirement Sample</i>  |                                 |
| Total Food Expenditure                         | -0.25<br>(0.14)                 |
| Food Expenditure "At Home"                     | -0.16<br>(0.14)                 |
| Food Expenditure "Away from Home"              | -0.73<br>(0.34)                 |
| Include Demographic/Family Size Controls?      | Yes                             |
| Include Year/Region Controls?                  | Yes                             |
| Include Health Controls?                       | Yes                             |
| Include Education Controls                     | Yes                             |

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. The main retirement sample is restricted to include only households with heads between the age of 57 and 71 (2,058 households). The low wealth sample is restricted households with less than \$1000 in liquid financial assets and who did not own a home. Additionally, the low wealth sample included households from the low income over sample (377 households). The high wealth sample includes all homeowners with more than \$5000 in liquid assets and who received some dividend or interest income in the prior year (695 households). The coefficients in Table 1 are from an IV regression of the log of total household consumption expenditure during the previous month on household retirement status, with the household head's age used as an instrument. See text for the full definition of variables included. Huber-White standard errors are presented in parenthesis.

**Table 6: OLS Regression of Consumption Expenditures as a Function of Three-Year Age Ranges among Older Households (Ages 54 – 71)**

| <i>Dependent Variable: Log of Total Monthly Consumption Expenditure</i> | <i>Coefficient</i> |
|---|--------------------|
| Dummy: Head aged 54-56  | -0.02<br>(0.04)    |
| Dummy: Head aged 57-59  | -0.02<br>(0.04)    |
| Dummy: Head aged 60-62 (omitted group)                                  | --                 |
| Dummy: Head aged 63-65  | -0.06<br>(0.03)    |
| Dummy: Head aged 66-68  | -0.08<br>(0.03)    |
| Dummy: Head aged 69-71  | -0.13<br>(0.04)    |
| Include Demographic/Family Size Controls?                               | Yes                |
| Include Year/Region Controls?   | Yes                |
| Include Health Controls?  | Yes                |
| Include Education Controls  | Yes                |

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. The data is restricted to include only household heads between the age of 54 and 71 (2,483 households). The coefficients in Table 1 are from a regression of the log of total household consumption expenditure during the previous month on three year age ranges with the 60-62 age range as the omitted group. All the controls included in Table 5 were the same as column IV of Table 4. Huber-White standard errors are presented in parenthesis.

**Table 7: Daily Time Spent on Food Production (in Minutes) Before and After Retirement**

| <i>Food Production Variables, By Sample</i>                | <i>Non-Retired</i> | <i>Retired</i> | <i>Difference</i>   | <i>p-value of Difference</i> |
|--|--------------------|----------------|---------------------|------------------------------|
| <i>Sample 1: All Individuals Between Age of 57 and 71</i>  |                    |                |                     |                              |
| Mean Unconditional Amount of Time Spent on Food Production | 36 minutes         | 46 minutes     | 28 percent          | <0.01                        |
| % of Heads with Positive Time Spent on Food Production     | 58%                | 67%            | 8 percentage points | <0.01                        |
| Mean Conditional Amount of Time Spent on Food Production   | 62 minutes         | 69 minutes     | 11 percent          | 0.10                         |
| <i>Sample 2: All Males Between Age of 57 and 71</i>        |                    |                |                     |                              |
| Mean Unconditional Amount of Time Spent on Food Production | 18 minutes         | 27 minutes     | 50 percent          | <0.01                        |
| % of Heads with Positive Time Spent on Food Production     | 42%                | 49%            | 7 percentage points | 0.10                         |
| Mean Conditional Amount of Time Spent on Food Production   | 42 minutes         | 55 minutes     | 31 percent          | 0.03                         |

Notes - Data is 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'. See text for additional details. Sample restricts individuals in the NHAPS to be between the ages of 57 and 71 who had time spent on food production less than 5 hours (1,328 observations, 564 of which were men). Only 8 individuals in the sample had daily food production in excess of 5 hours. The conditional mean of time spent on food production in this table are conditional on time spent being positive.

**Table 8: IV Estimation Time in Home Production of Food as a Function of Household Retirement Status, with Demographic Controls**

| <i>Dependent Variable:</i>  | <i>Coefficient on Retirement Status Dummy</i> | <i>Sample Size</i> |
|---|---|--------------------|
| 1. Unconditional Time Spent on Food Production (in minutes)                       | 17.0<br>(7.4)                                 | 1,328              |
| 2. Dummy Variable – Individual Has Positive Time Spent on Food Production         | 0.004<br>(0.07)                               | 1,328              |
| 3. Log of Time Spent on Food Production, Conditional on Time Spent Being Positive | 0.62<br>(0.20)                                | 833                |

Notes - Data is 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’. See text for additional details. Sample restricts individuals in the NHAPS to be between the ages of 57 and 71 who had time spent on food production less than 5 hours (1,328 observations). Only 8 individuals in the sample had daily food production in excess of 5 hours. To obtain the coefficients in columns I, an IV regression of time use was run on a vector of additional controls and a dummy variable which took the value of 1 if the individual was retired. We instrumented for individual retirement status using the individual's age. See text for additional details. All of the regressions included year dummies, family size dummies, a sex dummy and race dummies. Huber-White standard errors are presented in column II.

**Table 9: Regression of Total Daily Calories Consumed as a Function of Retirement Status, Controlling for Demographic, Time, Health, Region and Education**

| Dependent Variable: ln(Average Daily Calories) | <i>Model I</i>   | <i>Model II</i>  |
|--|--|--|
|  | OLS Regression:<br>Coefficient on<br>Age $\geq$ 63 Dummy | IV Regression:<br>Coefficient on<br>Retirement Status<br>Dummy |
| Sample 1: Main Retirement Sample               | -0.006<br>(0.01)   | -0.003<br>(0.04)   |
| Sample 2: High Wealth Retirement Sample        | 0.02<br>(0.02)   | -0.02<br>(0.06)  |
| Sample 3: Low Wealth Retirement Sample         | -0.07<br>(0.04)  | -0.14<br>(0.09)  |
| Include Demographic/Family Size Controls?      | Yes  | Yes  |
| Include Year/Region Controls?                  | Yes  | Yes  |
| Include Health Controls?                       | Yes  | Yes  |
| Include Education Controls                     | Yes  | Yes  |

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. The main retirement sample is restricted to include only households with heads between the age of 57 and 71 (2,063 households). The low wealth sample is restricted households with less than \$1000 in liquid financial assets and who did not own a home. Additionally, the low wealth sample included households from the low income over sample (377 households). The high wealth sample includes all homeowners with more than \$5000 in liquid assets and who received some dividend or interest income in the prior year (695 households). The coefficients in model I are from a regression of the natural log of average daily calories consumed by the household head on a dummy indicating whether the household head was older than 63. The coefficients in model II are from an IV regression of the natural log of total average daily calories consumed of the household head on retirement status of the household head, with the household head's age used as an instrument. All regressions reported in this table include demographic, time, region, health and education controls. See text for the full definition of variables included. Huber-White standard errors are presented in parenthesis.

**Table 10: Regression of Household Dietary Composition as a Function of Household Age, Controlling for Demographic, Region, Time, Education and Health Controls**

| Coefficient on Age Ranges                 | <i>Dependent Variable</i> |                 |                  |                    |                |                 |
|---|---------------------------|-----------------|------------------|--------------------|----------------|-----------------|
|   | Log(Protein)              | Log(Fat)        | Log(Cholesterol) | Log(Carbohydrates) | Log(Vitamin C) | Log(Calcium)    |
| Dummy: Head aged 57-59                    | <0.001<br>(0.02)          | 0.005<br>(0.02) | -0.02<br>(0.04)  | -0.01<br>(0.01)    | 0.02<br>(0.03) | -0.05<br>(0.06) |
| Dummy: Head aged 60-62<br>(omitted group) | ---                       | ----            | ---              | ---                | ---            | ---             |
| Dummy: Head aged 63-65                    | -0.001<br>(0.02)          | -0.01<br>(0.02) | -0.02<br>(0.04)  | 0.01<br>(0.01)     | 0.04<br>(0.03) | 0.04<br>(0.06)  |
| Dummy: Head aged 66-68                    | -0.003<br>(0.02)          | -0.04<br>(0.02) | -0.07<br>(0.04)  | 0.03<br>(0.01)     | 0.07<br>(0.02) | 0.16<br>(0.05)  |
| Dummy: Head aged 69-71                    | -0.03<br>(0.02)           | -0.02<br>(0.02) | -0.04<br>(0.04)  | 0.04<br>(0.01)     | 0.08<br>(0.03) | 0.07<br>(0.06)  |
| Include Demographic Controls?             | Yes                       | Yes             | Yes              | Yes                | Yes            | Yes             |
| Include Year/Region Controls?             | Yes                       | Yes             | Yes              | Yes                | Yes            | Yes             |
| Include Health Controls?                  | Yes                       | Yes             | Yes              | Yes                | Yes            | Yes             |
| Include Education Controls                | Yes                       | Yes             | Yes              | Yes                | Yes            | Yes             |

Notes –Data is from the pooled 1989-1991 and 1994-1996 cross sections of the Continuing Survey of the Food Intake of Individuals (CSFII), collected by the Department of Agriculture. The data is restricted to include households with heads between the age of 57 and 71. The coefficients in Table 9 are from a regression of the log of total household diet components average over two non-consecutive days on whether the household head was 63 years of age or older. The low wealth sample is restricted households with less than \$1000 in liquid financial assets and who did not own a home. Additionally, the low wealth sample included households which were part of the CSFII's low income over sample. The high wealth sample includes all homeowners with more than \$5000 in liquid assets and who received dividend or interest income in the prior year. All regressions include controls for household demographics, region, time and health. All specifications also include Log(Total Calories Consumed) as an independent variable. See text for the full definition of variables included. Huber-White standard errors are presented in column II.

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

| <i>Variable</i>   | <i>CSFII<br/>Sample</i> | <i>PSID<br/>Sample</i> |
|---|-------------------------|------------------------|
| 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                  |

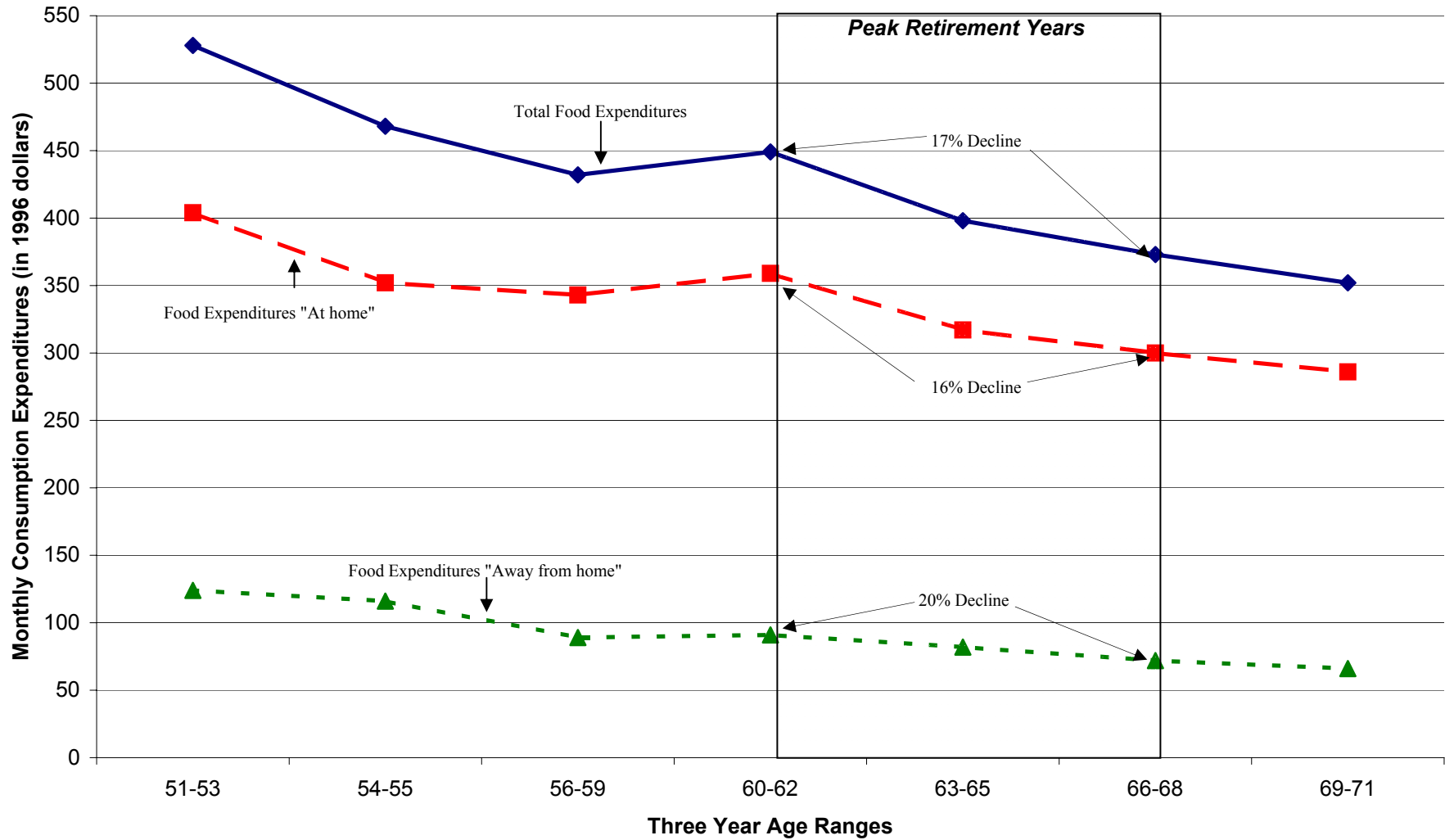
Notes: The first column of Table A1 reports the descriptive statistics for a sample of CSFII household heads between the ages of 22 and 65. The second column reports the descriptive statistics for a sample of PSID household heads between the ages of 22 and 65. The CSFII data uses both the 1989-1991 and 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 Variable of Household Head                 | Health Comparison By Age |          |                               | Health Comparison By Retirement Status |         |                               |
|---|--------------------------|----------|-------------------------------|--|---------|-------------------------------|
|   | Age < 63                 | Age ≥ 63 | <i>p</i> -value of difference | Non-Retired                            | Retired | <i>p</i> -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     |                               |

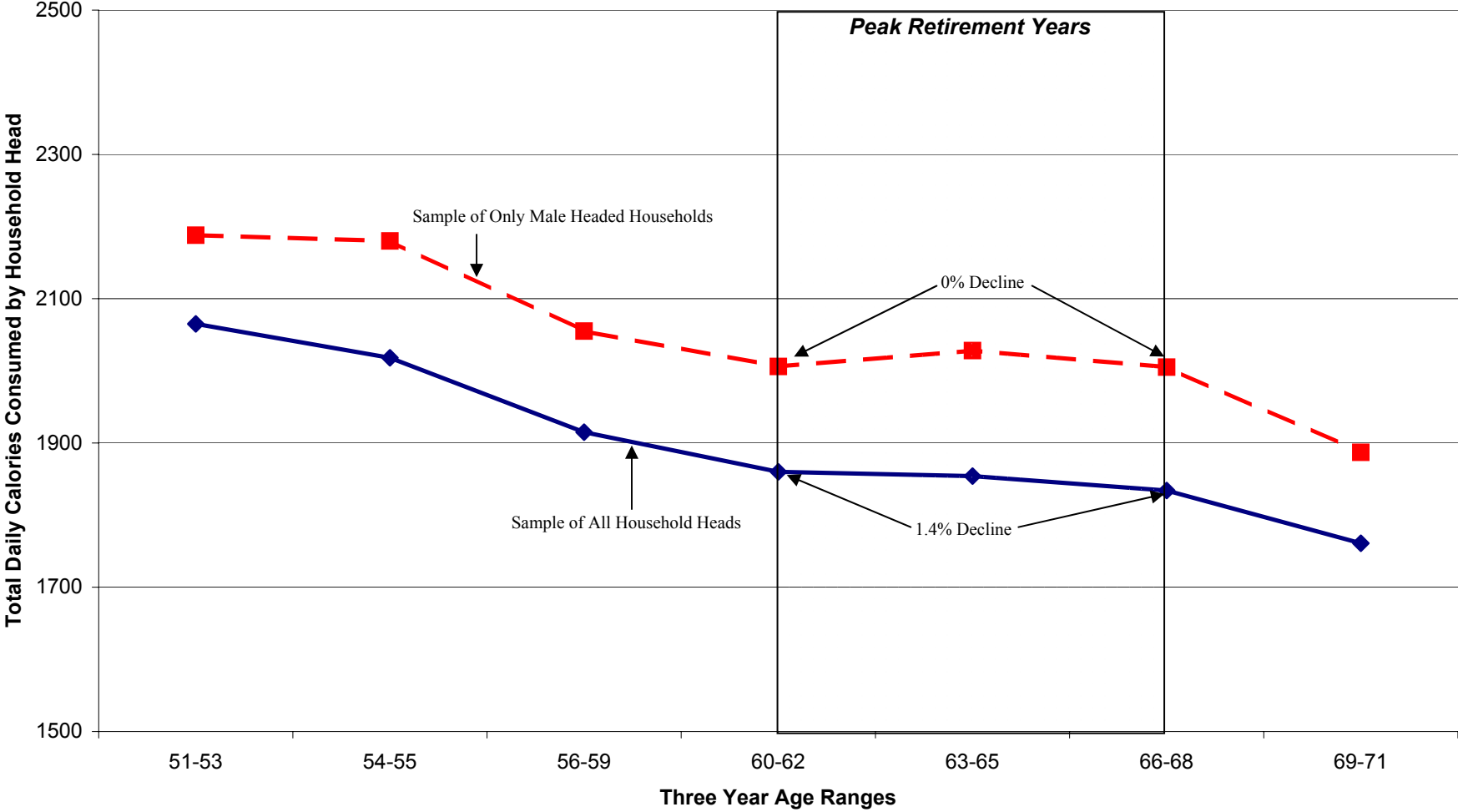
Notes – Data is from the pooled 1989-1991 and 1994-1996 cross sections of the Continuing Survey of the Food Intake of Individuals, collected by the Department of Agriculture, excluding the over sample of low income households. Sample is restricted to include only households with male heads who are between 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.

**Figure 1: Monthly Consumption Expenditure (in 1996 dollars) Within Three Year Age Ranges**



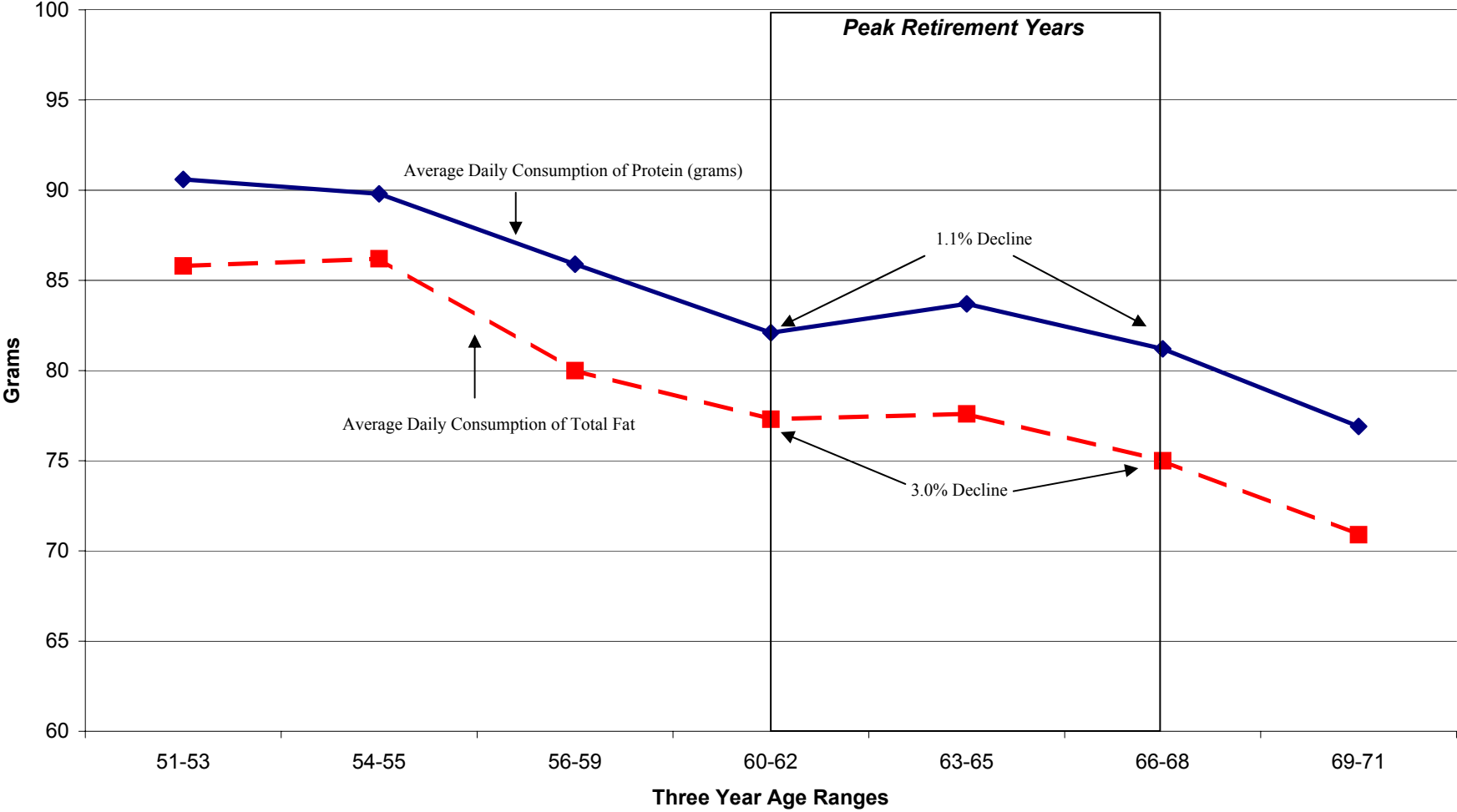
Notes: Data is from the pooled 1989-1991 and 1994-1996 cross sections of the Continuing Survey of Food Intake of Individuals, collected by the Department of Agriculture, excluding the over sample of low income households.

Figure 2: Average Daily Calories Consumed by Household Head, 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.

**Figure 3: Average Daily Protein and Total Fat Consumed by Male Household Head, 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.