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The Retirement-Consumption Puzzle and Unretirement

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Abstract

Using a panel sample of older Americans I investigate the drop in consumption at retirement, i.e. the so-called retirement-consumption puzzle, by taking into account that individuals may re-enter the labor force after being retired. In contrast with previous studies I look at how household consumption responds to the changes in both males' and females' labor market status. This paper has two important findings. Firstly, the unretirement decision is mainly determined by pre-retirement expectations of work and financial factors such as the amount of individuals' accumulated savings at the time of retirement and having an occupational pension plan. Secondly, in a model where retirement and unretirement are instrumented with individuals' retirement expectations, consumption does not respond to retirement or unretirement in line with the predictions of the life-cycle model. Overall, the findings of this paper suggest that individuals are able to smooth their consumption around retirement.

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1 Introduction

According to the standard life cycle theory of consumption with quadratic preferences, anticipated income changes do not affect individuals' consumption profiles because rational agents smooth their consumption over the life cycle using their savings. For example, if retirement is associated with an anticipated decline in income, in the certainty-equivalence model proposed by Browning and Lusardi (1996), the optimal response of individuals is to save before retirement to avoid a consumption decline during retirement.[1] As a result, individuals' level of consumption should not change at retirement. Banks *et al*. (1998) extend the certainty-equivalence model by allowing for non-quadratic preferences and possible nonseparabilities between leisure and consumption and they find that marginal utility of consumption is not smoothed around retirement when individuals retire expectedly. This empirical observation contradicts with the predictions of a life cycle model of consumption and is referred to in the literature as the "retirement-consumption puzzle".

Looking at consumption change at retirement might help to understand whether individuals have saved enough for their retirement. This is of interest from a policy perspective as in many industrialized countries, like in the United States; the social security budget is under strain due to population aging. Therefore, the governments of the industrialized countries adopt some pension reforms to alleviate the problem of aging population. These reforms include reductions in public pensions which require individuals to save more for their retirement. If individuals are forced to reduce their spending at retirement, this may suggest that they have not saved enough for retirement. In this case the reforms aiming to reduce public pensions might be ill-advised.

Earlier research in this field maintains the assumption that retirement is an "absorbing state" which means that re-entering the labor force after being retired is not possible. As a result, they compare preretirement consumption with post retirement consumption, assuming that retirement is a one-time event. In this paper I relax this assumption and investigate consumption behavior of retirees also after they re-enter the labor force.

[1] The certainty-equivalence model proposed by Browning and Lusardi (1996) predicts that anticipated changes in income have no impact on the level consumption. The assumptions of this model are that agents have intertemporally additive utility functions, capital markets are perfect, preferences are quadratic, agents have rational expectations, and rate of time preference is equal to real interest rate.

Unretirement is defined as returning to the labor force after retirement and has become more popular in some countries in recent decades. (Maestas, 2010; Petersson, 2011; Kanabar 2012). For example, Maestas (2010) shows that at least 26 percent of Americans re-enter the labor force following a retirement spell. Focusing on consumption drop at retirement only may be misleading while unretirement among retirees is so prevalent. For example, those who retired earlier than expected due to unemployment may experience a negative income shock at retirement and therefore may choose to re-enter the labor force to finance their consumption during unretirement. This paper re-addresses the retirement-consumption puzzle by taking into account that individuals may re-enter the labor force after being retired. For this purpose I use nine waves of the Health and Retirement Study (HRS) which represents the population of Americans over age 50 and their spouses.

When looking at the retirement-consumption puzzle, it is important to distinguish whether individuals have retired expectedly or unexpectedly because a consumption drop at retirement when retirement occurred as a result of an unexpected shock does not contradict with the predictions of the life cycle theory of consumption. For example, the study by Smith (2006) finds that British workers reduce their consumption when retirement is involuntary as a result of a health shock or redundancy, whereas they do not change their consumption when retirement is voluntary.[2] In this paper, I use respondents' subjective retirement expectations as an instrument to distinguish between expected and unexpected retirements. The HRS survey contains a question about individuals' self-reported probability of working after age 65. I use this probability to test whether consumption changes at expected labor market exits.

The life cycle theory also predicts that consumption does not change with unretirement if individuals' unretirement occurs as planned. Maestas (2010) finds that the majority of the HRS respondents who unretire planned this transition before retirement. She shows that unretirement is an anticipated event for the HRS respondents and it is not a result of financial shocks or insufficient savings. In this paper I also estimate a model of unretirement to investigate the characteristics of the respondents who reentered the labor force after being retired. I find that individuals' expectations about working during retirement in the baseline year of the survey strongly predict their future transitions to unretirement. Then I use these expectations as an instrument to distinguish between expected and unexpected unretirements.

[2] Smith (2006) defines individuals as voluntary retirees if they retired directly from working and as involuntary retirees if they were observed as unemployed or long-term sick/disabled before they retired.

This paper is closely linked to Haider and Stephens (2007) in the sense that it looks at consumption change at retirement. Haider and Stephens (2007) investigate retirement-consumption puzzle using questions about retirement expectations in the HRS and the Retirement History Survey (RHS). [3] They instrument individuals' current retirement status with their planned year of retirement and find that, for the RHS sample, the household food consumption drops by 7 percent to 11 percent for male workers who retired as expected. On the other hand, using the first three waves of the HRS survey, they find that retirement is not associated with a significant consumption decline. This paper is different than their study in two ways. First, in contrast with their study, I also take into account the fact that individuals may go back to work after retirement and I examine whether consumption responds to unretirement. Second, Haider and Stephens (2007) focus on male-headed households only and they do not control for the labor market status of the spouse for couple households. Household consumption of couples might be sensitive to the changes in the labor market status of both the head and the spouse. For instance, household consumption may not drop substantially with the head's retirement if his spouse is still working. In this paper I analyze the changes in household consumption with both males' and females' retirement and unretirement. This method also allows me to incorporate single females into the analysis who are often left out in the previous studies (See, e.g., Banks *et al*. 1998, Smith 2006).

The main findings of this paper are as follows: The unretirement decision is mainly determined by pre-retirement expectations of work and financial factors such as the amount of individuals' accumulated savings at the time of retirement and having an occupational pension plan. In contrast with the earlier studies in the literature, this paper does not find a significant drop in food consumption at retirement when retirement is fully anticipated.[4] I also find that men's observed retirement is not associated with a significant drop in food consumption, yet household food consumption decreases by about 7 percent when women become retired expectedly or unexpectedly. The drop in consumption with women's retirement does not necessarily contradict with the prediction of the life-cycle model since

[3] The HRS and the RHS surveys are both longitudinal and interview older Americans. The RHS was conducted from 1969 to 1979 and included men and unmarried women born between 1905 and 1911. The HRS is an ongoing survey and began in 1992. The initial HRS sample includes respondents who were born between 1931 and 1941 and their spouses (irrespective of their age).

[4] Although there is a distinction between consumption and spending, I use them interchangeably throughout the analysis. For nondurable goods consumption is usually the same as spending because consumption and spending occur almost at the same time.

in this model one cannot distinguish whether retirement was anticipated or unanticipated. Moreover, a significant drop in household food consumption at the women's retirement can be explained by women's contribution to home production. Household food spending may decrease during women's retirement since women spend more time on meal preparation and shopping than men. Another finding of this paper is that in line with the predictions of the life-cycle model consumption does not respond to unretirement if it is fully anticipated. One of the reasons for this finding could be that post-retirement jobs pay much less than pre-retirement jobs and therefore individuals' income does not increase significantly when they unretire. Overall, the findings of this paper suggest that individuals are able to smooth their consumption around retirement.

The paper is structured as follows: Section 2 describes the data and the descriptive statistics. Section 3 presents the estimation results for a model of unretirement. Section 4 outlines the consumption model and the methods for its estimation. Section 5 presents the main estimation results as well as the robustness checks, and Section 6 offers some concluding remarks.

2 Data

I use nine waves of the HRS survey for the period 1992-2010.[5] The sample consists of the original HRS cohort who were born between 1931 and 1941 and their spouses (irrespective of their age). The HRS is a biennial panel survey of Americans and its respondents were first interviewed in 1992 (Juster and Suzman, 1995). The HRS is well-suited for the purpose of this study since it is a large sample of elderly population and it includes detailed information on employment status, food spending, individuals' expectations of work during retirement, subjective retirement expectations, health, wealth, and marital status of the respondents.

I select individuals from the initial HRS cohort that entered in 1992 because the question about individuals' expectations of work during retirement was not asked to the other cohorts that entered in the subsequent waves. The HRS survey in 1992 covers about 7,700 households with at least one member aged between 51 and 61. For the analysis I exclude 222 households in which the respondent married or remarried during the

[5] Questions about food spending were not asked in the year 1998. The data is drawn from the RAND HRS database which is a cleaned and user-friendly version of the HRS raw files. Variables that are not available in the RAND dataset were taken from the RAND-Enhanced Fat Files.

observation period 1992-2010. The reason behind this restriction is that the question about the respondent and his/her spouse's expectations of work during retirement was only asked in 1992. I use these baseline expectations to predict the respondent and his/her spouse's future unretirement transitions. If the respondent was single in 1992 and was observed as a couple in the subsequent waves, he/she will not be in the sample because his/her wife expectations of work are not available in the subsequent waves. If the respondent remarried during the observation period, the baseline expectation of his/her spouse in 1992 is not relevant to the unretirement decision of his/her current spouse. Next I restrict the sample to 7,351 households with positive household income in 1992.[6] Household income is before-taxes and it consists of the respondent's income plus his spouse's income for couples. The components of the household income are wage/salary income, capital income, unemployment and disability benefits, social security income, pensions and annuities, income from veteran benefits, welfare and food stamps, alimony, other income, and lump sums from insurance, pension, and inheritance. 7,286 households also have non-missing information on household food spending in 1992. I further restrict the sample to 7,049 households in which the respondent and, if present, his/her spouse have non-missing information on their labor market status. Next I focus on 3,450 households in which the respondent and, if present, his/her spouse were working full time or part-time in 1992. This restriction is imposed because working respondents and their spouses (a) can potentially become retired during the survey period 1992-2010, and (b) are eligible to answer the question on subjective probability of working after age 65 and expectation of work during retirement.[7] Among 3,450 households in which the respondent and, if present, his/her spouse were working full time or part-time in 1992, 2,933 of them also have non-missing information on the question about the respondent's and his/her spouse's expectations of work during retirement. 2,865 households also have non-missing information on the question about the respondent's and his/her spouse's probability of working after age 65.

[6] At this stage I lose 127 households (1.7 percent) because the household income is equal to zero for these households. The main reason why the household income is equal to zero is that both the head of the household and the spouse (if present) were not working in 1992.

[7] In other words, non-working respondents are excluded as they cannot retire and do not answer the question on subjective probability of working after age 65 and expectation of work during retirement. This exclusion also concerns couple households in which the husband was working but the wife was out of the labor force in 1992. I find that in couple households in which the husband was working in 1992, 65 percent of the wives was also working. Although the sample selection may seem restrictive, I still include 65 percent of the wives due to high rates of female labor force participation in the HRS sample.

The final sample includes 2,461 households which are also observed in at least two consecutive waves.

I use the labor force status information of the respondents and their spouses to define retirement and unretirement. Labor force status measure in the RAND HRS data files classifies respondents and their spouses at each wave as working full-time, working part-time, unemployed, partially retired, fully retired, disabled, or not in the labor force. RAND derives this measure by combining objective and subjective information available in each wave. Working full-time is defined as working 35+ hours per week, and 36+ weeks per year, and working part-time is defined as working less than 35 hours per week or less than 36 weeks per year. Respondents and their spouses are classified as fully retired if they are not working for pay and describe themselves as retired and they are defined as partially retired if they are working part-time and describe themselves as retired. The difference between partially retired and part-time working is that there is mention of retirement in the case of being partially retired. In addition to these definitions and following earlier studies such as Maestas (2010) and Hurd and Rohwedder (2008), I also define individuals who are unemployed, disabled, or not in the labor force as fully retired.

I treat individuals as working if they are working either part-time or full-time, and as retired if they are fully or partially retired. Following Maestas (2010), individuals are defined as unretired if they transitioned from full retirement to full-time/part-time employment or partial retirement or if they transitioned from partial retirement to full-time or part-time employment. The fact that unretirement transitions are identified based on a wave-to-wave changes may lead to understating the importance of unretirement since this method ignores short unretirement spells that may occur between waves. Maestas (2010) uses the detailed job history information to identify short unretirement spells between waves and she finds that only 5 percent of the retirees reenter and exit the labor force between waves. Moreover, she points out that these individuals have a very short duration of unretirement and their annual earnings do not change substantially due to unretirement. In the face of Maestas (2010) evidence, I do not include between-wave unretirement spells in the analysis.

Retirement expectations are measured with a question about subjective probability of working past 65.[8] This question is asked in each wave if the respondent and his/her spouse are younger than age 65 and working. The exact wording of the question is as follows:

"On the same scale from 0 to 100 where 0 means absolutely no chance and 100 means absolutely certain… (Thinking about work in general and not just your present job,) what do you think the chances are that you will be working full-time after you reach age 65?"
I use individuals' retirement expectations available in the last year of their employment (one wave before retirement) to instrument their retirement transition in the next period. For those who did not transition to retirement during the observation period, I use their retirement expectations in the current period.

In this paper, I also investigate the characteristics of the respondents who reentered the labor force after being retired. For this analysis I use only the 2,541 individuals who were observed as retired (fully or partially) in the previous period (in wave t-1) and provided non-missing information on the variables used in the analysis. Then I explain the probability of becoming unretired in the current period (in wave t) using the information from the time of retirement (in wave t-1) and last employment (before wave t-1). The main variable of interest in this analysis is individuals' self-reported expectations of work during retirement. At the baseline year, 1992, the HRS asked survey participants the following question about their plans of work during retirement: "Some people want to stop paid work entirely when they retire, while others would like to continue doing some paid work. What about you? "

Survey participants reported either they will stop paid work entirely or they will continue some paid work during retirement. As it is shown in Section 3 individuals' expectations about working during retirement in the baseline year of the survey strongly predict their future transitions to unretirement. In the consumption model (section 4) I use these expectations as an instrument to distinguish between expected and unexpected unretirements.

The HRS collected information about household food expenditures in all waves except the fourth wave (in 1998). In theory, households' utility is affected not only by food expenditures but also expenditures spent on other nondurable goods consumed by the household. In practice, food expenditures have been used as a proxy for nondurable

[8] Note that the HRS survey also asks about the subjective probability of working past 62. I did not use this variable in the analysis since this variable is missing for individuals who are aged 62 and older.

expenditures by prior researchers (Haider and Stephens, 2007; Smith, 2006). Although it is not a perfect measure, food is also a nondurable good, therefore, changes in food expenditures are closely related to changes in household utility.[9]

Food expenditures are available at the household level and the questions on food expenditures were answered by the financial respondent.[10] These expenditures consist of three separate categories: food at the store, food delivered to the door, and food eating out (See Appendix for the exact wording of these questions). For the households who are receiving government food stamps last month, the survey asks about the quantity of food stamps received and the additional amount of money spent on these three categories. For those who are not receiving food stamps, the survey asks about expenditures on the same categories. Based on these questions I calculate total annual food expenditures for each household.

2.1 Descriptive Statistics

The sample which is used in the consumption regressions includes 2,461 households as introduced in Section 2. Among these households 1,343 were couples and 1,118 were singles in 1992, for a total of 3,804 working individuals.[11] Among these individuals 2,323 of them have become retired during the observation period 1992-2010 (61.07 percent). 735 individuals have re-entered the labor force after a retirement spell (31.64 percent). Among these unretirees 434 of them re-entered the labor force two years after retirement, which is the next wave following retirement (59.05 percent). This finding may suggest that the majority of the individuals who go back to work do so within a short period following retirement. Maestas (2010) finds that 26 percent of the retirees in the HRS survey reverse their retirement decision during the observation period from 1992-2002. The unretirement

[9] In 2001, the CAMS, a supplemental survey to the HRS, began to collect data on households' total spending including nondurable expenditures. However, this survey was interviewed a subsample of original HRS respondents, therefore it contains smaller number of observations. In this subsample there are a few individuals who re-entered the labor force after retirement. Section 5 reports some descriptive statistics and estimation results based on this subsample as well.

[10] In couple households, household level questions about finances are answered by one individual called the 'financial respondent'. In single households, the only respondent is the financial respondent.

[11] In couple households the respondent and his/her spouse are married or have a partnership. In single households the respondent is single, never married, divorced, separated or widowed. In single households and couple households, the household size can be greater than one and two, respectively, because these households can live with their children or parents.

rate in this study, which is about 32 percent, is higher compared to the unretirement rate in Maestas (2010) probably because I use four additional waves of the HRS survey which allows me to observe more transitions to unretirement.

Table 1 illustrates median total food spending and income around the time of retirement and unretirement of men and women in couple households. Similar statistics for single households are reported in Table 2. The median food spending is reported for two different groups. The first group consists of retirees who became retired in wave zero and stayed retired in the next wave (in wave one). The second group includes unretirees who became unretired in wave zero and also observed as unretired in the next wave. Household food expenditures and income are divided by the OECD-modified equivalence scale.[12] Both food spending and income are measured in 2004 dollars.

According to Table 1, for couples, the husband's and the wife's retirements are associated with a drop in household income which is about 19 percent and 18 percent, respectively. On the other hand, household total food spending falls with the husband's retirement by 5 percent whereas it falls with wife's retirement by 9 percent. A smaller drop in household consumption compared to that in household income may suggest that couples have enough savings to smooth their food consumption around retirement. Women's contribution to home production might explain a larger drop in household food spending with the wife's retirement. Women may spend more time on home production and shopping than men during retirement which reduces expenditures on food eating out and bought at the store. Using a cross section sample of American households from the CAMS survey Hurd and Rohwedder (2005) find that, 60-64 year-old retired men and women spent 1.3 and 2.8 hours more on shopping and meal preparation than men and women who were not retired, respectively.

Table 1 also shows that household income is 10 percent lower when the husband becomes unretired whereas the wife's unretirement is associated with an increase in income which is about 3 percent. Although individuals start to earn wage income when they unretire, it seems that their wage income does not exceed their retirement income substantially. In the United States, when individuals return to work after retirement, they may no longer receive employer pensions if they return to their former employer. For

[12] See Hagenaars *et al.*(1994) for the details of the OECD-modified equivalence scale. Household income is the sum of the respondent's income and the spouse's income (if present) and does not include the income of the other members of the household. Therefore, household income of the couples is divided by 1.5.

example, an individual may retire before the legal retirement age, which is 65 for those born before 1943 and between 66 and 67 for people born in 1943 and later, and may start receiving employer pension benefits. If this person decides to return to his/her former employer, he/she may have to give up pension benefits because it was not legal to be an employee and a pensioner of the same firm before the legal retirement age until 2007 (Maestas 2010). If this is the case, it is expected that individuals' unretirement income is lower than their retirement income. It is also likely that individuals may prefer to suspend their social security benefits after they become unretired. In the United States, individuals may stop benefits within 12 months of first claiming by repaying the benefits received during the last 12 months. They may also suspend their benefits after reaching the legal retirement age and delay receiving them until the age 70. This is an appealing option since each year of delay corresponds to 5 percent to 8 percent (depending on the year of birth) increase in retirement benefits.[13] Moreover, Maestas (2010) finds that the median wage earned on unretirement jobs are significantly lower than that on pre-retirement jobs which may also be reason that unretirement is not associated with a significant increase in the household income. Table 1 also reveals that household food consumption is slightly lower when the husband becomes unretired whereas the wife's unretirement is associated with a 2 percent increase in household food spending. The finding that household consumption does not increase substantially with unretirement is expected given that unretirement does not lead to a significant increase in household income. On the other hand, a small increase in food consumption with the wife's unretirement can be explained by the wife's contribution to home production. When the wife becomes unretired home production may drop which may cause household food expenditures to go up again.

According to Table 2, single men's income drops by 30 percent with retirement, whereas single women experience a fall in income at the time of retirement which is about 27 percent. On the other hand, single men's retirement does not reduce household food spending at all while single women's retirement is associated with a decrease in household food spending by 9 percent. One reason behind this finding can be that single women do not have sufficient amount of savings to smooth consumption at retirement compared to single men, since women earn less money than men over the life cycle (see Table A.1 in Appendix). Another reason can be that single women's contribution to home production may be higher than that of single men which reduces expenditures on eating out. Table 2

[13] http://m.kiplinger.com/article/retirement/T037-C000-S004-paycheck-impact-on-retirement-income-benefits.html

also suggests that, income is slightly higher when single men or women become unretired. Regardless of gender, single households do not start consuming more in the first year of their unretirement (in wave 0) whereas single men's income and consumption is higher in the third year of their unretirement (in wave 1) than in their last period of retirement (in wave -1).

Table 3 shows the changes in sub-categories of household food spending around the time of retirement and unretirement of men and women in couple households. Retirement may reduce expenditures on food eating out because retirees may spend more time on meal preparation than workers. According to Table 3, median household spending on eating out falls with both the husband's and the wife's retirement. Similarly, both the wife's and the husband's unretirement are associated with an increase in the median spending on eating out. Table 3 also shows that the median spending on food at home drops with both the husband's and the wife's retirement. The increased leisure time in retirement may lead to more efficient shopping which may reduce expenditures on food bought at the store.
According to Table 4, median spending on eating out is slightly lower when single men become retired whereas it decreases by 16 percent when single women become retired. Single women's expenditures on food at home also fall with retirement by 6 percent while single men's expenditures in the same category are higher at the time of retirement. On the other hand, both single men and women do not start spending more on eating out in the first year of unretirement, yet single women's spending on eating out is higher in the third year of unretirement (in wave 1).

3 Model of Unretirement

In this section, I investigate the characteristics of the HRS respondents who reentered the labor force after being retired. As explained in Section 2, these results are based on an unbalanced panel of individuals who were retired in the previous period. I estimate a Probit model where the dependent variable is a dummy which takes one if individuals transitioned to unretirement in period t and 0 otherwise. According to Maestas (2007) in a dynamic retirement model, optimal unretirement could arise through two channels. Firstly, dynamic preferences for leisure would affect individuals' decision to unretire. For example, individuals who work in a stressful job, and feel burned out, would become retired. After having enough time to recover, work may become attractive again. This is called the burnout and the recovery process. Secondly, the arrival of new information after retirement regarding financial situation, or satisfaction with retirement could cause an individual to

update his expectations of work during retirement. For example, an unexpected drop in stockholdings due to a stock market decline may increase the probability of unretirement. Similarly, individuals who realized that retirement was not as enjoyable as they expected may go back to work. Following Maestas (2007) I estimate the probability of unretirement on a set of variables. Table 5 summarizes the estimation results. The variables with the star (*) are constructed based on information in the last year of employment and the rest of the variables are based on information in period $t-1$.

The first row in Table 5 shows that those who reported in the baseline year of the survey that they would continue doing some paid work during retirement are more likely to transition to unretirement in the current period. Although it is a drawback that these expectations are not available in the subsequent waves of the HRS, it is promising that the baseline expectations still strongly predict individuals' future unretirement. The estimated marginal effect at the mean also suggests that an average respondent who planned to work during retirement in 1992 is about 3 % - points more likely to become unretired in the current period compared to an average person who reported that he/she would stop work entirely during retirement. Compared to the average rate of becoming unretired in the current period which is about 10 percent, the size of the marginal effect is considerable.

The second row in Table 5 shows that someone's probability of becoming unretired in the current period is higher if he/she reported a higher probability of working full-time after age 65 in the last year of employment. The coefficient on operators and laborers is not statistically different than those on the other occupational groups (i.e. managerial/professional specialty, services, etc.) suggesting that unretirement rates are the same across different occupation groups. Table 5 also reveals that those who have a defined benefit (DB) pension plan from the last employment are less likely to reverse their retirement compared to those who have defined contribution (DC) pension plan or no pension plan at all. In the DB pension plan employees receive a fixed annual amount during their retirement and this amount is determined by their age, years of service and salary. In the DC pension plan employees contribute a fixed amount in each year and these contributions are invested, for example, in the stock market. The pension income under the DC plan is determined by the return on the investments which can be positive or negative. Therefore, DC plan holders may face greater uncertainty regarding their retirement benefits compared to DB plan holders. As a result, it is expected that DC plan holders are more likely to unretire to finance their retirement years compared to DB plan holders. Table 5 also shows that the coefficient on years since retirement is negative and highly significant

suggesting that those who stay longer in retirement are less likely to unretire than those who stay shorter. If individuals realized that retirement was not as enjoyable as they expected, they may return to work shortly after retirement. The fact that an individual's work skills depreciate if he/she stays in retirement longer may also affect both the employer's willingness to hire an old worker and the employee's willingness to work.

Among the financial factors, household wealth at the time of retirement plays a role in the decision of unretirement. Those who are in the lower wealth quartiles (first and second) are more likely to unretire than those who are in the highest wealth quartile. On the other hand, the level of food consumption at the time of retirement does not seem to determine the decision to become unretired in the next period. Table 5 also shows that those who live in the low income households are less likely to unretire than those who live in the high income households. The findings also suggest that age is negatively associated with the likelihood of unretirement. Those who live in couple households are less likely to reverse their retirement than those who live in single households. The health status at the time of retirement also plays a key role in the decision of unretirement: The healthier are more likely to reverse their retirement. There is also a gender effect in the decision to unretire such that the probability of unretirement is higher for males than for females. The results regarding race shows that white people are less likely to go back to work after retirement compared to black people. Overall, the findings of this section show that individuals' pre-retirement expectations of work play a key role in the decision of unretirement which may suggest that most of the unretirement transitions are anticipated before retirement. On the other hand, the probability of unretirement is also determined by financial factors such as the amount of individuals' accumulated savings at the time of retirement. This latter finding may imply that for some individuals unretirement was not fully anticipated before retirement. The arrival of new information after retirement regarding financial situation may cause individuals to update their expectations of work during retirement.

4 The Consumption Model

Following Smith (2006), I estimate a consumption model derived from Frisch's demand function (Browning et al., 1985). In this model individuals choose consumption (C_t) and leisure (L_t) to maximize the following value function:

$$V(A_t,t)=\max\left\{U(C_t,L_t,\mathbf{X}_t)+\frac{1}{1+\rho}\mathrm{E}_t V(A_{t+1},t+1)\right\} \quad (1)$$

subject to the budget constraint

$$A_{t+1} = (1 + r_t)(A_t + B_t + w_t(T - L_t) - C_t) \quad (2)$$

where, $\mathbf{X}_t$ is a vector of individual's characteristics, T is the individual's time, ρ is the individual's rate of time preference, A_t is total wealth, r_t is the interest rate, B_t is non-labor income, w_t is the wage rate. This model gives the following first order conditions for the marginal utility of consumption, marginal utility of leisure, and marginal utility of wealth $\lambda_t (= \partial V / \partial A_t)$:

$$U_C(C_t, L_t, \mathbf{X}_t) = \lambda_t \quad (3)$$

$$U_L(C_t, L_t, \mathbf{X}_t) = \lambda_t w_t \quad (4)$$

$\lambda_t = \frac{1 + r_t}{1 + \rho} \mathrm{E}_t \lambda_{t+1}$, or equivalently

$$\frac{1 + r_t}{1 + \rho} \frac{\lambda_{t+1}}{\lambda_t} = 1 + \varepsilon_{t+1} \quad (5)$$

where ε_{t+1} is a forecast error such that $\mathrm{E}_t \varepsilon_{t+1} = 0$. λ_t contains all information from other periods that is needed to solve the maximization problem in period t. Equation (5) describes the rule for the allocation of wealth over time under uncertainty. According to this rule, the individual chooses savings such that the marginal utility of wealth in period t is equal to the discounted expected marginal utility of wealth in period $t+1$. In this model unanticipated shocks will be reflected in the marginal utility of wealth over time.

The log-linearization of equation (5) yields:

$$\ln \lambda_t = b_t^* + \ln \lambda_{t-1} + v_t \quad (6)$$

where $\mathrm{E}_{t-1} v_t = 0$, $b_t^* = \mathrm{E}_{t-1} \ln(1 + \varepsilon_t) - \ln(1 + r_t) + \ln(1 + \rho)$.

Equation (3) implies a Frisch demand function conditional on labor supply[14]:

$$C_t = C(\lambda_t, L_t, \mathbf{X}_t) \quad (7)$$

where consumption demand C_t is expressed as a function of individual's current characteristics, leisure, and the marginal utility of wealth which contains all expected future information including the effect of retirement (or unretirement) if it is an anticipated event.

[14] Labor supply is difficult to model because of corner solutions. The conditional demand function in equation (7) holds whether or not the hour variable, $T - L_t$, is equal to zero. See the discussion in Browning and Meghir (1991).

By assuming the within-period utility functions exhibit constant relative risk aversion (CRRA), $U(.)$ can be expressed as:

$$U(C_t, L_t, \mathbf{X}_t) = \frac{\exp(\theta' \mathbf{X}_t + \eta L_t)}{1-\gamma} C_t^{1-\gamma} \tag{8}$$

where γ is the coefficient of risk aversion for the household. Using the first order condition for marginal utility of consumption and equation (6), one can derive the consumption growth equation as follows:

$$\Delta \ln C_t = \psi b_t^* + \boldsymbol{\beta}' \Delta \mathbf{X}_t + \alpha \Delta L_t + u_t \tag{9}$$

where $\psi = -\frac{1}{\gamma}$, $\boldsymbol{\beta}' = \frac{1}{\gamma}\boldsymbol{\theta}'$, $\alpha = \frac{1}{\gamma}\eta$, $u_t = \psi \nu_t$ and $\mathrm{E}_{t-1} u_t = 0$.

In the empirical implementation of this model I will estimate the following equation:

$$\Delta \ln C_{it} = \boldsymbol{\alpha}' \Delta \mathbf{L}_{it} + \boldsymbol{\beta}' \Delta \mathbf{X}_{it} + u_{it} \tag{10}$$

where $i = 1,...,N$ and $t = 1,...,T$, $\Delta \ln C_{it} = \ln C_{it} - \ln C_{it-1}$, $\ln C_{it}$ is the natural logarithm of food expenditures, $\mathbf{L}$ is vector of dummies indicating the labor market status of the respondent, $\mathbf{X}$ includes household size, a quadratic specification for age, labor market status of the spouse (if present), and a couple dummy indicating whether the household members are married or have a partnership in period *t* and zero otherwise. The labor market status of the respondent or the spouse at time *t* might be correlated with the forecast error u_t since the model described above assumes that $\mathrm{E}_{t-1} u_t = 0$. In other words, u_t is uncorrelated with the variables in the information set available to the household at time $t-1$, yet labor market status at time *t* is not in the information set available at time $t-1$. For example, individuals may be forced to retire due to unexpected shocks such as unemployment or an adverse health event at time *t,* and as a result they may be forced to reduce their consumption simultaneously. The drop in consumption at time *t* is not necessarily at odds with the predictions of the life cycle model described above since this effect is a combination of expected and unexpected retirements. Therefore, one needs to distinguish between expected and unexpected retirements (or unretirements). For this purpose, I estimate the parameters in the equation (10) with a Generalized Methods of Moments estimator (GMM) introduced by Hansen (1982). This estimation method consists of two stages. In the first stage retirement and unretirement are regressed on a set of instruments that are correlated with retirement and unretirement but that are assumed to be uncorrelated with the error term in equation (10). In the second stage, predicted retirement and unretirement are calculated for each individual using the first stage results and these

predicted variables are used to replace the endogenous labor market status in equation (10). Under the rational expectations hypothesis, i.e. $E_{t-1}u_t = 0$, all variables measured at time $t-1$ and earlier are exogenous and therefore, they are potential instruments. Following Haider and Stephens (2007), I instrument the respondent's and his/her spouse's retirement status with their expectations about retirement, which are measured with their subjective probabilities of working after age 65 in the last year of employment.[15] Similarly, I use individuals' expectations of work during retirement available in 1992 to instrument their unretirement status in period *t*. Following Banks et al. (1998) I also use individuals' lagged labor market status as additional instruments. If the predictions of the model described above hold, I expect to see no change at retirement or unretirement if these events are fully anticipated, so the estimated coefficients based on GMM estimation should be equal to zero.

5 Estimation

5.1 Main estimation results

This section presents the estimation results based on a consumption equation described in equation (10). In addition to the consumption equation, I also estimate an income equation to see how household income is associated with changes in the labor market status of the respondent and his/her spouse (if present). I expect that retirement is associated with a decline in income since the replacement rate, defined as the ratio of post-retirement income to pre-retirement income, is less than 100 percent in the United States. I estimate a pooled regression for couple and single households (See section 5.2.3 for a separate analysis). Table 6 reports the estimation results. According to these results, couple households' income is 58 percent higher than single households' income. Similarly, couples spend 36 percent more on food than singles. Household size is also positively associated with expenditures on food.

The first two columns in Table 6 show the results based on the Ordinary Least Squares (OLS) estimation of the consumption and income equations. According to these results, household income falls with men's retirement by about 22 percent whereas women's retirement is associated with a drop in income which is about 16 percent. This finding

[15] The instrument in Haider and Stephens (2007) is based on individuals' expected year of retirement which is available in 1992. Although a similar expectation question is asked in the subsequent waves, fewer individuals answered this question which does not allow me to use their most recent expectations. (See Haider and Stephens (2007), footnote 6 for details.)

suggests that women have higher replacement rates than men. The differences between men and women may stem from the fact that men have higher earnings compared to women because they (a) earn higher wages than women and (b) work more years than women (they retire later and/or have less work interruptions). In the United States, the social security benefit formula is designed to provide progressive benefits in the sense that it replaces a larger share of pre-retirement earnings for low earners compared to high earners (Munnell and Soto, 2005). As a result, replacement rates are higher for women than men.

The first column in Table 6 shows that household food consumption decreases by about 7 percent when women become retired. On the other hand, men's retirement does not change household food spending significantly. The drop in consumption at observed retirement is not necessarily at odds with the predictions of the life cycle model described above since this effect is a combination of expected and unexpected retirements. The life cycle model only predicts that consumption does not change if retirement occurs as planned. If unexpected shocks such as unemployment or health shocks are correlated with the retirement status at time *t*, consumption may decline around the time of retirement. Therefore, it is important to distinguish between expected and unexpected retirements. Although the OLS estimates in the consumption equation are not consistent due to the possible endogeneity, it is promising that the drop in household consumption is much smaller than the drop in household income suggesting that individuals have enough savings to smooth their consumption around the time of retirement. A larger significant drop in household food consumption at the women's retirement can also be explained by women's contribution to home production during retirement.

The results regarding unretirement suggest that men's unretirement is not associated with a significant increase in household income whereas women who unretired have a 9 percent higher income. On the other hand, household food consumption does not respond to either men's or women's unretirement. Although in the OLS estimation I cannot distinguish between expected and unexpected unretirements, insignificant coefficient estimates may suggest that individuals smooth their consumption around the time of unretirement. The third column in Table 6 presents the results from the GMM estimation. The instruments used in the first stage regressions are, for both men and women, the probabilities of working after age 65 based on the last year of employment, expectations of work during retirement available in 1992, one period lag of working and retired dummies. Note that I interact 1992 expectations of work during retirement with one minus working

dummy in *t-1* in order to increase the predictive power of this instrument. Since this instrument is only available in 1992, it is assumed to be constant over time. However, in 1994 the unretirement dummy is zero for each individual in the sample because all respondents and their spouses are working in 1992 so that they may either become retired or continue working in 1994. Using the interaction variable ensures that expectations of work during retirement are irrelevant for those who were working in the previous period.

The null hypothesis of the Hansen's J statistic in Table 6 states that overidentifying restrictions are valid. Failing to reject the null hypothesis indicates that the instruments are exogenous in the sense that they are not correlated with the error term in the consumption equation (Equation 10). The partial F statistics are quite high which shows the strength of the relationship between the endogenous variables and excluded instruments in the first stage regressions. On the other hand, F statistics from the first stage regressions may not be valid to test the weakness of the instruments if there are multiple endogenous variables in the second stage. Angrist and Pischke (2009, pp. 217-18) propose a method to calculate the F statistics when there are multiple endogenous variables. Table 6 reports Angrist and Pischke (AP) F test for weak identification for each of the endogenous regressor. The null hypothesis of the AP F test is that the particular endogenous variable alone is weakly identified. The critical values for the AP F test for weak identification are not available but one can use the "rule of thumb" of Staiger and Stock (1997), which says that if F statistic is at least 10, the weak identification is not a problem anymore. Table 6 shows that the AP F test is greater than 10 for each of the endogenous regressor which confirms that the excluded instruments strongly predict the endogenous variables.

The last row in Table 6 reports Wooldridge's (1995) robust score test statistic to determine whether the endogenous right-hand-side variables in the model are in fact exogenous. The rejection of the null hypothesis indicates that the variables are endogenous at 5 percent level of significance, which may suggest that the GMM estimation is more reliable than the OLS estimation. According to the GMM estimation results, regardless of gender, household food consumption does not change significantly at the time of retirement or unretirement. This finding is in line with the prediction of the life cycle model described above in the sense that consumption does not change at the time of retirement or unretirement if these events are fully anticipated. In contrast with Banks et al. (1998) and Haider and Stephens (2007), this study does not find a drop in consumption at retirement if retirement is fully anticipated. These aforementioned studies which find a retirement-consumption puzzle use relatively old datasets from the 70s and 80s. The

replacement rates for older cohorts might be different than the replacement rates for younger cohorts. The recent study by Smith (2006) which looks at relatively younger cohorts, finds that food spending of British workers does not change significantly when they retire voluntary, but there is a significant drop in food spending when retirement is involuntary. Similarly, Haider and Stephens (2007) find that the HRS respondents do not experience a fall at expected retirement whereas the RHS respondents, who are relatively older than the HRS respondents, reduce their food consumption about 7 percent to 11 percent when they retire expectedly. Overall, the findings of this study are in line with the recent studies which do not find a significant drop in consumption at retirement.

5.2 Robustness Checks

5.2.1 Nondurable Consumption

Data in this section cover the period from 2001 to 2009 and were taken from the CAMS survey which is a supplemental survey to the HRS. In 2001 the CAMS survey sent questionnaires to a subsample of the households who were interviewed in the HRS 2000 core survey. If household members are married or have a partnership, the questionnaire was sent to one of the spouses, selected randomly. In the initial wave of the CAMS survey 3,866 households answered questions about total nondurable spending based on 26 categories (see Hurd and Rohwedder, 2008 for details). This survey has smaller number of households and covers a shorter time period than the HRS, therefore, I observe fewer retirement and unretirement transitions in this sample than in the HRS sample. The CAMS survey is matched to the most of the information in the previous HRS wave, i.e. CAMS 2001 is matched to the HRS 2000. However, information on financial variables such as wealth and income can be obtained from the next HRS wave. For example, HRS 2002 collects information on total income for the year 2001 which coincides with the information on consumption in CAMS 2001. Since HRS 2012 is not available yet, I exclude CAMS 2011 from the analysis.

For the analysis, I select an unbalanced panel sample of households in which the respondent and, if present, his/her spouse were working either full-time or part-time in 2001. The HRS sample introduced in Section 2 includes the households in which the respondent and the spouse (if present) were working in 1992. The sample in this section consists of individuals from the original HRS cohort who were first interviewed in 1992

and were still working in 2001 as well as younger cohorts who entered the survey in the subsequent waves.[16]

Based on the labor force status information reported in the CAMS survey I define retirement and unretirement as explained in Section 2. The final sample consists of 678 households which also have non-missing information on nondurable spending and on the covariates used in the analysis. Among these households 369 were couples and 309 were singles in 2001, for a total of 1047 working individuals. Among these individuals 563 of them have become retired during the observation period 2001-2009 (53.77 percent). 97 individuals re-entered the labor force after a retirement spell (17.23 percent). The unretirement rate in this sample is smaller than the unretirement rate in the HRS sample used in the main estimation probably because the observation period is relatively shorter.

Table 7 illustrates median total nondurable spending around the time of retirement and unretirement of men and women used in the analysis.[17] I do not report separate analysis for couples and singles due to small number of observations. The categories of nondurables are home insurance, property tax, rent, electricity, water, heat, home repair services, phone/cable/internet, auto insurance, health insurance, house/yard supplies, home repair supplies and services, food, dining out, clothing, gasoline, vehicle services, drugs, health services, medical supplies, vacations, tickets, hobbies, contributions, and gifts.

According to Table 7 men's and women's retirements are associated with a drop in household income which is about 33 percent and 30 percent, respectively. On the other hand, household total nondurable spending falls with the men's retirement by 8 percent whereas it falls with women's retirement by 5 percent. The drop in nondurable consumption is much smaller than the drop in income suggesting that individuals have enough savings to smooth their consumption around retirement. Table 7 also reveals that household income is 11 percent higher when men become unretired while it increases by 3 percent when women become unretired. The small increase in income with unretirement is

[16] The RAND HRS data consists of five cohorts: Initial HRS cohort who was born between 1931 and 1941 was first interviewed in 1992. AHEAD cohort born before 1924 was first interviewed in 1993. Children of Depression (CODA) cohort, born 1924 to 1930, War Baby (WB) cohort, born 1942 to 1947, and Early Baby Boomer (EBB) cohort, born 1948 to 1953, were first interviewed in 1998, 1998 and, 2004, respectively.

[17] The number of categories of the nondurable spending differs across waves. For example, in wave 2 new categories of nondurable spending such as personal care products and gardening and housekeeping services were added to the survey. To compare nondurable spending over time I use the categories that are available in all waves of the CAMS survey.

reasonable given that post-retirement jobs pay much less than pre-retirement jobs (Maestas 2010). The descriptive statistics in Table 7 also suggests that men's unretirement is associated with an increase in nondurable spending by 12 percent whereas women's unretirement does not change expenditures on nondurables substantially. The reason behind the increase in nondurable spending at unretirement could be the increase in work-related expenses such as expenses on dining out, clothing, gasoline, and vehicle services.

Table 8 gives estimation results for the consumption and income equations by OLS estimation. I do not instrument actual labor market status since one of the instruments which is individuals' expectations of work during retirement, is only available in 1992 and, therefore, I do not observe this variable for the younger cohorts who entered the survey in subsequent years. According to the results in Table 8, household income drops by 37 percent and 28 percent with men's and women's retirement, respectively, suggesting a higher replacement rate for women than men. As it is displayed in Table 6, the reductions in household income with men's and women's retirement are 22 percent and 16 percent in the HRS sample which consists of the original HRS cohort born between 1931 and 1941 and their spouses. As mentioned above, the CAMS sample includes the original HRS cohort as well as younger cohorts. The lower replacement rates for men and women in the CAMS sample than in the HRS sample may suggest that younger cohorts have lower replacement rates than older cohorts. One reason behind this finding can be that younger cohorts are more likely to hold a defined contribution (DC) pension plan as in the United States, like in other countries, the percentage of workers covered by a DC pension plan has been increasing over time. Unlike the DB plan holders who receive a fixed amount of retirement benefits during retirement, DC plan holders face a greater uncertainty about their retirement income due to uncertainty about the rate of return on their accumulated retirement savings.

Although younger cohorts have lower replacement rates at retirement, the findings in Table 8 show that they do not experience a fall in their nondurable spending, suggesting that they are able to smooth their consumption around retirement. The finding of this paper that there is no significant drop in nondurable spending at retirement is in line with the findings by Hurd and Rohwedder (2008). Using the first three waves of the CAMS survey they find that the drop in nondurable spending at retirement is negligible and the size of the drop could be explained by mechanisms such as the cessation of work-related expenses, home production and efficient shopping or unexpected retirement due to a health shock.

Table 8 also reveals that household income does not change when women become unretired whereas men's unretirement is associated with a 22 percent increase in household

income. On the other hand, neither men's nor women's unretirement is associated with a significant increase in expenditures on nondurables. Finally, the findings under the second column in Table 8 indicate that women's retirement reduces household food consumption by 13 percent while men's retirement does not change food consumption significantly. Moreover, regardless of gender, food consumption does not change with unretirement. The findings regarding food consumption are in line with the findings reported in Table 6. Overall, the findings in this section suggest that households do not experience a fall in nondurable spending around retirement and they do not start consuming more at the time of unretirement.

5.2.2 Narrower definition of retirement

As discussed in Section 2, this paper uses a broader definition of retirement in the sense that the individuals who are unemployed, disabled, or not in the labor force are assumed to be fully retired. This definition may overstate the importance of unretirement since under this definition the re-entries from unemployment are categorized as unretirement transitions. In this section I re-estimate the equation (10) for the HRS sample, using a narrower definition of retirement. Under this definition I exclude individuals who are unemployed, disabled, or not in the labor force from the estimation sample instead of treating them as fully retired. The new sample includes 2,310 households and 3,570 individuals who were working in 1992. Among these individuals 1,946 have become retired during the observation period 1992-2010 (54.51 percent). 535 individuals have re-entered the labor force after a retirement spell which corresponds to 27.49 percent of the retirees. Under broader definition of retirement, unretirement rate was 31.64 percent which is slightly higher than 27.49 percent. Estimation results are given in Table 9.

According to these results, the main findings in Table 6 seem to be robust to the narrower definition of unretirement. I find that the household food consumption does not change with the men's retirement or unretirement whereas it slightly decreases with the women's retirement only.

5.2.3 Separate estimations for couples and singles

In this section I estimate the consumption equation described in equation (10) for couple and single households separately.[18] Table 10 reports the estimation results for couple households.

The estimation results for couples are very similar to those reported in Table 6, suggesting that the main estimation results are driven largely by couple households. One major difference is that the AP F statistic for weak identification in the unretirement equation of men is smaller than 10, which may imply that this equation is weakly identified. If the instruments do not strongly predict the endogenous variables, the estimated coefficients are biased similar to the OLS estimates, and therefore, the GMM results are not reliable. The p-value of the exogeneity test statistic in Table 10 indicates that the exogeneity of the right-hand-side variables cannot be rejected. On the other hand, if there is a weak identification problem, one cannot rely on the validity of the exogeneity test. Although the estimation results for couples are in line with the main estimation results, the results based on GMM estimation should be interpreted with some caution.

As it is shown in Table 11, in single households, individuals' retirement is associated with a drop in income by 23 percent and a drop in consumption by 7 percent. The drop in consumption does not necessarily contradict with the predictions of the life-cycle model because this effect is a combination of expected and unexpected retirements.

The p-value value of the exogeneity test statistic in Table 11 shows that the exogeneity of the right-hand-side variables is rejected, suggesting that the GMM estimation is more reliable than the OLS estimation. According to finding based on the GMM estimation retirement or unretirement does not change the level of food consumption significantly.

6 Conclusions

The earlier studies from the UK and the US concluded that individuals experience a drop in consumption at retirement even if the retirement is anticipated. In this paper, I re-investigate the drop in consumption at retirement, the so-called retirement consumption puzzle, by taking into account the fact that individuals may re-enter the labor force after being retired. For this purpose I use nine waves of the HRS survey which represents the population of Americans over age 50 and their spouses. This paper has several important

[18] I do not report separate results for single males and females since there are a few single males in the sample (only 256 males are single).

findings. In contrast with the earlier studies in the literature, this paper does not find a significant drop in food consumption at retirement when retirement is fully anticipated. I also find that men's observed retirement is not associated with a significant drop in food consumption, yet household food consumption decreases by about 7 percent when women become retired expectedly or unexpectedly. This finding could be explained by women's contribution to home production. Household food spending may decrease during women's retirement since women spend more time on meal preparation and shopping than men. This paper also analyzes how nondurable spending respond to changes in individuals' labor market status. I find that retirement is not associated with a significant drop in nondurable spending in line with the predictions of the life cycle theory of consumption. The finding that consumption does not respond to retirement also suggests consumption and leisure are additively separable.

In contrast with the previous studies, I also investigate how consumption changes when individuals re-enter the labor force after retirement. I find that neither food nor nondurable spending changes with unretirement. One of the reasons behind this finding could be that individuals' income does not increase significantly when they unretire probably because post-retirement jobs pay much less than pre-retirement jobs. Therefore, it is not surprising to see that individuals' consumption does not increase significantly. Another reason could be that unretirement is an anticipated event for the majority of the individuals in the sense that individuals' expectations of work during retirement strongly predict their future transition to unretirement, on average. As a result, one may expect that consumption does not change with unretirement since anticipated income changes do not affect individuals' level of consumption according to the life-cycle theory of consumption.

Overall, the findings of this paper suggest that individuals are forward-looking and they have saved enough to smooth their consumption around retirement, on average. A larger drop in food expenditures with women's retirement can be explained by women's contribution to home production during retirement. A further research can be done to investigate how men and women differ in time spent on meal preparation and shopping before and after retirement. Similarly, one can also examine whether unretirement is associated with a decrease in time spent on home production. The CAMS survey has detailed information on time spent on several activities such as food preparation and shopping and, therefore, it can be used to investigate these issues in the future.

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Tables

Table 1: Median real annual spending on food and income (in 2004 dollars), couples

	Household Income						Household Food spending					
	Males						Males					
	Retirement in wave 0			Unretirement in wave 0			Retirement in wave 0			Unretirement in wave 0		
waves	No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change
-1	853	51202		271	39920		853	3993		271	3756	
0	853	41539	-19	271	36091	-10	853	3803	-5	271	3650	-3
1	551	32013	-23	123	37353	3	551	3756	-1	123	3565	-2
	Females						Females					
	Retirement in wave 0			Unretirement in wave 0			Retirement in wave 0			Unretirement in wave 0		
waves	No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change
-1	780	48886		230	38106		780	4159		230	3808	
0	780	40214	-18	230	39318	3	780	3803	-9	230	3899	2
1	578	33453	-17	113	36000	-8	578	3640	-4	113	3803	-2

Table 2: Median real annual spending on food and income (in 2004 dollars), singles

	Household Income						Household Food spending					
	Males						Males					
	Retirement in wave 0			Unretirement in wave 0			Retirement in wave 0			Unretirement in wave 0		
No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change	
163	42379		45	28985		163	3641		45	3276		
163	29472	-30	45	29179	1	163	3650	0	45	2817	-14	
104	24062	-18	21	33891	16	104	3433	-6	21	3411	21	
	Females						Females					
	Retirement in wave 0			Unretirement in wave 0			Retirement in wave 0			Unretirement in wave 0		
No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change	
527	28378		189	21332		527	3130		189	2889		
527	20783	-27	189	21618	1	527	2852	-9	189	2852	-1	
363	16648	-20	78	26340	22	363	2680	-6	78	2827	-1	

Table 3: Median real annual spending on food (sub-categories) (in 2004 dollars), couples

	Food at home				Food at home			
	Men				Women			
waves	Retired in wave 0	% change	Unretired in wave 0	% change	Retired in wave 0	% change	Unretired in wave 0	% change
-1	3042		2730		2981		2881	
0	2817	-7	2730	0	2852	-4	2889	0
1	2730	-3	2535	-7	2707	-5	2730	-5
	Food eating out				Food eating out			
	Men				Women			
waves	Retired in wave 0	% change	Unretired in wave 0	% change	Retired in wave 0	% change	Unretired in wave 0	% change
-1	921		815		949		911	
0	884	-4	901	11	910	-4	932	2
1	912	3	912	1	867	-5	974	5

Notes: Food at home includes food at the store and food delivered to the door. The underlying number of observations is the same as in Table 1.

Table 4: Median real annual spending on food (sub-categories) (in 2004 dollars), singles

	Food at home				Food at home			
	Men				Women			
waves	Retired in wave 0	% change	Unretired in wave 0	% change	Retired in wave 0	% change	Unretired wave 0	% change
-1	2289		2184		2504		2436	
0	2374	4	1997	-9	2366	-6	2281	-6
1	2504	5	2129	7	2194	-7	2281	0
	Food eating out				Food eating out			
	Men				Women			
waves	Retired in wave 0	% change	Unretired in wave 0	% change	Retired in wave 0	% change	Unretired in wave 0	% change
-1	1020		1036		420		385	
0	994	-3	912	-12	353	-16	323	-16
1	897	-10	974	7	255	-28	417	29

Notes: Food at home includes food at the store and food delivered to the door. The underlying number of observations is the same as in Table 2.

Table 5: Estimation results for the unretirement model
Dependent variable: Probability of becoming unretired in period t

	Probit Estimation	
	Marginal effects[a]	Std.err.
Planned to work during retirement in 1992	0.031***	0.006
Prob. of working after 65*	0.042***	0.010
Managerial/professional specialty*	0.004	0.010
Sales/admin support*	-0.004	0.009
Services*	-0.009	0.010
Precision production/craft/repair*	-0.012	0.012
Operators and laborers*	-	-
Pension plan, Defined Benefit (DB)*	-	-
Pension plan, Defined Contribution (DC)*	0.015*	0.009
Pension plan, DB and DC*	0.014	0.017
No pension plan*	0.035***	0.008
Years in retirement (in period t)	-0.007***	0.001
Income, Quartile^{1st}	-0.022**	0.010
Income, Quartile^{2nd}	-0.005	0.009
Income, Quartile^{3rd}	0.003	0.008
Income, Quartile^{4th}	-	-
Consumption, Quartile^{1st}	-0.012	0.009
Consumption, Quartile^{2nd}	0.001	0.008
Consumption, Quartile^{3rd}	0.007	0.008
Consumption, Quartile^{4th}	-	-
Wealth, Quartile^{1st}	0.028**	0.012
Wealth, Quartile^{2nd}	0.017*	0.010
Wealth, Quartile^{3rd}	-0.003	0.008
Wealth, Quartile^{4th}	-	-
Age	-0.007***	0.001
Couple	-0.017**	0.009
Household size	0.004	0.003
Low education	0.012	0.010
Medium education	-	-
High education	0.005	0.009
Good Health	0.025***	0.007
Fair Health	-	-
Poor Health	-0.035***	0.007
Male	0.018***	0.008
White	-0.024**	0.011
Black	-	-
Other race	0.016	0.021
Number of Observations (Individuals)	7,889 (2,541)	

Notes: [a]Marginal effects are at the mean values. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Year dummies are included Wealth, consumption and income are measured at the household level and in 2004 dollars.

Table 6: Estimation of household food spending, couples and singles together

	(1) Change in log consumption OLS	(2) Change in log income OLS	(3) Change in log consumption GMM
Change in couple dummy	0.357***	0.576***	0.355***
	(0.042)	(0.067)	(0.043)
Change in household size	0.106***	-0.002	0.107***
	(0.009)	(0.010)	(0.010)
(Men, Age)/10	0.003	0.005**	0.004
	(0.001)	(0.002)	(0.005)
(Women, Age)/10	0.004	0.001	0.005
	(0.003)	(0.005)	(0.005)
Men, become retired	-0.025	-0.220***	-0.018
	(0.018)	(0.024)	(0.108)
Women, become retired	-0.070***	-0.163***	-0.052
	(0.017)	(0.021)	(0.118)
Men, become unretired	0.028	-0.039	-0.129
	(0.034)	(0.053)	(0.274)
Women, become unretired	0.010	0.094**	-0.101
	(0.033)	(0.037)	(0.297)
Constant	-0.037	0.006	-0.048**
	(0.022)	(0.033)	(0.021)
Number of observations (households)	10,587(2,461)	10,587(2,461)	10,587(2,461)
Hansen's J test (p-value)			3.817 (0.431)
Partial F test			
Men, become retired			275.18
Women, become retired			274.61
Men, become unretired			42.37
Women, become unretired			54.85
AP F test for weak identification			
Men, become retired			34.04
Women, become retired			33.88
Men, become unretired			19.97
Women, become unretired			11.86
Test of exogeneity- χ^2_4 (p-value)			12.099 (0.016)

Standard errors in parentheses are robust to the presence of heteroscedasticity.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Year dummies are included.

Table 7: Median real annual spending on nondurables and income, couples and singles together

	Household Income						Household Nondurable Spending					
	Males						Males					
	Retirement in wave 0			Unretirement in wave 0			Retirement in wave 0			Unretirement in wave 0		
waves	No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change
-1	237	49520		41	43352		237	21992		41	21420	
0	237	33410	-33	41	48221	11	237	20219	-8	41	24087	12
1	145	33719	1	21	48457	0	145	19198	-5	21	17394	-28
	Females						Females					
	Retirement in wave 0			Unretirement in wave 0			Retirement in wave 0			Unretirement in wave 0		
waves	No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change	No. Obs	Median	% change
-1	326	40052		56	31867		326	20589		56	19662	
0	326	28064	-30	56	32693	3	326	19635	-5	56	19160	-3
1	145	35987	28	22	26122	-20	145	23421	19	22	17506	-9

Notes: Nondurable spending categories are divided by the OECD-modified equivalence scale, couples' household income is divided by 1.5 because household income is the respondent's income plus his/her spouse's income for couples. Both income and spending are in 2004 dollars.

Table 8: Estimation of household nondurables spending, couples and singles together

	(1) Change in log nondurable spending OLS	(2) Change in log food spending OLS	(3) Change in log income OLS
Change in couple dummy	0.186	0.136	-0.373*
	(0.174)	(0.159)	(0.216)
Change in household size	0.022	0.028	-0.027
	(0.017)	(0.025)	(0.017)
(Men, Age)/10	0.005	-0.001	0.001
	(0.004)	(0.006)	(0.006)
(Women, Age)/10	0.002	0.004	0.001
	(0.006)	(0.01)	(0.01)
Men, become retired	-0.029	-0.072	-0.374***
	(0.037)	(0.060)	(0.069)
Women, become retired	0.040	-0.133***	-0.275***
	(0.032)	(0.051)	(0.067)
Men, become unretired	0.077	-0.028	0.221**
	(0.079)	(0.126)	(0.096)
Women, become unretired	0.029	0.175	0.012
	(0.067)	(0.114)	(0.130)
Constant	-0.046	0.106	0.006
	(0.047)	(0.083)	(0.088)
Number of observations(households)	2027(678)	2002(672)	2027(678)

Standard errors in parentheses are robust to the presence of heteroscedasticity. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Year dummies are included. Food consumption includes food at home and food eating out.

Table 9: Estimation results with narrower definition of retirement, couples and singles together

	(1) Change in log consumption OLS	(2) Change in log income OLS	(3) Change in log consumption GMM
Change in couple dummy	0.317***	0.540***	0.317***
	(0.048)	(0.062)	(0.049)
Change in household size	0.105***	-0.003	0.104***
	(0.010)	(0.010)	(0.011)
(Men, Age)/10	0.001	0.005**	0.001
	(0.002)	(0.002)	(0.004)
(Women, Age)/10	0.002	0.001	0.003
	(0.002)	(0.005)	(0.005)
Men, become retired	-0.006	-0.226***	0.023
	(0.018)	(0.027)	(0.093)
Women, become retired	-0.061***	-0.151***	-0.061
	(0.018)	(0.024)	(0.125)
Men, become unretired	0.023	-0.050	-0.044
	(0.040)	(0.066)	(0.272)
Women, become unretired	0.048	0.102**	-0.101
	(0.041)	(0.042)	(0.377)
Constant	-0.014	0.012	-0.018
	(0.021)	(0.036)	(0.023)
Number of observations (households)	9,095(2,310)	9,095(2,310)	9,095(2,310)
Hansen's J test (p-value)			3.779 (0.436)
Partial F test			
Men, become retired			233.57
Women, become retired			230.23
Men, become unretired			31.71
Women, become unretired			38.33
AP F test for weak identification			
Men, become retired			35.05
Women, become retired			16.28
Men, become unretired			25.08
Women, become unretired			18.23
Test of exogeneity- χ^2_4 (p-value)			7.027 (0.134)

Standard errors in parentheses are robust to the presence of heteroscedasticity.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Year dummies are included.

Table 10: Estimation of household food spending, couples

	(1) Change in log consumption OLS	(2) Change in log income OLS	(3) Change in log consumption GMM
Change in household size	0.071***	0.019	0.071***
	(0.009)	(0.012)	(0.011)
(Men, Age)/10	-0.014	-0.038	-0.003
	(0.016)	(0.025)	(0.021)
(Women, Age)/10	0.019	-0.014	0.012
	(0.012)	(0.015)	(0.010)
Men, become retired	-0.033*	-0.164***	-0.120
	(0.0191)	(0.023)	(0.150)
Women, become retired	-0.058***	-0.163***	0.075
	(0.021)	(0.023)	(0.105)
Men, become unretired	0.053	-0.045	-0.222
	(0.038)	(0.052)	(0.385)
Women, become unretired	0.005	0.099**	0.205
	(0.047)	(0.043)	(0.231)
Constant	-0.024	0.350***	-0.055
	(0.090)	(0.126)	(0.088)
Number of observations(households)	5,624(1,343)	5,624(1,343)	5,624(1,343)
Hansen's J test (p-value)			5.606 (0.231)
Partial F test			
Men, become retired			189.29
Women, become retired			147.10
Men, become unretired			33.59
Women, become unretired			29.21
AP F test for weak identification			
Men, become retired			15.51
Women, become retired			28.38
Men, become unretired			5.69
Women, become unretired			12.89
Test of exogeneity- χ^2_4 *(p-value)*			3.915 (0.417)

Standard errors in parentheses are robust to the presence of heteroscedasticity. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Year dummies are included.

Table 11: Estimation of household food spending, singles

	(1) Change in log consumption OLS	(2) Change in log income OLS	(3) Change in log consumption GMM
Change in household size	0.144***	-0.001	0.142***
	(0.014)	(0.014)	(0.016)
Age/10	0.039	0.012	0.033
	(0.028)	(0.039)	(0.023)
Become retired	-0.070***	-0.231***	-0.181
	(0.026)	(0.037)	(0.196)
Become unretired	-0.004	0.061	-0.671
	(0.041)	(0.068)	(0.542)
Constant	-0.236	-0.083	-0.179
	(0.166)	(0.223)	(0.141)
Number of observations (households)	4,673 (1,118)	4,673(1,118)	4,673(1,118)
Hansen's J test (p-value)			0.506 (0.776)
Partial F test			
Become retired			306.14
Become unretired			55.69
AP F test for weak identification			
Become retired			32.39
Become unretired			14.14
Test of exogeneity- χ^2_2 (p-value)			13.437 (0.001)

Standard errors in parentheses are robust to the presence of heteroscedasticity. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Year dummies are included.

Appendix

HRS questions on food expenditures

Questions asked to the respondents who receive food stamps

-How many dollars' worth of food stamps did you (or other family members now living here) get last month?

-In addition to what you bought with food stamps, did you (or other family members now living here) spend any money on food that you use at home? If so, how much? Was that per month, year, or what?

-In addition to that, did you have any food delivered to the door? If so, how much did you spend on that food? Was that per month, year, or what?

-About how much do you (and other family members now living here) spend eating out, not counting meals at work or at school? (The answer can be nothing or an actual value) Was that per week, month, or what?

Questions asked to the respondents who do not receive food stamps

-About how much do you (and other family members living here) spend on food that you use at home in an average week? Was that per week, month, or what?

-Do you have any food delivered to the door which isn't included in that amount? If so, how much did you spend on that food? Was that per week, month, or what?

-About how much do you (and other family members now living here) spend eating out, not counting meals at work or at school? (The answer can be nothing or an actual value) Was that per week, month, or what?

Total income by gender

Table A.1: Mean and Median of Total Income in 2004 dollars

	Couples		**Singles**	
	Men	Women	Men	Women
Mean total income	40342	23678	74162	25239
Median total income	31865	18076	26166	20008
Number of observations (Individuals)	7,294(1,343)	7,294(1,343)	1,321(256)	4,707(862)

Total income is the sum of individuals' income from all sources (salary, pension, unemployment etc.)