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ABSTRACT

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The dissertation consists of three chapters concerning the well being of the older adult population in the United States. All three essays use data from the Health and Retirement Study (HRS), a longitudinal survey on health, retirement, and aging.

The first chapter studies the relationship between retirement and time transfers within the family. We use cross-sectional variation in the need for caregiving to assess whether caregiving affects the retirement decision. For instance, parents' inability to take care of certain tasks for themselves, or accumulated and new health problems of spouses could lead to a demand for care from working individuals. We do not find evidence that potential parental care-need accelerates retirement transitions. Also, it does not seem that people retire early to provide care for sick spouses. However, post-retirement health insurance coverage is important in early retirement, in that when people have access to such coverage, they retire sooner if a family member happens to be in ill health.

The second chapter assesses the potential usefulness of subjective expectation information in micro data by documenting the relationship between moving expectations and subsequent moving realizations among the United States population ages sixty-five and older. We find that the subjective probabilities of moving are very important in predicting future moving, even once demographic information known to be associated with the propensity to move is added to the analysis. Motivated by the observed relationship between the reported subjective probabilities and actual moving propensities, we hypothesize that

when people are asked for a subjective probability they report the true probability conditional on available information, plus some random noise. We look at the proposed model's implications regarding which population groups are better at predicting future residential moving. However, we fail to substantiate the hypothesis, and therefore, cannot conclusively identify individual characteristics associated with better forecasting.

The third chapter examines the long contested issue of whether the elderly draw down their housing wealth during retirement. In examining whether housing wealth declines during retirement, we emphasize exploring heterogeneity across population groups in housing wealth adjustments. Our analysis demonstrates that for non-mover retirees there is no systematic decline in housing equity. But for retiree-movers there is a decline in the median housing equity starting at age 71, and a decline in the mean housing equity from age 76. We find evidence of significant heterogeneity in housing equity adjustments at retirement. Nearly a quarter of the retiree-movers report that they are moving to downsize, and they do. Those with low non-housing wealth and with low income reduce housing equity significantly more than their respective counterparts. Retiree-movers experiencing widowing or divorce reduce housing equity substantially more than those without similar experience. Our findings are, in fact, largely consistent with the existing evidence in the literature regarding downsizing in later life. This study does not disprove or bolster either side of the debate on the role of housing wealth in financing retirement needs. But it highlights that the choice of emphasis regarding which side of the debate holds is often reliant on how one chooses to interpret what is in the data.

For Amma and Bapu

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I thank with the whole of my being my mother for her unyielding and unconditional love and support in every step of my life. I dedicate this dissertation to her and to the memory of my father – a girl could not have asked for a more loving, nurturing, and supportive father. My brother has been a pillar of strength in my life, and I am always proud of him. The love and kindness of many other family and friends have touched my life. I especially would like to mention my Mejo-Mama and Mami. Finally, I have the most pleasure in thanking my husband, Khan W. Mahmud; his constant love, encouragement, and faith in me gave me the strength to complete this work.

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Chapter 1

Timing of Retirement and Family Obligations

1 Introduction

Empirical studies of retirement behavior have generally focused on the influence of financial variables such as pensions, Social Security, employer-provided health insurance, wealth and wages. In a broader framework, however, the decision to retire involves weighing the utility of income against the utility from leisure and other competing time-demands. In an overview of the economic analysis of retirement, Lumsdaine and Mitchell (1999) note that the decision to retire is becoming less a consequence of concerns about one's own health or need for care and plausibly more related to the provision of care to other family members. The United States General Accounting Office estimates that by 2040 there could be as many as 12 million disabled elderly (Walker, 2002). Based on current trends in care provision, the vast majority of these elderly are likely to receive care through informal networks, typically from a spouse or an adult child (Department of Health and Human Services, 1998). Given the potential importance of informal caregiving, this chapter explores whether there is a direct effect of caregiving on retirement behavior.

The relationship between retirement and time transfer within the family has been the focus of a growing body of research in sociology and gerontology. For example, studies suggest that caregiving women are more likely than non-caregiving women to quit employment (Gibeau and Anastas, 1989; Gorey et al., 1992; Ettner, 1995; Pavalko and Artis, 1997; Dentinger and Clarkberg, 2002; Pavalko and Henderson, 2006). There is also evidence that

husbands tend to leave the labor force when their wives are ill (Hayward, Friedman, and Chen, 1998; Szinovacz and DeViney, 2000). On the other hand, some studies suggest that married individuals are less likely to stop working if their spouses report work limitations than when spouses are healthy (Pienta, 1997), and that care for parents or ill spouses or other disabled family members does not relate to retirement decisions (Johnson and Favreault, 2001; Szinovacz, DeViney and Davey, 2001; Pienta, 2003).[1] In a paper studying the effects of own and spousal health shocks on couples' labor supply decisions, Coile (2004) looks at the influences of new health events and injuries on people's retirement decisions and finds no significant relationship between spouses' recent health shocks and respondents' labor force exit behavior.

In this paper, we use cross-sectional variation in the need for caregiving to assess whether caregiving affects the retirement decision. For instance, parents' inability to take care of certain tasks for themselves, or accumulated and new health problems of spouses could lead to a demand for care from working individuals.[2] To preview the results, we do not find evidence that potential parental care-need accelerates retirement transitions. Also, it does not seem that people retire early to provide care for sick spouses. However, post-retirement health insurance coverage is important in early retirement, in that when people have access to such coverage, they retire sooner if a family member happens to be in ill health.

The organization of the chapter is as follows: The next section describes the data used in this study. Section 3 provides descriptive statistics relating retirement and potential family time demand. Section 4 lays out the empirical framework, and Section 5 presents the estimation results. The paper closes with concluding remarks in Section 6.

2 The Data

The data for this paper is drawn from *The Health and Retirement Study* (HRS). The HRS is a longitudinal biennial survey of U.S. population that had its first wave of interviews in

[1] Another strand of literature in sociology looks into the relationship between retirement preferences and perceived levels of work-family conflict. See Raymo and Sweeney (2006) for a review of this literature.

[2] Changes in prices of formal care also can impact the demand for caregiving time, which we do not account for in this study.

1992. The paper exploits seven waves of the HRS from 1992 through 2004. The initial HRS sample consisted of some 7,700 households, in which at least one person was HRS age-eligible in that he or she was born between 1931 and 1941 (ages 51 - 61 in the 1992 wave). The age-eligible individuals and their spouses, irrespective of birth year, were interviewed resulting in approximately 12,500 initial respondents. The HRS collects information on respondents' demographics, health status, physical limitations, health care use, labor force activity, and expectations about retirement, income, and assets. In addition, it provides detailed data on sharing, or "transfers", of time and help, money, and dwellings across generations within families. It also includes some basic demographic characteristics of parents and children of the respondents.

This study makes use of data on the HRS age-eligible individuals (the HRS-cohort, as identified by the Health and Retirement Study).[3] Even though the spouses/partners are interviewed in all coupled households, unless the spouses are themselves HRS age-eligible — and thus representative of the cohort — they have not been retained for analysis. The Health and Retirement Study over-sampled blacks, Hispanics, and Floridians, and therefore, throughout the analysis of this paper we use respondent-level sampling weights.

We define retirement using two separate survey questions: (a) current labor force status, and (b) self-defined retirement status. The current labor force status question asks whether individuals at present are engaged in one of a number of activities, including working, unemployed, retired, disabled, and homemaker. We define retirement as those individuals who report being retired.[4] The second question asks individuals to report their current retirement status as being fully retired, partly retired, or not retired at all. We retain a slightly smaller sample size when we define retirement using the self-report question. This question is not asked to individuals who report not working for pay currently, including those who are unemployed, or those who are homemakers.[5]

[3]The HRS introduced the AHEAD cohort (born between 1890-1923) in 1993 and two other cohorts — the CODA (born between 1924-1930) and the War Babies (born between 1942-1947) — in 1998.

[4]Individuals are allowed multiple responses on the current labor force status question; we do not consider an individual to be retired if the person reports being retired but simultaneously also reports being either unemployed or working.

[5]The skip pattern for the self-report question is such that the question is not asked to some individuals. Some of these skip patterns have to do with the interviewer's perception about the respondent's employment status, and others include the respondent's self/proxy report status, and nursing home stay status.

An important aspect of our sample design is that we require individuals to be *at risk* of retirement at the initial wave. In other words, the respondents had to report working or being unemployed so that they could potentially enter into retirement during the survey period. Thus, in order to contribute an observation to the sample, an individual has to be observed at least in two successive interviews during the seven survey waves. An example of how the sample design works is if a person is working (or, unemployed) in 1992, in 1994, and in 1996, and is reported to be retired in 1998, the person will contribute three observations to the sample. We consider retirement as an absorbing event, i.e., after the first transition into retirement, we ignore all subsequent movements in and out of retirement.

In the Appendix Table A.1.1, we discuss the sample selection criteria and the sample sizes for the definition of retirement based on the current labor force status question. We also report the sample sizes for the alternative definition of retirement at the endnotes of Table 1.A.1. We drop all the same-sex couples from the sample. When we define retirement using the current labor force status question, there are certain individuals who conditional on not having retired yet, report being disabled by the next survey wave. We drop these observations when we use this definition of retirement.

Before the sample is restricted to non-missing responses on parental and spousal care-need variables, we retain 25020 observations when we define retirement using the labor force status question. The two-year retirement hazard rate for this sample is 20.02%. For men, the hazard rate is 19.13%, and for women the hazard rate is 20.80%. In the sample based on the self-defined retirement status question, the two-year retirement hazard rates are slightly higher — 20.76% and 23.04% for men and women, respectively. The samples used in the regression analysis are conditional on non-missing information on parental and spousal care-need along with demographic and other characteristics of the respondents. These sample sizes and the two-year retirement hazard rates for coupled and non-coupled men and women are reported in Appendix Table A.1.2 for both definitions of retirement. Table A.1.2 also gives the summary statistics for the other variables that we use in the regression analysis. We describe these variables in detail in Section 4.

3 The Descriptive Importance of Family and Caregiving on Retirement Behavior

This section presents some descriptive statistics that capture the potential importance of family in people's retirement behavior.[6]

Table 1.1 tabulates the relative importance of reasons that retirees report mattered in their retirement decision. The relevant question in the HRS offers four reasons to choose from: poor health, wanting to do other things, disliking the work, and wanting to spend more time with family. Respondents can pick more than one category as the reason for retirement. Each category is considered as the reason for retirement if the respondent deems it very, moderately, or somewhat important in retirement as opposed to not important at all. An additional category of whether the retirees felt that they were forced into retirement is also reported in Table 1.1.[7] We compute the relative importance of different factors in retirement based on the information from 2,418 retiree observations after they make their first transition into retirement during the sample period. Except for the age group of 52−58, family concerns appear to be the predominant factor associated with people's retirement. For the youngest age group, family is only second in importance to health concerns. Thus, a substantial segment of recent retirees report spending time with family as an important reason for retirement.

Table 1.2 shows the amount of caregiving by the recipient and by characteristics of the caregiver.[8] Care hours to parents include time spent helping parents (or parents-in-law or

[6]We display the results based on the definition of retirement that uses the current labor force status question. The main conclusions remain the same if we use the alternative retirement definition.

[7]It draws on the question that reads: "*Thinking back to the time you (partly/completely) retired, was that something you wanted to do or something you felt you were forced into?*".

[8]We use the data on hours of care provision from 1998−2004 HRS surveys. The earlier surveys (1992, 1994, and 1996) have a slightly different set of questions on care hours to parents. For consistency, we focus on the last four survey waves in our data. From 1998−2004, of the core sample in the paper, we have a total of 5,544 observations where at least a parent or a parent-in-law is living. 4,711 of these observations are for married or partnered individuals. In 1998 and 2000, questions on care hours to parents are asked only to the family respondent; so for these two survey years we have data on care hours for one respondent per household. In 2002 and 2004 we have responses on care hours to parents from all respondents. In total — of the 5,446 *at risk* observations — we have non-missing responses on care hours to parents from 3,848 observations. For the 1998 and 2000 surveys, majority of these observations are for women, since women overwhelmingly tend to be the family respondent in the HRS. For care hours to grandchildren we have responses from the family respondent (one response per household). From 1998−2004, with one response per household, we have information on whether the respondent has any grandchildren for 8,215

both for couples) with basic personal activities like dressing, eating, and bathing as well as with other things such as household chores, errands, and transportation. Caregiving hours are reported for a period of approximately two years. The upper panel of Table 1.2 reports the mean care hours for all non-missing responses on care hours (including zero care hours); the lower panel reports the mean hours for those providing positive care hours. Apparently, women spend more care time than men both with parents and grandchildren. With respect to different age groups, there does not appear to be any distinct pattern in the average intensity of caregiving either for men or women.

We look into the bivariate relationship between retirement hazards and parental care-need in Table 1.3. We consider parents *in need of care* when they are reported to be needing assistance with daily activities of bathing, dressing, and eating, or when they cannot be left on their own even for an hour. For married and partnered couples, care-need by both parents and parents-in-law is taken into account.[9] We calculate the retirement hazard rates separately for men and women. Column (1) shows the retirement hazards for everyone in the sample with or without a living parent (or a parent-in-law). Columns (2) and (3) show that conditional on not having retired yet, men and women without any living parent are noticeably more likely to retire by the next period than those with at least one living parent. Part of the difference in the retirement hazards is likely due to the age difference — a difference, on average, of more than two years. Looking into the retirement hazards of people with and without care-needing parents (Columns (4) and (5)), we find that those with healthier parents have a smaller retirement hazard rate than those with care-needing parents. Not surprisingly, the care-needing parents are quite older than the non-care-needing parents of adult children.[10]

Finally, Table 1.4 presents the retirement hazards with respect to spousal health status. We consider a respondent *at risk* of providing care to the spouse if the spouse is experiencing any kind of adverse health condition. We take into account several dimensions of spousal

observations. Of that we have 6,927 observations with at least one grandchild. Data on care hours to grandchildren is available for all 6,927 observations.

[9]Table 1.3 retains an observation for couples whenever non-missing care-need information is available either for a parent or a parent-in-law. In Table 1.A.1 (Sample Selection Criteria), this corresponds to the sample sizes in the row "If Parent *or* Parent-in-Law Care-need Information Non-missing".

[10]The parental age for each group reported in the table is the average of the ages of the older (oldest) or the only living parent of the respondents in that group.

sickness. The first column in Table 1.4 gives the retirement hazards for the entire samples of married/partnered men and women. Columns (2) and (3) use spouses' self-reported subjective health status; Columns (4) and (5) use the information on doctor-diagnosed severe or chronic health conditions; Columns (6) and (7) use spouses' recent hospital and nursing home stay; and finally, Columns (8) and (9) draw on the number of limitations in activities of daily living (ADL) that the spouse has. Irrespective of the spousal health variable considered, the retirement hazard rate is larger for those with spouses in relatively worse health than for their counterparts with healthy spouses. Both the respondents and the spouses are older when spouses have any kind of health condition compared to when spouses do not report any health problems. In the multivariate analysis, we control for the respondents' and the spouses' ages along with other variables to find out if similar patterns of retirement responses are still observed with respect to spousal health.

4 Empirical Framework for Analyzing the Role of Potential Caregiving on Retirement Timing

The paper does not delve into developing a formal utility maximization framework, and we cannot a priori predict the direction of causality from family time demand to retirement patterns. Nonetheless, we make a presumption, shaped by the descriptive statistics presented earlier, that labor force participants who assume an informal caregiving role may derive different utility from continued work than non-caregivers. Consequently, the former group may retire from the labor force at a higher rate than the latter group. A health shock may alter the value of the time shared between a couple or between a parent and an adult child. This may be so because the affected spouse or parent may need more assistance with activities of daily living, or because the sick family member has a shortened lifespan. At times, however, financial considerations — and thus, the need for continuing employment — can become predominant over the need for caregiving in determining people's retirement behavior. This may be particularly important in the context of financing out-of-pocket health care costs for family members. Sources of spousal health insurance coverage as well as the potential for accessing care from alternate caregivers may also influence individual retirement decision.

All in all, the response of retirement timing to adverse health events or care-need in the family is theoretically ambiguous and may differ across families.

Econometric Specification

The empirical strategy of this paper is to specify and estimate a reduced form retirement model to examine the potential role of caregiving. We consider a discrete time hazard model, where the binary variable R_{it} equals 1 if a person not having retired in the previous time period t-1 retires by the current time period t. Also, let the binary variable C_{it} equal 1 if at time t an individual is *at risk* of caregiving to a parent or the spouse/partner. Consider the probit model,

$$Pr[R_{it} = 1] = f(\beta_0 + \beta_1 \boldsymbol{X}_{it} + \beta_2 \boldsymbol{Z}_{i,t-1} + \beta_3 \boldsymbol{C}_{it} + \beta_4 \boldsymbol{F}_{it}) \quad (1)$$

where f is the normal density. $\boldsymbol{X}$ denotes a set of demographic characteristics pertaining to the respondent, and $\boldsymbol{Z}$ represents variables that capture information related to the job held in the previous period. Since the retirees no longer have job attachments at the current period, information like earnings from employment are used from the last period's jobs[11]. $\boldsymbol{C}$ captures the potential care-need variables, and $\boldsymbol{F}$ represents additional information about family members and family composition.

We estimate the retirement model separately for the non-coupled group and the coupled group. Retirement responses of these two groups have been found to be somewhat different[12], and since married or partnered individuals have an additional set of family members who can potentially create time demands, it seems a reasonable approach. When there is only one respondent from a household, and the respondent identifies him/herself as never married, widowed, or separated/divorced, we include that person in the non-coupled sample. Married or partnered respondents contribute to the coupled sample. For the non-coupled individuals (singles), the only source of family obligation we consider is parents; whereas, for the coupled individuals (couples), potential care-need may arise from parents, parents-in-law[13], as well

[11]For individuals who are *at risk* of retirement but are unemployed, earnings can be zero if no job is held during the survey year.

[12]For instance, Lumsdaine, Stock, and Wise (1996) find that married men are significantly more likely to retire at age 65 than single men.

[13]The parents of cohabiting partners are considered as parents-in-law, and their siblings as

as the spouse/partner. We estimate the probit model separately for men and women.

Recall that parental care-need is a dummy variable equal to 1 if the respondent reports that at least one parent requires assistance with basic daily activities, such as, dressing, bathing, and eating, or that the parent cannot be left alone even for an hour. If the respondent answers either of these two parental care-need related questions in the HRS for at least one parent, we have a non-missing observation for the parental care-need variable. A similar care-need variable for parents-in-law is defined for married and partnered individuals.

We consider two different specifications, with the difference stemming solely from the set of parental care-need variables that we use. In one specification, the parental variables included are — (1) *all living parents healthy*, (2) *Mom and Dad married and both of them in need of care, OR Mom/Dad unmarried and in need of care*, (3) *Mom and Dad married and one of them in need of care*, and (4) *Mom/Dad married to stepparent and in need of care* — with *no living parent* as the omitted category. The category *all living parents healthy* is equal to 1 if none of the living parents needs care. The rest of the categories account for parental marital status. After all, the spouse of a care-needing parent may be capable of taking care of the ailing parent. Thus, the adult child's retirement response may be impacted by whether the care-needing parent has a potentially caregiving spouse or not. In the HRS, questions are not asked regarding the health of the stepparent. Therefore, *Mom/Dad married to stepparent and in need of care* is considered as a separate category from the categories reflecting the health status of biological parents. *Mom and Dad married and both of them in need of care* and *Mom/Dad unmarried and in need of care* are combined into one variable, as in both cases there is no healthy care-providing partner for the ailing parent.

In the other specification, the parental variables included are — (1) *Mom or Dad or both living*, and (2) *Mom or Dad or both in need of care*. The second variable does not distinguish potential parental care-need by parental marital status. We have a more parsimonious estimation with this set of parental variables. Since only small fractions of the sample have parents meeting the criteria *Mom and Dad married and one of them in need of care* and *Mom/Dad married to stepparent and in need of care* (see Table 1.A.2 for summary statistics of the parental care-need variables), this seems a useful alternative specification. When we

siblings-in-law.

estimate the retirement model for couples, the two specifications include dummy variables for parents-in-law corresponding to all the variables for parents. We prefer including separate variables for own and spousal parents, as people might respond differently to the health needs of parents and parents-in-law.[14]

As proxies for potential care-need arising from ailing spouses, we consider several variables: (1) *whether the spouse has ever had any chronic health condition*[15], (2) *whether the spouse has ever had any severe health condition*[16], (3) *whether the spouse has any difficulties with activities of daily living (ADL)*[17], and (4) *whether the spouse has developed any new chronic or severe health condition in the past two years.*[18] The first three variables are expected to capture the overall level of spousal health. The fourth one is included in the specifications to account for any additional effects of new or worsening health events on retirement hazards. When a spouse gets sick, the unaffected spouse may not choose to retire in the immediate next period. But it is plausible that when the sick spouse does not recover, his/her sickness still affects the healthy spouse's decision to retire in the following periods, although there may have been no further deterioration in the sick spouse's health condition in the recent past. As such, in addition to recent occurrences of health shocks, we account for the level of spousal health status.

Ideally, we would have wanted to include in the specifications one set of dummy variables reflecting simultaneously potential care-need from any and all family members, instead of including separate sets of variables for parents, parents-in-law, and the spouse/partner. However, for certain combinations of health status for different family members we either have no observations, or have too few observations with no variation in the outcome variable of interest.

Siblings could represent an alternate source of informal care for parents. With this in mind, the estimations include a variable indicating whether the individual has any siblings.

[14]We lose some observations when we use the longer list of parental variables, due to some non-responses on parental care-need when both parents are married to each other (see Table 1.A.1 endnotes 6 and 8).

[15]Chronic health conditions include high blood pressure, diabetes, lung disease, arthritis, and psychological problems.

[16]Severe health conditions include cancer, heart problem (heart attack or heart surgery), and stroke.

[17]In addition to the doctor-diagnosed medical conditions, we include the variable for any limitation in ADL, because activity limitations may aggravate the health effects of retirement.

[18]Summary statistics for these variables are given in Table 1.A.2.

We also include an interaction tern between this sibling indicator variable and *Mom or Dad or both in need of care.* The variable *Mom or Dad or both in need of care* is captured by four separate variables when we use the longer list of parental variables, but in that specification it is econometrically feasible to use this one variable in the interaction term. The sum of the estimated coefficients on *Any sibling* and *Any sibling*Mom or Dad or both in need of care* tells us whether someone with a sibling and a care-needing parent has a different retirement response than someone without a sibling but with a parent in need of care. In the estimation of the coupled sample, a similar set of variables — *Spouse has any sibling* and *Spouse has any sibling*Mom-in-law or Dad-in-law or both in need of care* — are included to account for the role of siblings-in-law in providing care for parents-in-law. We include another interaction variable representing the importance of siblings-in-law in providing care for the respondents' spouses — *Spouse has any sibling*Spouse has new chronic or severe health condition.* Conditional on overall health status and ADL limitations, spousal new health events may influence retirement response. As such, we use *Spouse has new chronic or severe health condition* in the interaction variables involving spousal health.[19] The estimations on couples include two additional interaction terms: *Spouse has new chronic or severe health condition*Mom or Dad or both in need of care* and *Spouse has new chronic or severe health condition*Mom-in-law or Dad-in-law or both in need of care.* These interactions, in conjunction with their level variables, capture the retirement responses of individuals with different number and combination of care-needing family members.

We include four health variables for the respondents, similar to the ones described for the spouses, in all regressions. In couples' regressions, we also add an indicator variable for *Spouse not working at present.* Hurd (1990) and Blau (1998) find that about one-third of couples in which both spouses are in the labor force at age 50 retire within one year of each other. Thus, if a respondent's spouse is not working and also happens to be in need of care, the individual's retirement response might be determined by the spousal labor force status and not spousal illness. The interaction variable between *Spouse not working at present* and *Spouse has new chronic or severe health condition* along with the spousal sickness variable then tells us whether retirement response differs with respect to potential spousal care-need

[19]It should be emphasized that the estimations have been rerun with interaction terms using the alternative spousal health variables, and the results do not differ qualitatively.

when the spouse is not working.

The variable *Retiree health insurance, Medicare or other health coverage* is a dummy variable equal to 1 if the individual is eligible for retiree health insurance[20] from the job held last period, or is covered by a long-term care insurance, or is enrolled in any type of federal government health insurance program, e.g., Medicare, Medicaid, CHAMPUS/VA/TRICARE, or any other government health insurance.[21] We include in the regressions an interaction term between *Retiree health insurance, Medicare or other health coverage* (RHI-M, for short) and *Mom or Dad or both in need of care* to capture if access to post-retirement health coverage makes people respond differently to parental care-need. Similarly, we include the interaction term *Retiree health insurance, Medicare or other health coverage*Spouse has new chronic or severe health condition* in couples' regressions to account for possible differential retirement responses to spousal care-need with respect to eligibility for RHI-M.

Often people have health insurance coverage through the employers of their spouses. When the respondents' employer-sponsored health insurances cover the spouses, it might slow retirement transition for the individuals. This seems more likely if the spouse's health condition involves potentially large health care costs. The slowing effect on retirement transition could be offset if the spouse is Medicare eligible, or has retiree health insurance, or some other federal health coverage. Even with spousal access to Medicare or other insurances, it might happen that the respondents' employer-provided health plans are simply better, and therefore, respondents might still defer retirement. To understand these effects of health insurances, we add in the regressions a dummy variable *Spouse has retiree health insurance, Medicare or other health coverage* (SRHI-M), and a dummy variable *Spouse is covered by respondent's employer-provided health insurance*, as well as an interaction term of these two variables.

The other control variables in the specifications are dummy variables for respondent age, dummy variables for education, the total yearly earnings from the job held, the total house-

[20]Employer-provided retiree health insurance permits individuals to remain in the health insurance plan of their career employer after retirement at a lower cost than they would face purchasing similar coverage in the market. The role of retiree health insurance can be particularly important when retirement occurs before the Medicare eligibility age of 65.

[21]All the regressions — both for the samples of singles and couples — have also been estimated with an alternate post-retirement health insurance variable that includes, instead of all government health programs, only Medicare. There is no important difference in the results using either of the two variables.

hold income, and the total non-housing assets[22] (all in year-2000 dollars and re-scaled)[23]. As crude proxies for pension wealth, we include three indicator variables for *defined benefit pension*, *defined contribution pension*, and *a combination of defined benefit and defined contribution pension* (with *no pension enrollment* as the omitted category). Dummy variables for the HRS survey years are also included. Estimations using the sample of couples include a quadratic in spousal age. In the estimations with the non-coupled sample, since the individuals are never married, widowed, or separated/divorced, two dummy variables — *widowed* and *separated/divorced* — are included in the regressions. Similarly, two dummy variables — *married with spouse absent* and *partnered* — enter the regressions using the couples' sample.

5 Estimation Results

Table 1.5 presents the estimation results for the non-coupled individuals, and Tables 1.6 and 1.7 present the results for the couples. The results in these tables are from the probit estimations using the retirement variable based on the current labor force status question.[24]

5.1 Results for Non-Coupled Individuals

From Table 1.5 there does not appear to be any statistically significant positive association between potential parental care-need and the retirement transition of non-coupled men and women. If anything, we find evidence of statistically significant delaying effect on retirement for certain combinations of parental care-need and marital status (Columns 5 and 7 for men and Columns 6 and 8 for women).[25] With respect to the potential role of siblings as alternate

[22]Non-housing assets defined as the sum of the net value of real estate (not primary residence), the net value of vehicles and businesses, IRA, Keogh accounts, stocks, mutual funds, and investment trusts, the value of checking, savings, or money market accounts, CD, government bonds, and T-bills, the net value of bonds and bond funds, and the net value of all other savings, less the value of other debts. The values of primary residence, mortgages, and other home loans are not included.

[23]Data on earnings, household income, and non-housing assets are taken from the RAND HRS files (See St. Clair et al., 2006).

[24]We also estimate the retirement model using the alternative retirement variable based on the self-defined retirement status question. The results are basically identical.

[25]For women, the negative effect of *Mom or Dad or both in need of care* in Column (4) and that of *Mom and Dad married and both of them in need of care, OR Mom/Dad unmarried and in need of care* in Column (8) of Table 1.5 are statistically significant when we estimate the model using the self-defined retirement hazard variable.

caregivers, we find that single men with sick parents are likely to delay retirement when they have siblings than when they do not have siblings.[26]

Access to post-retirement health insurance makes both single men and women retire sooner. Moreover, the sum of the estimated coefficients on the health insurance variable and the interaction term of this variable with the parental care-need variable is always statistically significant and positive for men and women. This suggests that when parents are sick, having access to post-retirement health insurance facilitates earlier retirement.

In results not displayed in Table 1.5, not surprisingly, retirement behavior is influenced by respondent age as well as health status. Transition into retirement is delayed for single men with larger household income. Single women retire earlier if net non-housing assets are larger. Men tend to retire sooner if they have a combination of defined benefit and defined contribution pension plans compared to when they do not have any pension enrollment. Defined benefit pension plans delay single women's retirement.[27]

5.2 Results for Married or Partnered Individuals

For couples' estimations, Table 1.6 displays the coefficient estimates for the potential familial care-need variables and the sibling related variables. Table 1.7 presents the estimates for the health insurance and spousal employment variables.

Estimation of the retirement model for couples considers potential family obligations from parents, parents-in-law, and the spouse/partner. There appears to be no statistically significant evidence that married men and women retire sooner when a parent or a parent-in-law potentially needs care.[28] Neither does it appear that married men and women retire sooner if their spouses are in need of care. On the contrary, individuals seem to delay

[26]Estimation of the model with the alternative retirement variable shows that when parents need care, women with siblings are likely to retire sooner than women without any siblings.

[27]We also estimate the retirement model defining the *at risk* sample to consist only of those working in the previous period, i.e., excluding those who were unemployed. In those specifications we additionally include an indicator for whether the individual was reported to be self-employed in the job held last period. We do this since it is probable that self-employment allows individuals more flexibility with their time allocation to competing needs. We do not find any evidence that self-employed non-coupled individuals retire any differently than non-self-employed individuals when faced with potential caregiving obligations.

[28]In fact, there is some evidence that for certain parental care-need and marital status, women might delay retirement; these delaying effects are significant for more parental variables if we use the self-defined retirement variable than the retirement variable based on the current labor force status question.

retirement for particular spousal health events. For instance, wives whose husbands have activity limitations, and husbands whose wives have had experienced a severe or a chronic health condition, are likely to postpone retirement. For women, the result is consistent with Pozzebon and Mitchell's (1989) finding that working women with a spouse in poor health tend to delay retirement. There is no significant effect of spouse's *recent* health shocks on individual's retirement timing, which is in line with Coile's (2004) results.

Like single men and women, married men and women retire earlier if they have *Retiree health insurance, Medicare or other health coverage* (RHI-M). Taking into account the estimated coefficients on the interaction variables with RHI-M, we find that married men and women with sick parents who have RHI-M are significantly more likely to retire early than those who do not have RHI-M. Similarly, people with sick spouses who have RHI-M are significantly likely to retire sooner than those who do not have RHI-M. Married men appear more likely to retire early when their spouses are Medicare or retiree health insurance (SRHI-M) eligible. Also, there is some evidence that married men may be delaying retirement if their wives are covered by the men's employer-provided health plans. Women delay retirement if the husbands are covered by women's employer-provided health insurance, even when the husbands have their own retiree health insurance coverage. Conversely, if wives are eligible for retiree health insurance coverage (SRHI-M), men retire early even if spouses are covered by the men's employer-provided health insurances.

We find men and women retiring sooner if the spouse is not working. Thus, there is evidence for complementarity of leisure for married couples.[29] But the sum of the coefficients on the interaction term *Spouse not working at present*Spouse has new chronic or severe health condition* and the spousal sickness variable does not reveal that spousal complementarity of leisure is stronger when a spouse is sick. In other words, individuals do not retire sooner when non-working spouses are ill compared to when they are healthy. Siblings or siblings-in-law do not affect retirement behavior in general. When husbands potentially need care, married women with siblings-in-law retire sooner than women without any sibling-in-law — a result that contradicts the role of siblings as alternate caregivers.

Among a few of the other findings, the higher the level of total household income, the

[29]Coile (2004) also reports evidence for a significant complementarity of leisure effect for men.

more likely married men and women are to delay retirement. Higher non-housing assets make men retire sooner. Individuals are likely to delay retirement if they have defined benefit pension enrollment. Own medical conditions precipitate retirement.[30]

6 Summary and Concluding Remarks

In this chapter we look at the influence of people's potential caregiving roles on their retirement timing. The general conclusion from this study is that familial caregiving obligation is not a strong determinant of people's early retirement behavior. While we do not find any major evidence that parental care-need is associated with individuals' retirement timing, it appears that potential spousal care-need has a delaying effect on people's retirement. The finding that retiree health insurance has a substantial effect on increasing the early retirement probability corresponds to the previous literature on the effects of retiree health insurance on retirement timing.[31] What we additionally find is that individuals who have parents or spouses in need of care are more likely to retire early if they have access to retiree health insurances. Therefore, potentially losing employer-sponsored current or retiree health insurance coverage in the instance of early retirement, particularly for those who are not yet Medicare age-eligible, possibly plays a significant role in deterring individuals from retiring sooner when faced with caregiving obligations.

We should note a few caveats of this study. It is possible that the variables needed for defining potential care-need by family members could be improved in future data collection, thus enabling a closer examination of this issue. Particularly, it would be interesting to have better indication of the degree of severity of various health conditions to obtain further conclusive evidence of the possible causality between caregiving and retirement tim-

[30] As in the non-coupled sample, we estimate the retirement model for couples defining the *at risk* sample to consist only of those working in the previous period, i.e., excluding those who were unemployed. The results are not affected in any notable way. In those specifications we additionally include an indicator for whether the individual was reported to be self-employed in the job held last period. Self-employed coupled individuals do not appear to retire any differently than non-self-employed individuals when faced with care-need by family members.

[31] For example, Karoly and Rogowski (1994) note that the availability of retiree health benefits increases the baseline probability of retiring by nearly 50 percent, while Gruber and Madrian (1995) find that a single year of continuation of retiree coverage increases the retirement hazards among persons aged 55–64 by about 20 percent.

ing. Moreover, it would be useful to have information on potential care-need arising from children.

Finally, it should be emphasized that the literature on the determinants of retirement has emphasized the importance of future retirement income accumulation that comes from Social Security benefit formulas and pension structures. A central behavioral assumption in an economic model of retirement is that individuals decide whether to retire by assessing the financial benefit from delaying retirement against the loss of utility from forgone leisure. In that regard a major deficiency of our analysis is that we do not explicitly account for the financial incentives to retirement in the framework of a forward-looking economic model of retirement. Consequently, our findings in this paper should be considered as suggestive effects of potential familial obligations on the timing of retirement.

Table 1.1: Reported Reasons for Retirement

Age Category	Forced	Poor Health	Spend Time with Family	Want to Do Other Things	Did Not Like Work	Number of Observations
	Percent in Each Age Group Citing Reason as Important in Retirement					
52-58	55.08	61.19	55.33	27.03	21.30	219
59-61	48.96	45.36	57.91	38.46	19.87	413
62-64	38.29	41.73	63.40	50.07	21.87	899
65-67	35.32	39.47	63.23	60.05	21.33	610
68-73	34.71	38.64	59.14	57.92	18.47	277

1. We observe 5009 retirement transitions in the sample out of 25020 observations (the sample before conditioning on non-missing parental and spousal careneed variables). Of that, we have responses on reasons for retirement from 2418 retirees after they make their first transition into retirement.
2. In the HRS, each retiree is asked whether they felt that they were forced into retirement. In another set of questions respondents are asked whether any of the four criteria – poor health, spending time with family, wanting to do other things, not liking work – has been a reason for retirement. Each criterion is considered as a reason for retirement if it is deemed very, moderately or somewhat important in retirement by the respondent. Each retiree can report multiple reasons as important in retirement.
3. Data Source: 1992, 1994, 1996, 1998, 2000, 2002 and 2004 waves of the Health and Retirement Study.
4. Weighted tabulations.

Table 2: Hours of Care Provided to Parents and Grandchildren

(In Past Two Years)

	Care Hours to Parents	Care Hours to Grandchildren
Sample Conditional on At Risk of Providing Care and Non-Missing Reports of Care Hours		
All	185.63 (10.56) [n=3848]	303.18 (14.42) [n=6927]
Male	86.94 (8.95) [n=1412]	94.00 (21.59) [n=968]
Female	242.84 (15.74) [n=2436]	337.16 (16.34) [n=5959]
Age 52-58	214.01 (31.38) [n=494]	475.87 (63.55) [n=619]
Age 59-61	180.08 (17.83) [n=943]	284.09 (30.05) [n=1431]
Age 62-64	175.64 (16.54) [n=1271]	307.06 (26.18) [n=2032]
Age 65-67	175.85 (19.47) [n=792]	298.36 (27.78) [n=1795]
Age 68-73	219.18 (60.90) [n=348]	228.15 (33.54) [n=1050]
Sample Conditional on At Risk of Providing Care and Reporting Positive Care Hours		
All	600.27 (30.94) [n=1190]	1023.46 (44.83) [n=2052]
Male	449.66 (39.34) [n=273]	575.88 (125.78) [n=158]
Female	645.11 (38.29) [n=917]	1060.80 (47.33) [n=1894]
Age 52-58	597.28 (79.97) [n=177]	1146.16 (143.10) [n=257]
Age 59-61	520.91 (46.05) [n=326]	998.84 (97.07) [n=407]
Age 62-64	584.39 (49.10) [n=382]	998.30 (78.38) [n=625]
Age 65-67	624.55 (59.47) [n=223]	1046.01 (89.27) [n=512]
Age 68-73	930.18 (243.45) [n=82]	954.43 (130.27) [n=251]

1. Standard error of the mean reported in parentheses.
2. Sample size reported in brackets.
3. Care hours to parents include hours provided to either parents or parents-in-law for married/partnered couples.
4. Care hours to parents include hours spent in helping parents with household chores, errands and basic personal activities.
5. Data Source: 1998, 2000, 2002 and 2004 waves of the Health and Retirement Study.
6. See page 5 footnote 8 for further discussion on the sample sizes used in this table.

Table 1.3: Retirement Hazards[1] With Respect To Living and Care-Needing Parents

Non-Coupled Households		Sample With and Without Living Parents	Sample With No Living Parents	Sample With At Least One Living Parent		
				Total	Parent in Need of Care[2]	Parent Not in Need of Care
		(1)	(2)	(3)	(4)	(5)
Men	Sample Size	1762	1252	510	151	359
Retirement Hazard		23.16	25.07	18.44	**26.32**	**15.09**
Age		61.63	62.46	59.53	60.67	59.04
Age of the Oldest/Only Parent		--	--	84.89	87.50	83.77
Women	Sample Size	4553	3280	1273	449	824
Retirement Hazard		22.84	24.61	18.25	**21.53**	**16.42**
Age		61.97	62.77	59.95	60.99	59.43
Age of the Oldest/Only Parent		--	--	84.57	86.60	83.54
Coupled Households[3]						
Men	Sample Size	9536	4594	4942	1516	3426
Retirement Hazard		18.59	22.98	14.39	**15.97**	**13.71**
Age		61.60	62.72	60.55	61.12	60.30
Age of the Oldest/Only Parent		--	--	85.56	87.58	84.67
Women	Sample Size	8759	4786	3973	1415	2558
Retirement Hazard		19.73	23.43	15.21	**15.62**	**14.95**
Age		61.03	62.26	59.53	60.03	59.25
Age of the Oldest/Only Parent		--	--	86.74	88.19	85.93

1. Retirement hazard is defined as the transition into retirement at period t conditional on not having retired in the previous period t-1.
2. For couples, the sample is conditional on non-missing potential care-need information on either a parent or a parent-in-law. For non-coupled individuals the sample is conditional on non-missing information on potential parental care-need.
3. Parents are in Need of Care when they are reported to be needing assistance with daily activities of bathing, dressing and eating or when they can not be left on their own even for an hour.
4. For respondents with more than one living parent, the age of the oldest (older) parent is reported.

Table 1.4: Retirement Hazards[1] With Respect To Spousal Health

	Sample of Coupled Individuals[2]	Spouse's Health Excellent or Very Good[3]	Spouse's Health Fair or Poor[3]	Spouse Has No Severe/ Chronic Condition[4]	Spouse Has At Least Two Severe/ Chronic Conditions[4]	Spouse Has Not Been in Hospital/ N. Home in Last 2 Years	Spouse Has Been in Hospital/ N. Home in Last 2 Years	Spouse Has No ADL Difficulty	Spouse Has At Least One ADL Difficulty
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Men									
Sample Size	9914	5000	1748	2824	4045	8331	1583	8810	1104
Retirement Hazard	**18.39**	**18.26**	**19.29**	**15.48**	**20.61**	**18.15**	**19.62**	**17.83**	**22.77**
Age	61.48	61.33	61.75	60.41	62.42	61.38	61.98	61.43	61.87
Spouse's Age	57.56	57.25	58.34	55.34	59.20	57.34	58.71	57.50	58.07
Women									
Sample Size	8738	3790	2017	1952	4189	6775	1963	7625	1113
Retirement Hazard	**19.73**	**19.65**	**20.06**	**15.91**	**21.57**	**19.41**	**20.83**	**19.28**	**22.87**
Age	61.03	60.87	61.28	59.61	61.89	60.88	61.57	60.98	61.40
Spouse's Age	63.82	63.21	64.79	61.19	65.29	63.42	65.22	63.68	64.85

1. Retirement hazard is defined as the transition into retirement at period t conditional on not having retired in the previous period t-1.
2. Couples include married and partnered individuals; partners and spouses are succinctly identified as spouses.
3. The sample is conditional on non-missing information on spousal potential careneed and other spousal variables used in the regression analysis later.
4. The category of spouse's health status good has not been included in these two classifications to make retirement hazard comparisons with respect to the top two and the bottom two spousal subjective health statuses.
5. The classifications omit the group where spouses have only one doctor diagnosed chronic or severe health condition.
6. Data Source: 1992, 1994, 1996, 1998, 2000, 2002 and 2004 waves of the Health and Retirement Study. Weighted tabulations reported.

Table 1.5: Effects of Potential Parental Care Needs on Retirement Transitions of Non-Coupled Individuals

Independent Variables	Retirement Transition Conditional on Not Having Retired Yet (Retirement Defined Using Current Labor Force Status Questions)							
	(1) Men	(2) Women	(3) Men	(4) Women	(5) † Men	(6) † Women	(7) † Men	(8) † Women
Mom or Dad or both alive	-0.011	0.002	-0.017	0.002				
	(0.029)	(0.021)	(0.028)	(0.021)				
Mom or Dad or both in need of care	0.069	0.024	0.246	-0.076				
	(0.070)	(0.043)	(0.172)	(0.063)				
All living parents healthy					0.022	0.014	0.024	0.015
					(0.032)	(0.022)	(0.032)	(0.022)
Mom/Dad unmarried and in need of care *or* Mom and Dad married and both of them in need of care					0.068	0.040	0.255	-0.055
					(0.069)	(0.042)	(0.160)	(0.063)
Mom and Dad married and one of them in need of care					**-0.154****	-0.049	**-0.132+**	**-0.122+**
					(0.059)	(0.077)	(0.079)	(0.066)
Mom/Dad married to stepparent and in need of care					0.225	**-0.120+**	**0.426+**	**-0.164****
					(0.185)	(0.067)	(0.225)	(0.050)
Has sibling(s)			-0.023	-0.020			-0.025	-0.019
			(0.033)	(0.024)			(0.033)	(0.024)
Mom or Dad or both in need of care*Has sibling(s)			**-0.133+**	0.133			**-0.149***	0.122
			(0.081)	(0.086)			(0.071)	(0.082)
Retiree health insurance, Medicare or other health coverage	**0.142****	**0.112****	**0.138****	**0.111****	**0.138****	**0.112****	**0.137****	**0.112****
	(0.025)	(0.017)	(0.025)	(0.017)	(0.025)	(0.017)	(0.025)	(0.017)
Mom or Dad or both in need of care*Retiree health insurance, Medicare or other health coverage	0.016	0.030	0.010	0.033	-0.006	0.026	0.009	0.026
	(0.075)	(0.048)	(0.076)	(0.048)	(0.072)	(0.048)	(0.077)	(0.047)
Observations	1762	4553	1762	4553	1761	4544	1761	4544

Table 1.5 Continued

1. Marginal effects from probit estimations are reported. Robust standard errors in parentheses. + Significant at 10%; * Significant at 5%; ** Significant at 1%.
2. The dependent variable Retirement Transition Conditional on Not Having Retired Yet is a binary variable equal to 1 if the respondent retires by the next period conditional on not having retired until the previous period.
3. † The omitted category for the set of parental variables is no living parent.
4. Other regressors included are: earnings from the job held last period, total household income at present, total non-housing assets, dummy variables for types of pension coverage, dummy variables for respondent's age, new and existing chronic (blood pressure, diabetes, lung disease, arthritis, and psychological problems) and severe (cancer, heart problem, and stroke) health conditions, indicator for difficulty in daily activities, education dummy variables, non-coupled status variables (separated/divorced and widowed, with never married as the omitted category), and finally the set of survey year dummy variables.

Table 1.6: Effects of Potential Care Needs by Family Members on Retirement Transitions of Coupled Individuals

Independent Variables	Retirement Transition Conditional on Not Having Retired Yet (Retirement Defined Using Current Labor Force Status Questions)					
	(1)	(2)	(3) †	(4) †	(5)	(6)
	Men	Women	Men	Women	Men	Women
Mom or Dad or both alive	-0.006	-0.018			-0.001	-0.017
	(0.024)	(0.013)			(0.014)	(0.013)
Mom or Dad or both in need of care	0.027	-0.028			-0.028	-0.067
	(0.027)	(0.023)			(0.059)	(0.044)
All living parents healthy			0.004	-0.020		
			(0.014)	(0.012)		
Mom/Dad unmarried and in need of care or Mom and Dad married and both of them in need of care			0.038	-0.034		
			(0.027)	(0.022)		
Mom and Dad married and one of them in need of care			-0.050	-0.035		
			(0.043)	(0.041)		
Mom/Dad married to stepparent and in need of care			0.080	**-0.109***		
			(0.091)	(0.045)		
Mom-in-law or Dad-in-law or both alive	0.020	-0.010			0.020	-0.010
	(0.012)	(0.013)			(0.012)	(0.013)
Mom-in-law or Dad-in-law or both in need of care	-0.006	0.009			-0.011	-0.034
	(0.024)	(0.024)			(0.054)	(0.050)
All living parents-in-law healthy			0.009	-0.009		
			(0.013)	(0.014)		
Mom-in-law/Dad-in-law unmarried and in need of care or Mom-in-law and Dad-in-law married and both of them in need of care			0.013	0.017		
			(0.026)	(0.025)		

Table 1.6: Continued

Independent Variables	(1) Men	(2) Women	(3) † Men	(4) † Women	(5) Men	(6) Women
Mom-in-law and Dad-in-law married and one of them in need of care			0.028	-0.069		
			(0.045)	(0.054)		
Mom-in-law/Dad-in-law married to stepparent and in need of care			0.040	0.001		
			(0.071)	(0.080)		
Spouse has new severe/chronic condition	-0.026	0.018	-0.035	0.021	-0.026	0.012
	(0.028)	(0.027)	(0.027)	(0.027)	(0.048)	(0.039)
Spouse has had a chronic condition	**-0.020+**	-0.010	**-0.019+**	-0.009	**-0.020+**	-0.010
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Spouse has had a severe condition	**-0.020+**	-0.009	**-0.020+**	-0.008	**-0.020+**	-0.009
	(0.012)	(0.011)	(0.012)	(0.011)	(0.012)	(0.011)
Spouse has at least one ADL limitation	-0.003	**-0.027+**	-0.005	**-0.026+**	-0.002	**-0.027+**
	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)	(0.014)
Spouse has new severe/chronic condition*Mom or Dad or both in need of care	0.002	**-0.063+**	0.005	**-0.063+**	0.001	**-0.064+**
	(0.047)	(0.037)	(0.048)	(0.036)	(0.047)	(0.036)
Spouse has new severe/chronic condition*Mom-in-law or Dad-in-law or both in need of care	0.006	-0.022	0.007	-0.039	0.005	-0.022
	(0.046)	(0.042)	(0.046)	(0.040)	(0.046)	(0.042)
Has sibling(s)					0.018	-0.013
					(0.014)	(0.016)
Mom or Dad or both in need of care*Has sibling(s)					0.064	0.051
					(0.072)	(0.060)
Spouse has sibling(s)					0.012	0.004
					(0.018)	(0.016)

Table 1.6: Continued

Independent Variables	(1) Men	(2) Women	(3) † Men	(4) † Women	(5) Men	(6) Women
Mom-in-law or Dad-in-law or both in need of care*Spouse has sibling(s)					0.005	0.052
					(0.056)	(0.061)
Spouse has new severe/chronic condition*Spouse has sibling(s)					0.001	0.007
					(0.045)	(0.035)
Observations	8578	8676	8494	8654	8578	8676

1. Marginal effects from probit estimations are reported. Robust standard errors in parentheses. + Significant at 10%; * Significant at 5%; ** Significant at 1%.
2. The dependent variable Retirement Transition Conditional on Not Having Retired Yet is a binary variable equal to 1 if the respondent retires by the next period conditional on not having retired until the previous period.
3. † The omitted category for the set of parental variables is no living parent (and no living parent-in-law).
4. Other regressors included are: two dummy variables for own and spousal retiree health insurance, Medicare or other health coverage, an indicator for spousal non-work status, earnings from the job held last period, total household income at present, total non-housing assets, dummy variables for types of pension coverage, dummy variables for respondent's age, spousal age, new and existing chronic (blood pressure, diabetes, lung disease, arthritis, and psychological problems) and severe (cancer, heart problem, and stroke) health conditions, indicator for difficulty in daily activities, set of education dummy variables, coupled status variables (partnered and married but spouse absent presently, with married with spouse present as the omitted category), and finally the set of survey year dummy variables.

Table 1.7: Effects of Health Insurance Coverage and Spousal Employment Status in the Context of Potential

Table 1.7: Effects of Health Insurance Coverage and Spousal Employment Status in the Context of Potential Care Needs by Family Members on Retirement Transitions of Coupled Individuals

	Retirement Transition Conditional on Not Having Retired Yet (Retirement Defined Using Current Labor Force Status Questions)			
Independent Variables	(1) Men	(2) Women	(3) Men	(4) Women
Spouse not working at present	**0.096****	**0.141****		
	(0.012)	(0.012)		
Spouse has new severe/chronic condition*Spouse not working	0.033	-0.020		
	(0.029)	(0.024)		
Retiree health insurance, Medicare or other health coverage	**0.088****	**0.071****		
	(0.013)	(0.013)		
Mom or Dad or both in need of care*Retiree health insurance, Medicare or other health coverage	-0.035	0.018		
	(0.023)	(0.027)		
Spouse has new severe/chronic condition*Retiree health insurance, Medicare or other health coverage	0.006	0.008		
	(0.028)	(0.026)		
Spouse has retiree health insurance, Medicare or other health coverage	**0.035****	0.014		
	(0.011)	(0.012)		
Spouse is covered by respondent's employer provided health insurance			**-0.026+**	-0.014
			(0.014)	(0.019)
Spouse has retiree health insurance or Medicare*Spouse is covered by respondent's employer provided health insurance			0.023	-0.012
			(0.023)	(0.022)
Observations	8578	8676	6575	6579

1. Marginal effects from probit estimations are reported. Robust standard errors in parentheses. + Significant at 10%; * Significant at 5%; ** Significant at 1%.
2. The dependent variable Retirement Transition Conditional on Not Having Retired Yet is a binary variable equal to 1 if the respondent retires by the next period conditional on not having retired until the previous period.

Table 1.7 Continued

Table 1.7 Continued

3. Column 1 reports the results from the same regression that gives the estimates in Table 6 Column 1. Column 3 gives the estimates from a different regression with everything the same as the regression in Column 1 plus the two additional variables whose coefficient estimates are reported. Similarly, for women (Columns 2 and 4), where Column (2) reports the results from the same regression that gives the estimates in Table 6 Column 2. See Note 4 in Table 6 for a description of the other independent variables.

Appendix

Appendix

Table A.1.1: Sample Selection Criteria

	All		Male		Female	
Total Number of Age-Eligible HRS Cohort Individuals Interviewed[1]	**57496**		**26485**		**31011**	
If Not Same-Sex Couples	57406	99.84%	26422	99.76%	30984	99.91%
If At Least Two Successive Interviews Obtained	47406	82.45%	21711	81.97%	25695	82.86%
If At Risk of Retirement	26674	46.39 %	12512	47.24%	14162	45.67%
If At Risk of Retirement but Not Reported Disabled in Subsequent Wave	25550	44.43%	12053	45.51%	13497	43.52%
Ignoring Observations After First Move into Retirement[2]	25085	43.63%	11731	44.29%	13354	43.06%
If Non-missing Respondent Characteristics[3]	25020	43.52%	11704	44.19%	13316	42.94%
If Coupled Household	**18701**		**9940**		**8761**	
If Spousal Careneed Variables & Other Controls Non-missing[4]	18652	99.73%	9914	99.74%	8738	99.74%
If Parent Careneed Information Non-missing[5, 6]	17921	95.83%	9171	92.26%	8750	99.87%
If Parent-in-Law Careneed Information Non-missing[5, 6]	17670	94.49%	8967	90.21%	8703	99.34%
If Parent and Parent-in-Law Careneed Information Non-missing	17296	92.49%	8602	86.54%	8694	99.23%
If Parent or Parent-in-Law Careneed Information Non-missing	18295	97.83%	9536	95.94%	8759	99.98%
If Parent, Parent-in-Law, and Spousal Information Non-missing[7]	17254	92.26%	8578	86.29%	8676	99.03%
If Employer Health Insurance Coverage for Spouse Non-missing	13154	70.34%	6575	66.15%	6579	75.09%
If Non-Coupled Household	**6319**		**1764**		**4555**	
If Parent Careneed Information Non-missing[8, 9]	6315	99.94%	1762	99.89%	4553	99.96%

1. 9738, 8812, 8412, 8182, 7707, 7459, and 7096 observations, respectively, from the 1992, 1994, 1996, 1998, 2000, 2002, and 2004 HRS Surveys.
2. Retirement defined using the current job status questions in the HRS surveys. The sample sizes are different when we define retirement using the self-reported retirement status question: 10346 and 11137 observations for men and women, respectively.
3. When we define retirement using the self-reported retirement status question, the sample sizes for men and women are 10323 and 11107 observations, respectively.
4. Excluding the information on whether the individual's employer provided health insurance covers the spouse.

Table 1.A.1 Continued

Table 1.A.1 Continued

5. Parent/Parent-in-law care need variables include both parental living status and care need status.
6. Sample sizes are for the set of parent/parent-in-law careneed variables that do not distinguish by parental marital status. For the set of parent careneed variables using marital status, the sample size is 17885; for the set of parent-in-law careneed variables using marital status, the sample size is 17594. The reduction is due to missing information on whether any parent or parent-in-law is in need of care when both parents are married to each other.
7. The sample sizes relevant for the regression analysis. When we define retirement using the self-reported retirement status question, the sample sizes for men and women are 7421 and 6934 observations, respectively.
8. Sample sizes are for the set of parental careneed variables that do not distinguish by parental marital status. For the set of parent careneed variables using marital status, the sample size is 6305.
9. The sample sizes relevant for the regression analysis. When we define retirement using the self-reported retirement status question, the sample sizes for men and women are 1678 and 4099 observations, respectively.

Table A.1.2: **Summary Statistics of Variables**

Table A.1.2: Summary Statistics of Variables

	Non-Coupled Sample		Coupled Sample	
	(1) Men	(2) Women	(3) Men	(4) Women
Dependent Variables				
	N=1762	N=4553	N= 8578	N= 8676
Retirement Transition Conditional on Not Having Retired Yet (Retirement Defined Using Current Labor Force Status Question)	23.16	22.84	18.52	19.74
Retirement Transition Conditional on Not Having Retired Yet (Retirement Defined Using Self-Reported Retirement Status Question)	27.92 (n=1678)	25.32 (n=4099)	20.23 (n=7421)	21.71 (n=6934)
Independent Variables				
Mom or Dad or both alive	28.27	28.19	28.62	33.00
Mom or Dad or both in need of care	8.54	9.47	9.15	10.02
Mom-in-law or Dad-in-law or both alive	--	--	38.66	27.66
Mom-in-law or Dad-in-law or both in need of care	--	--	9.54	8.57
All living parents healthy	17.50	16.34	17.13	19.82
Mom/Dad unmarried and in need of care or				
Mom and Dad married and both of them in need of care	7.64	8.14	7.58	8.17
Mom and Dad married and one of them in need of care	0.45 (n=1761)	0.80 (n=4544)	1.08 (n=8550)	1.05 (n=8669)
Mom/Dad married to stepparent and in need of care	0.27	0.51	0.40	0.67
All living parents-in-law healthy	--	--	22.55	15.40
Mom-in-law/Dad-in-law unmarried and in need of care or	--	--		
Mom-in-law and Dad-in-law married and both in need of care			7.31	7.08
Mom-in-law and Dad-in-law married and one of them in need of care	--	--	1.42 (n=8517)	0.93 (n=8661)
Mom-in-law/Dad-in-law married to stepparent and in need of care	--	--	0.63	0.28

Table 1.A.2 Continued

Table 1.A.2 Continued

	Non-Coupled Sample		Coupled Sample	
	(1) Men	(2) Women	(3) Men	(4) Women
Independent Variables				
Spouse has had a chronic condition	--	--	66.52	69.89
Spouse has had a severe condition	--	--	19.90	31.85
Spouse has at least one ADL limitation	--	--	10.72	11.90
Spouse has new chronic or severe condition in the past 2 years	--	--	15.50	17.49
Age (in years)	61.63	61.97	61.89	61.05
	(4.43)	(4.47)	(4.45)	(4.29)
Spouse's age (in years)	--	--	58.03	63.85
			(6.72)	(6.51)
Has siblings	86.16	87.33	87.13	88.41
Spouse has siblings	--	--	89.31	86.36
Has had a chronic condition	69.34	78.43	70.87	72.55
Has had a severe condition	24.18	24.98	28.79	21.80
Has at least one ADL limitation	9.70	13.44	7.12	7.93
Newly diagnosed chronic or severe condition in the past 2 years	18.48	19.02	15.12	14.80
Was self-employed last period (only if employed last period)	22.15	20.05	22.80	21.49
Spouse not working presently	--	--	44.85	46.81
Earnings from the job held in last period (in year-2000 dollars)	29,608.83	30,831.89	32,881.20	32,510.58
	(46039.6)	(36780.7)	(60456.7)	(55286.0)
Total household income at present (in year-2000 dollars)	51,203.48	27,586.75	77,252.94	67,509.81
	(191718.3)	(39611.0)	(97583.7)	(83170.8)
Total non-housing assets (in year-2000 dollars)	227,534.3	89,657.96	327,327.10	331,052.30
	(1429711.0)	(229105.3)	(1447445.0)	(1451683.0)
Retiree health insurance, Medicare or other health coverage	61.92	63.07	60.33	56.21
Spouse has retiree health insurance, Medicare or other health coverage	--	--	37.45	59.48

Table 1.A.2 Continued

Table 1.A.2 Continued

	Non-Coupled Sample		Coupled Sample	
	(1) Men	(2) Women	(3) Men	(4) Women
Independent Variables				
Spouse is covered by respondent's employer provided health insurance	--	--	38.17 (n=6575)	36.27 (n=6579)
Defined benefit pension plan	19.79	23.84	20.98	21.23
Defined contribution pension plan	19.38	19.32	19.53	19.78
Combination of defined benefit and defined contribution	9.79	9.05	9.53	8.98
Less than high school graduation	24.97	28.28	22.88	21.67
High school graduation	34.21	34.98	32.53	41.53
Some college	15.01	15.60	14.88	17.26
More than 2 years of college	25.81	21.14	29.71	19.54
Never Married	18.90	9.59	--	--
Separated/divorced	57.55	43.34	--	--
Widowed	23.55	47.07	--	--
Married with spouse present	--	--	96.13	96.50
Married but spouse absent presently	--	--	0.36	0.34
Partnered	--	--	3.51	3.16

1. Column 1 sample size 1762 unless otherwise noted; Column 2 sample size 4553 unless otherwise noted; Column 3 sample size 8578 unless otherwise noted; Column 4 sample size 8676 unless otherwise noted.
2. All numbers are in percent unless otherwise mentioned.
3. Dollar figures are in year-2000 dollars.
4. Standard deviations are reported in parentheses.
5. All means are weighted.

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Chapter 2

Predictability of Residential Mobility: Evidence from The Health and Retirement Study

1 Introduction

Expectations of future events play a prominent role in economic models of decision-making under uncertainty. Hurd and McGarry (1995) note that subjective expectations may determine behavior, even if incorrect. This paper adds to the growing literature that assesses the potential usefulness of subjective expectation information in micro data. The key research question in this paper is: What do subjective expectations about moving tell us? Drawing on the longitudinal data from *The Health and Retirement Study*, we document the relationship between moving expectations and subsequent moving realizations among the United States population ages sixty-five and older.

There has been an upsurge of interest in the policy debate with respect to the well being of the elderly population in the recent decades. Residential moving represents an important economic outcome variable that can involve a change of living arrangement as an independent household, with adult children or other unrelated persons, or in an institution. Engelhardt and Gruber (2006) note that changes in living arrangements are likely to be associated with changes in the level of care and assistance received by the elderly. Living arrangements additionally affect the elderly's eligibility and transfer level for certain types of government assistance, such as, food stamps and supplemental Social Security (since these are determined by the income of the household, not of the individual). As such, it is important to know if the elderly are making mistakes in their predictions for future moving, which could have adverse consequences.

Some household surveys ask about subjective probabilities, and studies analyzing the validity of responses to these questions have found encouraging results.[1] *The Health and Retirement Study* (HRS) asks respondents a number of expectational questions on matters such as survival to a target age, working beyond the normal retirement age, residential mobility, nursing home entry, job stability, receiving inheritances, and making bequests. Hurd and McGarry (1995, 2002) study survival expectations and conclude that the subjective survival probabilities are not simply an alternative measure to health status and that they predict mortality. Loughran, Panis, Hurd, and Reti (2001) and Haider and Stephens (2007) find that retirement expectations are strong predictors of retirement. Maestas (2007) studies the expectations of work during retirement and shows that unretirement is anticipated for the vast majority of those returning to work. Finally, Rohwedder and Kleinjans (2006) find that at the population level expectations about Social Security earnings are very consistent with realizations. Besides studies that use the HRS expectational variables, there have been a number of important studies on individual expectations about different events that exploit data sources other than the HRS, both from the United States and elsewhere.[2] The results of these papers lend confidence that respondents on average understand the probability questions, and by and large the papers conclude that the expectations are fairly accurate predictors of the future event/outcome that they are supposed to characterize.

As in studies on other expectations, we also find that the subjective probabilities of moving are very important in predicting future moving, even once demographic information known to be associated with the propensity to move is added to the analysis. Although this relationship is positive and monotone, the probabilities of moving rise much less than one-to-one with subjective probabilities. Still, information on expectations improves the accuracy of models of moving behavior most likely because it includes information about unobserved

[1] See Dominitz and Manski (1997) for a discussion of a history of subjective probability questions in survey data.

[2] Most notably, Bernheim extensively analyzes the responses from the *Retirement History Survey* (RHS) on age of expected retirement (1990) and expected Social Security benefits (1988; 1989). Dominitz and Manski (1997) analyze data on expected future income from the *Survey of Economic Expectations* (SEE), and Manski and Straub (2000) use workers' subjective expectations about job security from the same source. Das and Van Soest (1999, 2001) explore income expectations using data from the *Dutch Socio-Economic Panel*; Jappelli and Pistaferri (2000) look at expectations of nominal income growth using the *Bank of Italy Survey of Household Income and Wealth*; and Souleles (2002) examines expectations about respondents' future financial position from the *Michigan Consumer Sentiment Surveys.*

tastes and individual circumstances.

We find that moving is subjectively a low probability event, even for most movers. For a sizable fraction of movers — about 43% — moving apparently represents an entirely unanticipated shock/event, because they report a subjective probability of zero. Individual responses of subjective probabilities contain considerable noise in the form of inordinate number of focal responses of "0", "0.5", and "1". There is some indication that the response of "don't know" is similar to a response of "0.5" in the subjective probabilities.

Motivated by the observed relationship between the reported subjective probabilities and actual moving propensities, we put forward the hypothesis that when people are asked for a subjective probability they report the true probability conditional on available information, plus some random noise. We look at the proposed model's implications regarding which population groups are better at predicting future residential moving. However, we fail to substantiate the hypothesis, and therefore, cannot conclusively identify individual characteristics associated with better forecasting.

The outline of the remainder of the chapter is as follows. The next section describes the data used in this study. Section 3 characterizes the subjective moving probabilities and their correlates. Section 4 presents the descriptive relationship between moving expectations and subsequent residential moves. The same section also explores the role of subjective probabilities in economic models of residential mobility. Section 5 examines what people report when asked for the subjective probabilities, and also explores which groups are better at predicting. The paper closes with a conclusion in Section 6.

2 The Data

We use data from *The Health and Retirement Study* (HRS). The HRS is a longitudinal biennial survey of the American population that had its first wave of interviews in 1992. The analysis draws on data from five survey years from 1998 to 2006 on individuals from four cohorts in the HRS: AHEAD (born between 1890-1923), CODA (born between 1924-1930), HRS (born between 1931-1941), and War Babies (born between 1942-1947).

The key question concerning moving expectation in the HRS is:

Now using the same scale as before where "0" is absolutely no chance and "100" means that it is absolutely certain, please tell me what you think are the chances that you will move in the next two years?

(00—10—20—30—40—50—60—70—80—90—100)

Normalizing the responses to [0, 1] allows treating them as subjective probabilities of residential mobility.[3]

The moving expectation question is asked to the respondents if either of the following conditions is met:

(1) The respondent is at least 65 years of age, or

(2) The respondent is giving a new interview (to the new interviewees the question is asked irrespective of age).

In other words, if an individual is under age 65 and is a re-interview respondent, the moving expectation question is not asked.

We investigate the predictability of moving for those ages 65 and older. The Health and Retirement Study over-sampled blacks, Hispanics, and Floridians, and therefore, throughout the analysis of this paper we use respondent-level sampling weights. Our sample design is motivated by the idea of studying moving behavior in relation to the subjective probabilities of moving elicited in the immediate prior survey wave. Therefore, to contribute an observation to the sample, the respondent has to be part of at least two consecutive survey waves. For the number of years of data we consider, an individual can provide a maximum of four observations to the sample. Table A.2.1 in the Appendix describes the sample construction steps. For the cohort and age-eligible respondents, we retain 61,688 observations where we observe an individual in any two successive interview waves. Of this, 35,720 respondents are of 65 years of age or older. We have non-missing subjective probability responses for 31,541 of the 35,720 observations. We additionally have *don't know* and *refusal* responses to the moving expectation question for another 762 observations not included in this 31,541 sample size. We observe moving transitions conditional on non-missing subjective moving

[3]The questions on both moving expectation and realization in the HRS are such that any changes in residences irrespective of the distance involved is taken into account; in other words, a residential move can be within the same city, or the same state, as well as out of the current city, or state, of residence.

probabilities for 7,725 individuals in 1998−2000, and for 7,536, 7,876, and 8,404 individuals, respectively, for the years 2000−2002, 2002−2004, and 2004−2006. Restricting the sample to non-missing data on other respondent and household variables we finally retain a sample of 29,584 observations, excluding 513 observations that have *don't know* or *refusal* responses to the moving expectation question. Of the final sample, the number of moving transitions observed in the four transition years are 7,494, 6,987, 7,292, and 7,811. Table A.2.2 in the Appendix gives the summary statistics for all the variables used in the analysis of this paper.

3 Moving Expectation and Its Correlates

The distribution of individual subjective moving probabilities for all observations is presented in Figure 2.1 − Panel *A*. The figure indicates a heaping of responses most notably at 0, and also at 0.5 and 1[4], a pattern found previously for other HRS subjective probability measures (Lillard and Willis, 2001). It has been suggested previously in the literature that some of the bunching of responses could be due to cognition error or misunderstanding (Hurd and McGarry, 1995; Hurd, McFadden and Gan, 1998), or due to imprecision in beliefs about these probabilities (Lillard and Willis, 2001).

Figure 2.1 also clearly displays that most individuals have a very low subjective probability of moving, with more than 60 percent reporting zero. The figure also indicates significant heterogeneity across individuals. To understand how much of the variation in subjective moving probabilities can be explained by observable characteristics, Ordinary Least Squares regressions of the probability variable on observable characteristics typically used in studies of residential move[5] are reported in Table 2.1. In Column (1), the analysis controls for race, gender, education groups (with the group of high school graduates omitted), marital status, a quadratic in age, health status captured by two dummy variables for the numbers of doctor-diagnosed medical conditions (with no condition as the omitted category), ownership of home, labor force status represented by three dummy variables (with complete retirement as

[4]The response of "1" is contributed largely by those who actually move, as can be seen in Panel *B*, which plots the distributions of the subjective moving probabilities separately for movers and non-movers.

[5]To mention a few of the papers on moving behavior: Venti and Wise (1989, 1990, 2004); Feinstein (1996); Börch-Supan, McFadden and Schnabel (1996); Clark and Wolf (1992); Börch-Supan (1989, 1990).

the omitted category), number of children, household size, individual earnings, total household income, net housing value, net non-housing financial wealth, and dummy variables for survey waves. While the F-test for overall significance of the model is significant at the 0.001 level, the R^2 from this regression is only 0.03. Married and widowed people report lower probabilities of making a residential move compared to never married, separated, and divorced people. Subjective probabilities of moving increase with education. Home-ownership is negatively associated with moving expectations. Adverse health conditions increase subjective moving probabilities. While undoubtedly more observable characteristics could be added to explain more of the variation in moving probabilities, these results suggest that subjective probability reports are considerably idiosyncratic.

In the next three columns, in addition to the variables that enter the regression presented in Column (1), we add expectations about other future events to explore what future expectations make moving subjectively a more probable event. For instance, we take into account the expectation about whether income would keep up with inflation in the next five years, the subjective probabilities of survival for another 5 to 15 years, and the expectations about leaving a bequest and receiving an inheritance. All these expectation variables are measured as subjective probabilities, and range between 0 and 1, inclusive. Life expectancy and subjective probabilities of moving are negatively correlated. It could be that because of the consumption value of housing, the longer people expect to live, the less they expect to make a residential move to potentially tap into housing equity. The expectation that income would keep up with inflation is also negatively associated with subjective probabilities of moving. It could imply that unless the elderly are threatened that their purchasing power is going to be impacted, they are unlikely to expect to move and alter housing consumption. The expectation of receiving inheritances is positively associated with subjective probabilities of moving. Incidentally, the expectations about longer life, receiving inheritances, and income keeping up with inflation can all be considered as positive things in an individual's life. Bassett and Lumsdaine (2001) find evidence of a common "systematic" component across an individual's subjective responses for different questions that is unrelated to whether the specific question of interest bears a positive or a negative connotation. In contrast, we find that subjective moving probabilities are both positively and negatively associated with apparently positive

expectations in life.

4 The Predictive Power of the Subjective Probabilities of Moving

4.1 Relationship between Expectations and Realizations

An initial examination of the data suggests that the subjective probability measure might have predictive power for forecasting residential mobility — on average, individuals who have not moved report a moving probability of about 12.8%; movers report 36.1%. Figure 2.1 – Panel *B* indicates that the subjective probability distribution for non-movers is heavily concentrated at very low probabilities and is highly skewed. In fact, the median subjective probability for non-movers is 0%, the 75th percentile is 10%, and the 90th percentile is 50%. For movers, the distribution is relatively more dispersed. Their median subjective probability is 20%, 75th percentile is 80%, and their 90th percentile is 100%. However, it is noteworthy that approximately 43% of the movers reported a 0% chance of future moving possibility. Thus, for a sizable fraction of the movers, moving apparently represents an unforeseen event.

The direct relationship between the subjective moving probability and subsequent moves is shown in Figure 2.2 – Panels *A* and *B*. Panel *A* shows the relationship for all the survey waves pooled together; Panel *B* presents the relationship separately for the four waves of moving transitions. The dashed and dotted lines in the two panels give the fractions of individuals actually moving by their reported subjective probability. The plots in Figure 2.2 indicate that there is a positive relationship between the subjective probabilities and the incidence of moving. Most notably, there is at least a doubling of realized moving between those with a 80% subjective probability and those with a 100% subjective probability. These results are indicative of subjective probability's predictive power. It is notable that the non-solid lines, representing the fraction of individuals actually moving by their subjective probability, look very similar across waves. However, the fact that the realization lines fall below the 45-degree line (except for those who report a zero probability) suggests that a substantial number of individuals in the sample tend to overstate their mobility probabilities.

For the entire sample population, the mean of subjective moving probabilities is 15.60% and the mean moving propensity is 12.12%. In other words, the sample average of the forecast errors (deviation between the actual moving outcome and the reported moving probability) is non-zero: overall, there is about a 29% over-prediction in the subjective probabilities.[6]

4.2 Economic Models of Residential Mobility

Even though the predictions about residential mobility remain noticeably unfulfilled for almost the entire range of reported subjective probabilities, we do observe that the realization rate is increasing in the subjective probabilities. Naturally, if people can tell us something about their future moving through the subjective probabilities, then the predictions have the potential for improving modeling of moving behavior. As such, we can expect to find additional covariation between actual and expected moving propensities beyond what is present through common covariation with the factors that would typically be included in a model of mobility behavior. To assess this point, we regress individuals' moving outcomes on individuals' subjective mobility probabilities, and subsequently include the full set of economic and demographic variables that we have been using in our previous regressions.

The predictive power of the subjective moving probabilities is shown in Column (1) of Table 2.2. When only the expectation variable is included in the regression, the coefficient on this variable is highly statistically significant. Since the variable used in the regression ranges from 0 to 1, the coefficient can be interpreted as stating that a 10-percentage point increase in moving expectation increases the probability of a residential relocation by 3.3 percentage points.

Figure 2.2 reveals that the relationship between the moving expectations and realizations is nonlinear. Column (2) of Table 2.2 includes a series of dummy variables for the non-zero probability categories to capture the nonlinearity in a nonparametric fashion. The regression coefficients tend to increase in magnitude as the subjective moving probabilities

[6]The result of the general over-prediction in residential mobility is consistent with the finding of Duncan and Newman (1976). They study the fulfillment rates of job- and housing-related mobility expectations for various demographic, housing, job-related and community characteristics using four waves of the Panel Study of Income Dynamics (PSID) and find that irrespective of the type of the move, fewer than half of those expecting to move fulfilled these expectations.

increase, and are statistically significant for all of the probability categories from 40%. The relationship between the subjective moving probability and the probability that a residential move actually takes place is precisely similar to the pattern found in Figure 2.2. The probability of a move is slightly increasing in the expectation up to 80% category and then jumps rather sharply between 80% and 100% subjective probability categories. In fact, all that the estimates in Column (2) add to Figure 2.2 are the standard errors. The probability variables are jointly significant at the 0.001 level of significance.

Including the demographic characteristics in the regressions only has a slight qualitative effect on the relationship between individuals' subjective moving probabilities and future moves. The expectations variable remains highly significant. To highlight a few of the coefficients on the demographic and other variables, those with more than high school education are significantly more likely to make a residential move than their high school graduate counterparts. Medical conditions raise the likelihood of moving. Those who own their residences are substantially less likely to move, a finding well documented in the literature. Those with greater housing equity move with lesser probabilities, and current employment diminishes the probability of future moving.[7] The estimated coefficients for the observable characteristics are almost unchanged in regressions with or without the subjective probability variable. More importantly, the subjective measure remains a strong predictor of future residential mobility, even conditional upon numerous observable characteristics. This means that the predictive power of the subjective probability variable is nearly orthogonal to the predictive ability of the demographic variables. In spite of the apparent overstatement of the expectational probabilities, this subjective variable contains very important private information that is otherwise unseen by the econometrician.[8]

Table 2.3 presents the regression results for the four moving transition waves separately. As suggested visually in Figure 2.2 – Panel *B*, the estimated coefficients on the dummy

[7]These results in conjunction with the results in Table 2.1 allow us to explore the extent to which expectations and outcomes of residential mobility qualitatively vary with observables in the same way. For instance, we see that homeowners are less likely to expect to move, just as they are less likely to make a move; those with more than high school education appear more likely to move, and the same group of people also reveals larger expectations of moving; and so on.

[8]All these regressions have been estimated by maximum likelihood probit also. The estimated marginal effects from the probit regressions are nearly identical to the reported OLS estimates.

variables for the ten non-zero probability categories are very similar for the pooled sample and the individual transition waves. Some of the demographic and other variables, such as, *Age*, *Age-squared*, and *Home-ownership*, are statistically significant both in the pooled and the wave by wave regressions. In fact, almost all the variables that are significant in the pooled regression — for example, *White*, *Less than High School Graduate*, *More than High School Graduate*, *At Least Five to Eight Health Conditions*, *Working for Pay*, *Number of Children*, and *Earnings* — tend to have the same sign and are significant in at least one of the individual wave regression. The only exception is *Net Housing Value*, which is statistically significant in the pooled regression, but not significantly estimated in any of the individual wave regressions.

4.3 Item Non-responses in the Subjective Moving Probabilities

In the HRS, besides the exact responses that range between 0 and 1 (more specifically, 0 and 100; see Section 2), there are two additional responses that are allowed in the moving expectation question: "don't know" and "refuse". We have omitted these observations in the analysis thus far. For the sample population under consideration, the groups that say "don't know" or "refuse" are extremely small fractions of the population, 1.6% and 0.1%, respectively. The analysis in Table 2.4 depicts that the respondents who either say "don't know" or give a subjective moving probability of "0.5" are both approximately 5-percentage points more likely to make a residential move than the entire population. In other words, the moving propensities of the two groups with these two probability responses are remarkably close. A "don't know" response may mean the same as a response of "0.5", reflecting a belief in a 50-50 chance of future moving.

5 The Heterogeneity in the Accuracy of Prediction Across Population Groups

A relevant and important question is whether there are individual characteristics that are associated with people making better predictions about future events. The ability to make more precise forecasts, for instance, might be expected to vary with education and cognitive

ability. As a first step in capturing the variations in predictive accuracy, we group people by characteristics and compare the mean subjective probabilities of moving with the mean realized moving propensities. The averages of the subjective probabilities and actual moving propensities for various groups are listed in Table 2.5. Mean subjective probabilities exceed actual probabilities for almost every sub-group of population. One notable exception is the group of people ages 90−105; it appears that moving is more of a surprise for the oldest adult population than for other demographics. We also find that moving is somewhat of a surprise (under-predicted event) for the Hispanic population, and for people without home-ownership.

A drawback of this straightforward comparison is that it does not say anything about whether, within a group, those who say they are more likely to move are in fact more likely to do so. It is possible that the group could do very well on average while individual members are doing quite poorly. Therefore, as an alternative we look at the mean squared forecast errors within groups. Let m_t denote the binary moving indicator (a 0/1 dummy variable) for whether one moves between periods t-1 and t, and m^e_{t-1} denote the reported subjective probability of moving. Then the sample mean squared forecast errors is simply the average of $(m_t - m^e_{t-1})^2$. The mean of squared errors has the advantage that it looks at individual forecast errors and does not allow negative errors to offset positive ones. We report these means for different groups in Column (3) of Table 2.5.

In order to interpret these mean squared errors across groups, it is useful to introduce the *true* (unobserved) probability of moving, p_{t-1}, conditional on Ω_{t-1} — the information available at the time of the forecast. A difficulty with the mean squared errors is that even if people are predicting as well as they can, if moving is not perfectly predictable given all available information, the mean squared errors will be larger for those whose true probability of moving is closest to $\frac{1}{2}$. To elaborate this point, let us suppose we could form groups that are homogeneous in the conditional probability of moving, p_{t-1}, and everyone reports p_{t-1} as their subjective probability. By definition, p_{t-1} is the true expectation of moving outcome, m_t, and therefore, the term $E(m_t - p_{t-1})^2$ is the variance of m_t. Since m_t is a binary 0/1 outcome variable, the variance of m_t can be written as: $p_{t-1}(1 - p_{t-1})$. This shows that if in each group everyone reports p_{t-1} as their subjective probability, then for the group the mean squared error will be $p_{t-1}(1 - p_{t-1})$. For different p_{t-1}'s in different groups, the means

of squared errors will vary across groups and will be largest for groups with p_{t-1} closest to $\frac{1}{2}$. However, we may not wish to say that groups are better at predicting just because they are less likely to move.

One way to address this difficulty in interpreting the mean squared errors across groups is to use a standardized distribution of subjective moving probabilities (the overall distribution of subjective probabilities) to calculate *weighted* mean squared errors across groups.[9] Weighting the mean-squared errors allows us to account for the differential subjective probability reports by observable characteristics. These weighted mean squared errors are reported in the last column of Table 2.5. Weighting the mean squared errors does seem to reduce the variation across groups compared to the unweighted mean squared errors. This appears to be the case, for instance, for education, marital status, home-ownership, activity limitations, and financial wealth quartiles. The relative subgroup comparisons in weighted means are often very similar to that implied by the basic mean squared errors reported in Column (3), but for certain groups they are quite different. For instance, the usual mean of squared forecast errors is smallest for the least educated of the three education groups that we consider, whereas the *weighted* mean squared errors for this group is the largest among the three groups. Similarly, individuals in the highest quartile of financial wealth have the smallest *weighted* mean squared errors, though in the usual calculation those in the second and third quartiles of financial wealth have smaller means of squared errors than people in the highest quartile. Taken as a whole, there does not appear to be a straightforward interpretation of the mean squared errors in assessing group variation in predictive accuracy.

5.1 What do People Report as Subjective Probabilities of Moving?

In view of the difficulty in interpreting the mean squared errors, in this section we try to make some sense of what people report as subjective probabilities and also try to say something more about which groups are better at predicting. We assume that individuals are *rational* based on all available information (Ω) when they form expectations about the

[9] In short, we calculate the average squared forecast errors for each group for each reported value of subjective moving probability, and then use the overall distribution of subjective probabilities to calculate the weighted mean squared errors for each group.

probability of moving. Then:

$$m_t = p_{t-1} + \upsilon_t \text{ .....(1)}$$

where, by definition of p_{t-1}, $E(\upsilon_t|\Omega_{t-1}) = 0$.

We hypothesize that when individuals are asked at period t-1 about the probability that they will move by period t, what they report is the true probability conditional on the available information, p_{t-1}, plus some noise that is mean zero for all p_{t-1}. Thus,

$$m^e_{t-1} = p_{t-1} + \xi \text{ .....(2)}$$

where, ξ is the *noise* term that can be positive, negative, or zero, and in the population $E(\xi|\Omega_{t-1}) = 0$. In the data some individuals report a zero probability of moving (i.e., m^e_{t-1}=0), and nonetheless move, and others report a probability, m^e_{t-1}, of 1 and do not move. Such behavior can be consistent with the model. The model implies that for such individuals p_{t-1} is greater than 0 and less than 1, but noise, ξ, in their subjective probabilities leads many of them to report the extreme values.

If p_{t-1} varies across people, the model suggests that the subjective moving probabilities are informative but noisy. One motivation for this hypothesis is the pattern observed in Figure 2.2 (showing the relationship between moving propensities and subjective moving probabilities), in which the subjective probabilities might be interpreted as reflecting moving probabilities plus something akin to classical measurement error.

We assume that the two components of m^e_{t-1} in (2) — p_{t-1} and ξ — are uncorrelated (the classical-errors-in-variables (CEV) assumption). We also maintain the assumption that υ_t is uncorrelated with m^e_{t-1}. From (1) and (2) we can write:

$$m_t = m^e_{t-1} + (\upsilon_t - \xi) \text{ .....(3)}$$

If we estimate this equation by OLS with the inclusion of a constant term[10], it can be shown

[10]To be specific, we estimate the following by OLS:

$$m_t = \beta_0 + \beta_1 m^e_{t-1} + (\upsilon_t - \beta_1 \xi).$$

that the *p*lim of $\hat{\beta}_1$ — the coefficient estimate on the subjective mobility measure, $m^e_{t\text{-}1}$ — can be characterized as[11]:

$$plim\hat{\beta}_1 = \frac{\sigma_p^2}{\sigma_p^2 + \sigma_\xi^2} \text{.....(4)}$$

where, σ_p^2 is the variance of $p_{t\text{-}1}$, and σ_ξ^2 is the variance of the random noise term. β_1 would be 1 if we could plug in $p_{t\text{-}1}$ directly instead of the observed $m^e_{t\text{-}1}$ in the OLS estimation, but $plim\hat{\beta}_1 < 1$ if $m^e_{t\text{-}1}$ is $p_{t\text{-}1}$ plus measurement error.

Recall that the estimated coefficients from this OLS regression are what we present in Column (1) of Table 2.2. This regression estimates the curve in Figure 2.2 – Panel *A* as a straight line. As we can see in Table 2.2, the estimated coefficient $\hat{\beta}_1$ is 0.334.[12] Thus, the pattern in Figure 2.2 and the estimated $\hat{\beta}_1$ in Table 2.2 appear consistent with our model of what people report as the subjective probabilities of moving.

The hypothesis in Equation (2) implies that the observed forecast errors (the deviation between the binary moving outcome and the subjective moving probability) are made up of two components: one component is due to the fact that moving is uncertain — even given all the available information; and the other component is the random noise element in the subjective probability:

$$m^e_{t\text{-}1} = p_{t\text{-}1} + \xi \text{.....(2)}$$
$$\Rightarrow m_t - m^e_{t\text{-}1} = m_t - p_{t\text{-}1} + \xi.$$
$$\Rightarrow (m_t - m^e_{t\text{-}1})^2 = (m_t - p_{t\text{-}1})^2 + \xi^2 + 2(m_t - p_{t\text{-}1})\xi.$$

If v_t and ξ are independent it follows that:

$$\Rightarrow E(m_t - m^e_{t\text{-}1})^2 = E(m_t - p_{t\text{-}1})^2 + E\xi^2.$$

Since, E(ξ)=0,

$$E(m_t - m^e_{t\text{-}1})^2 = E(m_t - p_{t\text{-}1})^2 + Var(\xi) \text{.....(5)}$$

The left hand side in (5) is the mean squared forecast error. The first term on the right hand side is the variance of m_t[13], which depends on the true probability of moving, $p_{t\text{-}1}$, and for a

[11] See Wooldridge (2002); p. 75.

[12] Incidentally, since $\hat{\beta}_1 \approx 0.33$, it follows from (4) that for the sample population $\sigma_\xi^2 \approx 2\sigma_p^2$.

[13] $p_{t\text{-}1}$ is, by definition, the 'true' expectation of m_t.

binary (0, 1) variable m_t, is largest when p_{t-1} is closest to $\frac{1}{2}$. The second term is a measure of the random noise component in the reported subjective probability. One implication of the model is that the mean of squared forecast errors is larger the closer the average of the true probabilities is to $\frac{1}{2}$.

Because the hypothesis of what people report as subjective probabilities incorporates a random noise element, if true, the model has the potential to tell us something about which groups predict better. If, for example, it can be shown that the variance of the random noise component is smaller for some groups than others, it could be said that those groups predict better. However, there are some problems with testing and applying this model. One of the problems relates to the possibility of new information arriving between t-1 and t that affects moving. If everyone gets the same shock (that is, all probabilities are affected in the same way) then in a cross section forecast errors will not have zero mean even in large samples. Some years the mean should be positive, some years negative.[14] More critically, following Chamberlain's (1984) argument, it is possible that new information can affect the moving outcome in ways that could be correlated across individuals with differences in p_{t-1}. That is, shocks could affect different people differently, in a way that is correlated with the observable characteristics in a cross-section. For instance, in some years homeowners may be particularly affected, or low income people.[15] This implies that v_t in Equation (1) may not be orthogonal to p_{t-1} across individuals in a particular cross-section. Therefore, in a cross-section or in a short panel like ours, new information can increase forecast errors and can influence the ex-post prediction accuracies of certain groups more than those of the others. The important point to acknowledge is that just because a shock affects a particular group more than the others, and thereby influences the moving outcome of that group in ways not predicted, it should not be concluded that the affected group will consistently make worse predictions than others. To clarify, if, for example, an unexpected downward shock to home values makes it harder for homeowners to move, and they move less than they expected, homeowners may not be consistently poor forecasters. Instead, if our model is correct, we would prefer to say that one group predicts better than another when the former group has

[14]Econometrically, this issue can be dealt with with time dummies.

[15]A long enough panel should be able to deal with this econometrically, because the same groups should not get shocks in the same direction repeatedly, but we do not have a long panel.

a smaller variance of the noise component than the latter group.

There is also a more basic problem with applying this model in assessing group differences in predictive abilities. We observe whether one moves and the subjective probability reported, but we do not observe the true probability. If we did, we could calculate for different groups the first term on the right of Equation (5); since we observe for every group the term on the left of Equation (5), we could then infer the second term on the right, and see how it varies across groups. We can, however, consider an approximation of the true probability. We regress the indicator for moving outcome, m_t, on a subset of information that the individuals have access to at the time of the forecasts, and take the fitted values from the regression. We calculate the first term on the right of Equation (5) by plugging in these fitted values in place of the p_{t-1}'s.

We look into the group variation in the variances of the random noise component in the subjective moving probabilities by considering many different groups segregated by different individual characteristics. We use more than one criterion to disaggregate groups — the general one in all cases being a classification by gender — in order to retain more homogeneity in true probabilities within groups. Tables 2.6.1 (for women) and 2.6.2 (for men) report the averages of the subjective probabilities, m^e_{t-1}, and the (approximated) true probabilities, p_{t-1}, in the first two columns. The mean squared forecast errors for the various groups are reported in Column (3). The next column of Tables 2.6.1 and 2.6.2 reports the noise variances, i.e., the estimates of σ^2_ξ, which we derive using Equation (5) with the fitted values replacing the p_{t-1}'s in the calculation. The next two columns report the $\hat{\beta}_1$'s and the estimates of σ^2_p.[16] It appears that the variances of the random noise component differ with individual characteristics. Higher education does not appear to make people better forecasters, whereas better health seems associated with less noisy reports of subjective probabilities.[17]

[16]The $\hat{\beta}_1$ for each group is the estimated coefficient of the subjective probability variable from the regression of moving outcome on subjective moving probability along with a constant. The estimates of σ^2_p are calculated using Equation (4). Please see Footnote 19 for additional notes.

[17]Among some other findings, homeowners make better predictions than non-homeowners (Rows 12-13). We find no distinct association between financial assets and the ability to make less noisy forecasts (Rows 14-15). Single people, in general, are more prone to offering noisier predictions than married adults (Rows 16-19). Finally, we do not find evidence that the older adult population are more or less likely to give noisier predictions based on their employment status.

It is useful to compare the group differences in noise variances to the group differences in weighted and unweighted mean squared errors that we looked at in Table 2.5. After all, these are two different approaches to trying to answer the same question of whether some groups forecast better than others. For the most part, with respect to any particular individual characteristic(s) we use in grouping people, the subgroup of people that has the largest mean squared errors also happens to give the noisiest forecasts. Of course, larger mean squared errors and larger noise variances are both indicative of relatively worse predictions. For instance, we find that the most educated group has the highest mean of squared errors as well as the largest noise variance among the various education groups. However, the weighted mean squared errors is largest for the least educated group in the sample and smallest for those with high school graduation. Married and partnered people have better forecasts both by the measure of mean squared errors (weighted and unweighted) and that of the noise variances relative to never married and other single people; so does the group of homeowners compared to those without ownership. Those in worse health status — in terms of either activity limitations or subjective health status — have the largest weighted and unweighted mean squared errors and also the largest noise variance relative to those in better physical health. However, we also observe some deviations to this more common pattern of association between the mean squared errors and the noise variances across different subgroups of people. For instance, among the various age groups, the oldest age group of people has the largest mean squared errors. Although the oldest group of women also happens to have the largest noise variance, it is the youngest group of men that makes the noisiest predictions. Also, individuals in the lowest financial wealth quartile have the largest mean squared errors; whereas, women in the highest financial wealth quartile have the largest noise variance.

These results regarding the variance of the noise term should be interpreted with caution. The problem is that, as we have mentioned earlier, the expectations may contain additional information not available in observable variables. In fact, if the fitted values were good approximations of the $p_{t\text{-}1}$'s, adding the explanatory variables to an equation for predicting moving should substantially reduce toward zero the coefficient on the subjective probability. We find in Table 2.2 that it only falls a little. The fact that the decline in the estimated coefficient is so small suggests that most of the information in the subjective probabilities

is not adequately captured by the set of variables that we are using as regressors. As such, we think that the fitted values from moving regressions do not do a very good job of approximating the p_{t-1}'s.[18] Therefore, we should be cautious about putting too much stock in the implied values of the variance of the noise term, and consequently about what we can say about which groups are better at predicting.[19]

Besides considering the model's applicability in telling us something about which groups predict better, the other important matter we are concerned about is validating the model itself. In order to investigate whether the model is consistent with the data, we consider a testable implication of the model. The procedure involves estimating Equations (1) and (2), replacing p_{t-1} with a set of explanatory variables — a subset of the information available to the individuals at the time of the forecast. If we maintain the hypothesis that when asked for a subjective probability of moving, people respond with the true probability conditional on available information, plus noise of mean zero, then the coefficients on the various explanatory variables in the regressions of Equations (1) and (2) should be the same whether the dependent variable is m_t or m^e_{t-1}.

Table 2.7 presents the estimated coefficients in the two regressions along with the test statistics for the equality of coefficient for the pooled sample. Failure to reject the hypothesis of equal coefficients for the explanatory variables would be consistent with the hypothesis that reported subjective probabilities are true conditional probabilities plus noise.

[18]We also see in Table 2.1 that the regressor variables have fairly small explanatory power in explaining the variation in the subjective moving probabilities, as captured in the R^2 statistics.

[19]Another issue regarding the estimates of the variance of the noise component makes us concerned about the reliability of the magnitudes of these estimates. We calculate the noise variances reported in Tables 2.6.1 and 2.6.2 using Equation (5), which does not require us to have estimates of σ_p^2. However, we can obtain the estimates of σ_p^2 directly from the fitted values that approximate the p_{t-1}'s. If we plug in these estimated σ_p^2 in Equation (4) along with the $\hat{\beta}_1$'s, we obtain another set of estimates for the variances of the noise term. These estimates of σ_ξ^2 are smaller compared to the estimates that we derive using Equation (5) and report in Tables 2.6.1 and 2.6.2. We get the approximations for p_{t-1}'s using a subset of the information available to individuals. As such, for a group, the variance of the true probabilities is likely to be larger than that of the fitted values. If that is the case, then the estimates of σ_p^2 we obtain from the fitted values of p_{t-1} would give lower bound estimates of the variances of the true probabilities. If we plug in these alternative estimates of σ_p^2 in Equation (4), we are likely to get lower bound estimates also for σ_ξ^2, the variance of the noise element in the subjective moving probability.

As apparent in Table 2.7, we reject the hypothesis that the coefficients are jointly equal in the two regressions.[20] Thus, if we focus on the joint tests of equality of all coefficients, it seems that the main hypothesis about what people report is wrong. However, it is possible that the main hypothesis is not inaccurate, because the test we are conducting is not entirely a clean test. Note that for the test to be valid, we need to assume that v_t in Equation (1) is uncorrelated with p_{t-1}. But as we have discussed earlier, this assumption may be violated in a cross section even in large samples, because of new information that would affect m_t in ways that could be correlated with p_{t-1} (Chamberlain, 1984). In the absence of this assumption of orthogonality in Equation (1), the rejection of the hypothesis of equal coefficients in the test described above may be due to the deficiency in the test, rather than the inadequacy of the model that we have hypothesized.

When we conduct the test of equality of coefficients for one explanatory variable at a time, we fail to reject equality of coefficients across the two regressions for majority of the variables. The variables for which we reject the equality of coefficients are *Age*, *White*, *More than High School Graduate*, *Homeowner*, *Number of Children*, *Earnings*, *Total Household Income*, and *Working for Pay*.[21]

If our model is correct, it is likely that there exists heterogeneity in the noise in reported moving expectations across population groups. But it is important to acknowledge that a group may predict badly in one year because of unanticipated shocks but this does not imply it will consistently predict badly. Unfortunately, in the absence of being able to account for the Chamberlain critique, and in the absence of a conclusive testable implication to corroborate our hypothesis, we cannot be certain if the group variations that we have shown in Tables 2.6.1 and 2.6.2 accurately capture the extent or direction in which people differ in their noisiness in reported forecasts.

[20] We also reject the equality of coefficients in every individual transition wave.

[21] Incidentally, if we reject the equality of coefficients in the two regressions for any variable in any individual transition wave, we often reject the equality of coefficients for that variable in the pooled sample also. Moreover, except for the dummy variable *Home-ownership*, we do not find the estimated coefficients of the same variables to differ repeatedly in several transition waves. That we reject equality of coefficients for different observable characteristics in different survey waves (except for home-ownership) gives credence to the hypothesis that if people give noisy forecasts, they are random noise, and that individuals are not systematically wrong in reporting their moving expectations.

6 Summary and Concluding Remarks

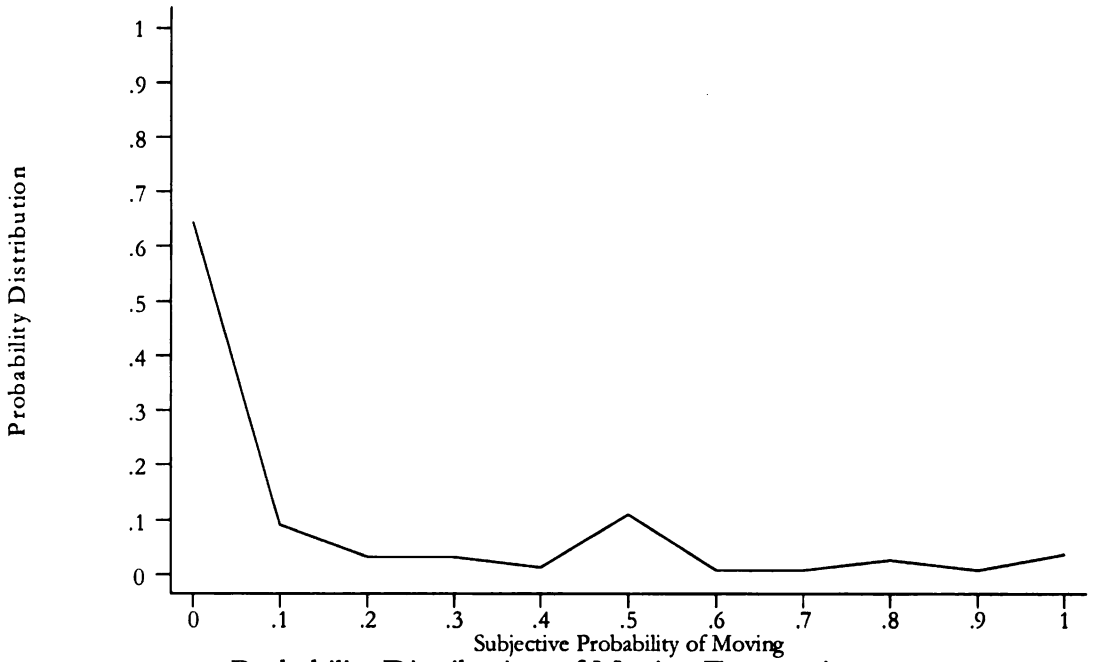
The availability of subjective expectations information offers an exciting opportunity to validate the importance of expectations in decision-making. However, the results in this paper suggest the need for careful research to assess the empirical relationship between expectations and economic behaviors. The paper provides a comprehensive account of the relationship between the expectation and realization of a binary decision variable for people ages 65 and older in the United States. The results show that the subjective moving expectations are highly significant predictors of subsequent moving. Moving expectations contain additional information beyond that found in demographic variables known to be related to residential mobility. However, the older population appear to over-predict their mobility probabilities during the sample period examined here. At the same time, for approximately 43% of the movers, residential mobility is a completely unforeseen event, and as such, this 43% did not overpredict future moving. Moving appears to be a shock, in particular, for the elderly in their nineties and beyond, and also for a wider age group of older population without home-ownership. There is some evidence that the responses of "don't know" and "0.5" are similar, that a "don't know" response instead of representing a lazy response possibly reveals a belief in a 50-50 chance of moving.

In order to understand what people report when they are asked for a subjective probability of moving, and also to say something about which groups make better moving forecasts, we propose the hypothesis that when asked for the subjective probability of moving, people respond with the true probability conditional on available information plus random noise. This appears to be largely consistent with the pattern of association between the subjective probabilities and the moving propensities. One of our main objectives has been to explore the model's implications regarding which groups predict future moving better. For instance, if the variance of the random noise component is smaller for some groups than others, then it might be interpreted that those groups make relatively better predictions. However, we have encountered some problems in validating and applying the model. For one thing, because of our reservations about the approximations to the true conditional probabilities that we use in calculating the noise variances, we cannot be confident about the magnitudes of the estimates of these variances for different population groups. In order to validate our model

we test whether the coefficients on variables explaining subjective probabilities are the same as when those variables are used to explain moving. The model does not pass, but we argue that the failure might be attributable to the Chamberlain critique. Chamberlain's argument implies that in the wake of new information, the true conditional probability may no longer reflect the true probability ex-post for certain groups. In a single cross section or in a short panel like the one in this paper, new information can increase forecast errors and can do so differentially for groups with different characteristics. Since we have relied on the mean squared forecast errors and the true conditional probabilities to calculate the measure of noisiness in the subjective probabilities for various groups, we ought to be cautious about the implied values of the variance of the noise term across different groups.

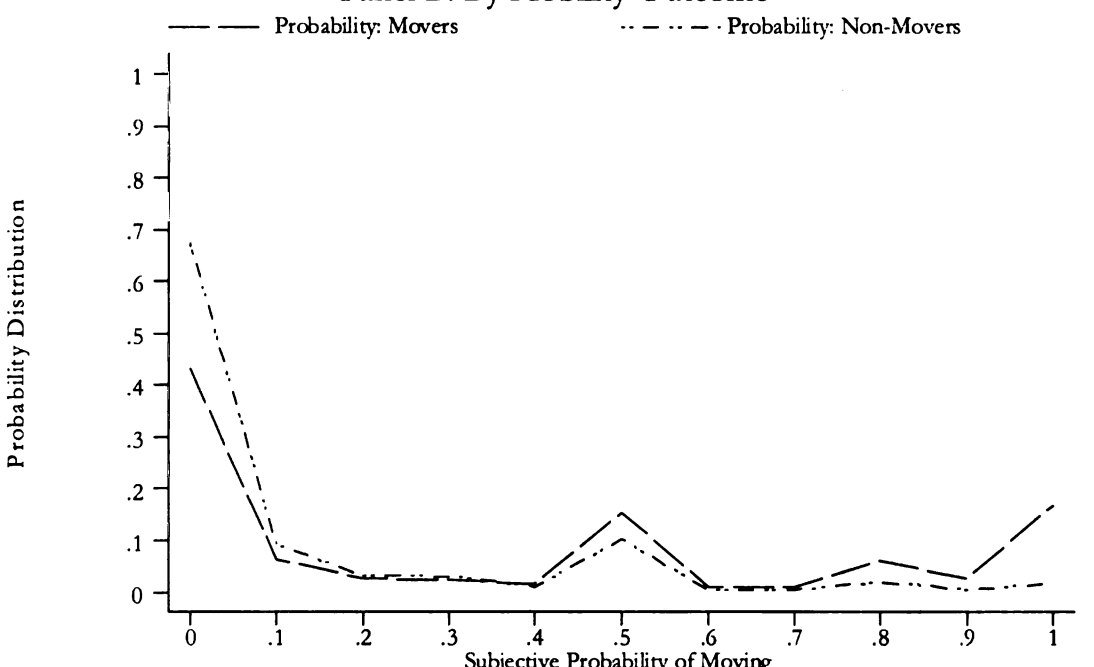
Figure 2.1: Probability Distribution of Moving Expectations

Panel A: All Observations



Probability Distribution of Moving Expectations

Panel B: By Mobility Outcome



Probability Distribution of Moving Expectations

Table 2.1: Observable Determinants of Moving Expectations and Relationship between Expectations about Future Moving and Other Events

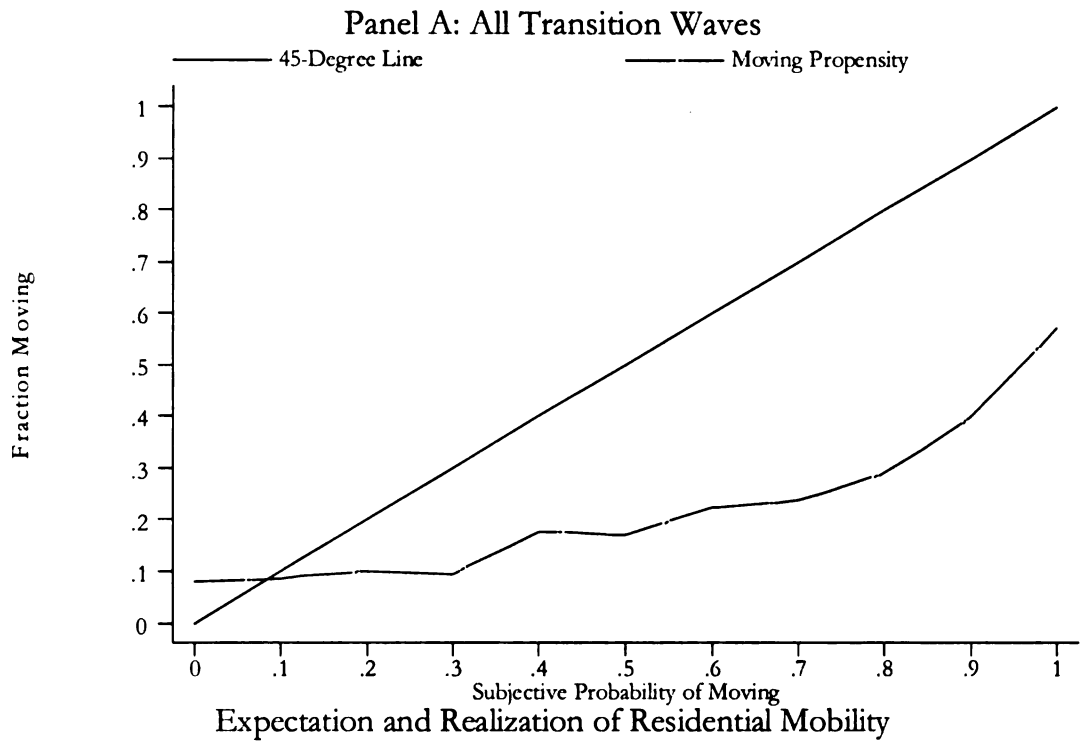
Independent Variables	Dependent Variable: Subjective Probability of Moving			
	(1)	(2)	(3)	(4)
Age	**-0.013***	**-0.017****	**-0.012***	**-0.030****
	(0.005)	(0.005)	(0.005)	(0.008)
$Age^2/100$	**0.017****	**0.010****	**0.007+**	**0.018****
	(0.003)	(0.004)	(0.003)	(0.005)
Female	0.004	**0.006+**	0.005	0.007
	(0.004)	(0.004)	(0.004)	(0.004)
White	**0.015****	**0.017****	**0.012***	0.010
	(0.005)	(0.006)	(0.006)	(0.007)
Hispanic	**-0.021****	-0.012	**-0.020****	-0.013
	(0.007)	(0.008)	(0.007)	(0.009)
Married	**-0.034****	**-0.037****	**-0.037****	**-0.035****
	(0.007)	(0.008)	(0.008)	(0.009)
Widowed	**-0.031****	**-0.033****	**-0.033****	**-0.025****
	(0.007)	(0.008)	(0.008)	(0.009)
Less than High School Graduate	**-0.036****	**-0.034****	**-0.035****	**-0.035****
	(0.004)	(0.004)	(0.004)	(0.005)
More than High School Graduate	**0.040****	**0.040****	**0.037****	**0.039****
	(0.004)	(0.004)	(0.004)	(0.005)
At Least 1–4 Health Conditions	**0.010+**	**0.010+**	**0.011***	**0.013+**
	(0.005)	(0.006)	(0.005)	(0.007)
At Least 5–8 Health Conditions	0.013	0.014	**0.018+**	0.015
	(0.010)	(0.011)	(0.010)	(0.012)
Owns Home/Residence	**-0.079****	**-0.080****	**-0.081****	**-0.074****
	(0.005)	(0.005)	(0.006)	(0.006)
Works for Pay Full/Part-Time	-0.006	-0.006	-0.005	-0.001
	(0.007)	(0.007)	(0.007)	(0.008)
Partly Retired	-0.009	-0.009	-0.008	**-0.012+**
	(0.006)	(0.006)	(0.006)	(0.007)
Disabled or Unemployed	-0.005	-0.002	-0.007	-0.003
	(0.017)	(0.019)	(0.017)	(0.022)
Number of Children	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Number of Household Residents	**-0.006****	**-0.006****	**-0.006****	**-0.008****
	(0.002)	(0.002)	(0.002)	(0.003)
$Earnings/10^6$	0.027	0.033	0.028	-0.125
	(0.135)	(0.136)	(0.135)	(0.126)
$Total\ Household\ Income/10^6$	**0.116****	**0.124****	**0.108****	**0.109****
	(0.038)	(0.039)	(0.039)	(0.041)

Table 2.1 Continued

Independent Variables: Other Subjective Probabilities about the Future	Dependent Variable: Subjective Probability of Moving			
	(1)	(2)	(3)	(4)
Net Value of Housing/10^6	0.004	0.005	0.004	0.006
	(0.004)	(0.004)	(0.004)	(0.004)
Net Value of Financial Wealth/10^6	0.006	0.006	0.006	0.005
	(0.004)	(0.004)	(0.004)	(0.004)
Income Keep Up With Inflation Next 5 Years		**-0.013***		
		(0.006)		
Live Next 5 to 15 Years†				**-0.003+**
				(0.002)
Leave Bequests of At Least $10,000			0.008	
			(0.005)	
Receive Any Inheritance in Next 10 Years			**0.022***	
			(0.009)	
Constant	**0.788****	**0.947****	**0.745****	**1.418****
	(0.189)	(0.205)	(0.197)	(0.295)
Observations	**29584**	**27903**	**28492**	**20676**
R-squared	0.03	0.03	0.03	0.03

1. The dependent variable – subjective probability of moving – ranges between 0 and 1, inclusive.
2. Robust standard errors in parentheses. + Significant at 10%; * Significant at 5%; ** Significant at 1%.
3. All estimations include dummy variables for survey waves.
4. Weighted regression results reported.
5. For the set of dummy variables Married and Widowed, the excluded category is Divorced, Separated, or Never Married.
6. The omitted education category is High School Graduation.
7. The omitted health condition category is No Doctor-Diagnosed Health Condition.
8. The excluded labor force status variable is Completely Retired (which also includes those identified as Out of Labor Force).
9. † Data from the last three transitions waves. Not asked if individuals are 90 or older.
10. Sample sizes in Columns (2) – (4) are conditional on non-missing observations on the additional subjective probabilities that are included in the regression estimations.

Figure 2.2: Moving Expectations and Actual Mobility



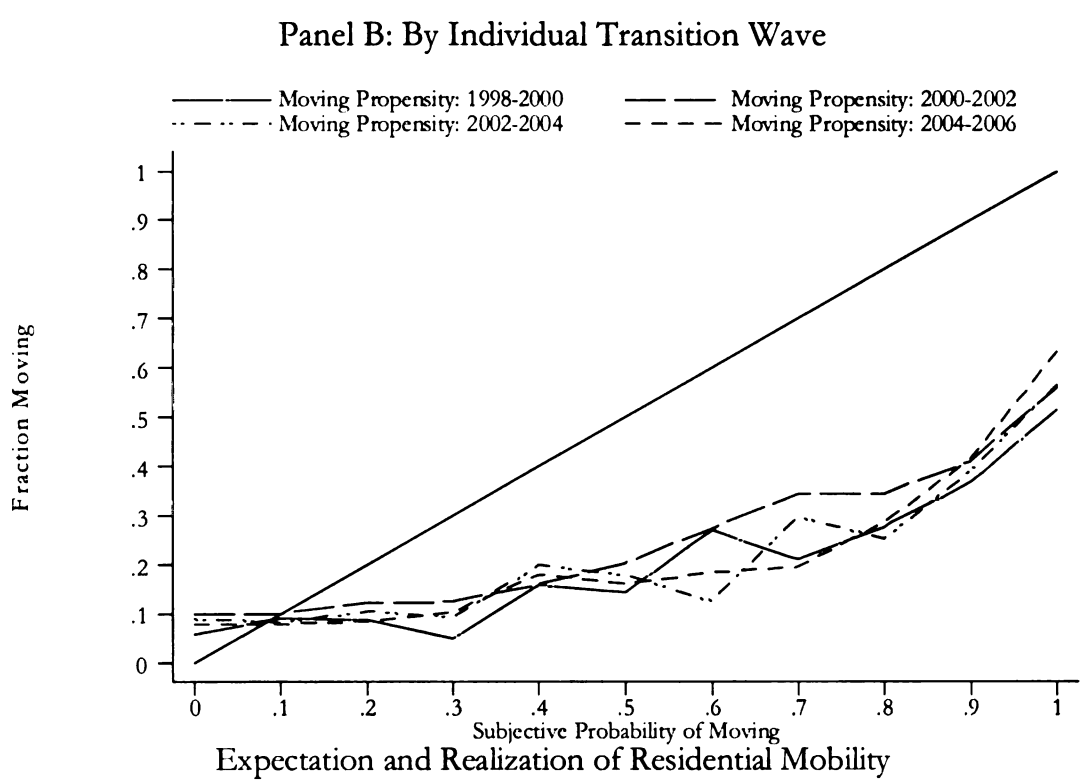


Table 2.2: Predictiveness of the Subjective Moving Probabilities

Independent Variables	Dependent Variable: Moving Outcome			
	(1)	(2)	(3)	(4)
Subjective Probability of Moving	**0.334****		**0.317****	
	(0.010)		(0.010)	
Subjective Mobility Probability 10%		0.005		0.004
		(0.006)		(0.006)
Subjective Mobility Probability 20%		0.017		0.013
		(0.011)		(0.010)
Subjective Mobility Probability 30%		0.013		0.006
		(0.011)		(0.010)
Subjective Mobility Probability 40%		**0.093****		**0.082****
		(0.023)		(0.023)
Subjective Mobility Probability 50%		**0.089****		**0.079****
		(0.007)		(0.007)
Subjective Mobility Probability 60%		**0.138****		**0.123****
		(0.032)		(0.031)
Subjective Mobility Probability 70%		**0.154****		**0.153****
		(0.035)		(0.035)
Subjective Mobility Probability 80%		**0.208****		**0.198****
		(0.018)		(0.018)
Subjective Mobility Probability 90%		**0.316****		**0.310****
		(0.035)		(0.035)
Subjective Mobility Probability 100%		**0.490****		**0.467****
		(0.017)		(0.017)
Age			**-0.032****	**-0.032****
			(0.007)	(0.006)
$Age^2/100$			**0.021****	**0.021****
			(0.004)	(0.004)
Female			-0.004	-0.003
			(0.004)	(0.004)
White			**0.029****	**0.032****
			(0.006)	(0.006)
Hispanic			-0.002	-0.002
			(0.009)	(0.009)
Married			-0.013	-0.012
			(0.009)	(0.009)
Widowed			-0.010	-0.011
			(0.009)	(0.009)
Less than High School Graduate			-0.007	**-0.010***
			(0.005)	(0.005)
More than High School Graduate			**0.009+**	**0.013****
			(0.005)	(0.005)
At Least 1–4 Health Conditions			-0.003	-0.002

Table 2.2 Continued

Independent Variables	Dependent Variable: Moving Outcome (1)	(2)	(3)	(4)
At Least 5–8 Health Conditions			**0.022+**	**0.023+**
			(0.013)	(0.013)
Owns Home/Residence			**-0.097****	**-0.095****
			(0.006)	(0.006)
Works for Pay Full-Time or Part-Time			**-0.029****	**-0.032****
			(0.007)	(0.007)
Partly Retired			-0.010	**-0.011+**
			(0.006)	(0.006)
Disabled or Unemployed			0.013	0.012
			(0.022)	(0.022)
Number of Children			**0.004****	**0.004****
			(0.001)	(0.001)
Number of Household Residents			0.002	0.000
			(0.003)	(0.003)
Earnings/10^6			**0.380***	**0.348***
			(0.163)	(0.160)
Total Household Income/10^6			-0.046	-0.043
			(0.030)	(0.030)
Net Value of Housing/10^6			**-0.011***	**-0.008+**
			(0.005)	(0.004)
Net Value of Financial Wealth/10^6			0.001	0.001
			(0.003)	(0.003)
Constant	**0.067****	**0.080****	**1.287****	**1.292****
	(0.004)	(0.004)	(0.246)	(0.243)
Observations	**29584**	**29584**	**29584**	**29584**
R-squared	0.08	0.10	0.10	0.12

1. The dependent variable – Moving Outcome – is a dummy variable equal to 1 if a residential move has occurred between survey waves.
2. Ordinary least squares estimates are reported. Robust standard errors in parentheses. + Significant at 10%; * Significant at 5%; ** Significant at 1%.
3. All estimations include dummy variables for survey waves.
4. Weighted regression results reported.
5. For the set of dummy variables Married and Widowed, the excluded category is Divorced, Separated, or Never Married.
6. The omitted education category is High School Graduation.
7. The omitted health condition category is No Doctor-Diagnosed Health Condition.
8. The excluded labor force status variable is Completely Retired (which also includes those identified as Out of Labor Force).

Table 2.3: Predictiveness of the Subjective Moving Probabilities By Individual Transition Wave

Independent Variables	Dependent Variable: Moving Outcome			
	1998-2000	2000-2002	2002-2004	2004-2006
Subjective Mobility Probability 10%	**0.031***	0.000	-0.011	0.004
	(0.014)	(0.014)	(0.012)	(0.011)
Subjective Mobility Probability 20%	0.027	0.011	0.013	0.002
	(0.021)	(0.022)	(0.022)	(0.019)
Subjective Mobility Probability 30%	-0.006	0.011	-0.003	0.017
	(0.016)	(0.023)	(0.021)	(0.020)
Subjective Mobility Probability 40%	**0.090+**	0.043	**0.101***	**0.092+**
	(0.050)	(0.042)	(0.045)	(0.048)
Subjective Mobility Probability 50%	**0.076****	**0.089****	**0.081****	**0.072****
	(0.013)	(0.016)	(0.015)	(0.014)
Subjective Mobility Probability 60%	**0.190***	**0.166****	0.025	**0.088+**
	(0.075)	(0.058)	(0.061)	(0.050)
Subjective Mobility Probability 70%	0.047	**0.239****	**0.201***	**0.120***
	(0.054)	(0.078)	(0.081)	(0.061)
Subjective Mobility Probability 80%	**0.210****	**0.226****	**0.154****	**0.198****
	(0.037)	(0.039)	(0.035)	(0.032)
Subjective Mobility Probability 90%	**0.304****	**0.290****	**0.294****	**0.330****
	(0.066)	(0.073)	(0.073)	(0.064)
Subjective Mobility Probability 100%	**0.433****	**0.426****	**0.455****	**0.540****
	(0.036)	(0.035)	(0.034)	(0.031)
Age	**-0.021+**	**-0.024+**	**-0.031***	**-0.045****
	(0.013)	(0.013)	(0.013)	(0.013)
$Age^2/100$	**0.015+**	**0.016+**	**0.020***	**0.031****
	(0.008)	(0.009)	(0.008)	(0.008)
Female	0.010	-0.009	-0.011	-0.000
	(0.008)	(0.009)	(0.009)	(0.008)
White	**0.029****	**0.044****	0.008	**0.049****
	(0.010)	(0.013)	(0.014)	(0.011)
Hispanic	0.013	0.014	**-0.037***	0.009
	(0.018)	(0.021)	(0.017)	(0.017)
Married	-0.001	0.018	-0.019	**-0.042***
	(0.016)	(0.019)	(0.018)	(0.017)
Widowed	-0.010	0.019	-0.009	**-0.038***
	(0.016)	(0.019)	(0.018)	(0.018)
Less than High School Graduate	**-0.019***	-0.012	-0.009	-0.001
	(0.009)	(0.011)	(0.011)	(0.010)
More than High School Graduate	0.005	**0.018+**	0.009	**0.023***
	(0.009)	(0.011)	(0.010)	(0.009)
At Least 1–4 Health Conditions	-0.001	-0.010	0.010	-0.007
	(0.009)	(0.013)	(0.012)	(0.013)

Table 2.3 Continued

Independent Variables	Dependent Variable: Moving Outcome			
	1998-2000	2000-2002	2002-2004	2004-2006
At Least 5–8 Health Conditions	-0.017	-0.001	0.030	**0.047***
	(0.022)	(0.030)	(0.024)	(0.023)
Owns Home/Residence	**-0.085****	**-0.138****	**-0.071****	**-0.089****
	(0.012)	(0.014)	(0.013)	(0.012)
Works for Pay Full-Time or Part-Time	-0.003	**-0.062****	**-0.038***	**-0.024+**
	(0.014)	(0.014)	(0.017)	(0.012)
Partly Retired	-0.001	**-0.033***	-0.017	0.008
	(0.012)	(0.013)	(0.013)	(0.012)
Disabled or Unemployed	0.019	0.060	-0.033	0.003
	(0.033)	(0.055)	(0.039)	(0.047)
Number of Children	**0.005****	0.003	**0.006****	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Number of Household Residents	-0.000	-0.001	-0.003	0.003
	(0.005)	(0.006)	(0.005)	(0.005)
Earnings/10^6	0.354	0.146	**0.516+**	0.108
	(0.323)	(0.309)	(0.290)	(0.210)
Total Household Income/10^6	-0.035	-0.099	0.051	-0.049
	(0.086)	(0.082)	(0.066)	(0.039)
Net Value of Housing/10^6	-0.010	-0.025	-0.034	-0.004
	(0.006)	(0.051)	(0.022)	(0.004)
Net Value of Financial Wealth/10^6	**-0.022****	0.025	-0.001	0.002
	(0.008)	(0.018)	(0.005)	(0.004)
Constant	**0.820+**	**1.064***	**1.322****	**1.763****
	(0.476)	(0.503)	(0.475)	(0.478)
Observations	**7494**	**6987**	**7292**	**7811**
R-squared	0.12	0.11	0.10	0.15

1. The dependent variable – Moving Outcome – is a dummy variable equal to 1 if a residential move has occurred between survey waves.
2. Ordinary least squares estimates are reported. Robust standard errors in parentheses. + Significant at 10%; * Significant at 5%; ** Significant at 1%.
3. Weighted regression results reported.
4. For the set of dummy variables Married and Widowed, the excluded category is Divorced, Separated, or Never Married.
5. The omitted education category is High School Graduation.
6. The omitted health condition category is No Doctor-Diagnosed Health Condition.
7. The excluded labor force status variable is Completely Retired (which also includes those identified as Out of Labor Force).

Table 2.4: Moving Propensity by Reported Subjective Moving Probability

Subjective Moving Probability	Moving Propensity
Exact Non-Focal and Focal Responses (n=29584)	12.12
Probability Response = 0 (n=19308)	8.13
Probability Response = 0.5 (n=3181)	17.08
Probability Response = 1 (n=1037)	57.16
Probability Response = Don't Know (490)	16.86
Probability Response = Refusal (n=23)	20.31

Note: Weighted tabulations are reported.

Table 2.5: Subjective Moving Probabilities, Moving Propensities, and Mean Squared Forecast Errors among Different Groups of Population

Groups of Population	Subjective Moving Probabilities	Moving Propensity	Mean Squared Errors	Weighted Mean Squared Errors†
Full Sample of Population	15.60	12.12	0.1321	--
Gender				
Men	15.27	11.77	0.1276	0.1301
Women	15.83	12.36	0.1352	0.1334
Education				
Less than HS Graduate	11.41	11.03	0.1201	0.1353
High School Graduate	15.06	11.77	0.1294	0.1304
More than HS Graduate	19.01	13.21	0.1429	0.1343
Age				
65 – 69	17.42	12.55	0.1371	0.1306
70 – 74	14.92	10.62	0.1200	0.1231
75 – 79	14.48	11.34	0.1233	0.1273
80 – 89	15.13	14.08	0.1480	0.1481
90 – 105	12.87	17.70	0.1827	0.1902
Race & Ethnicity				
White	15.79	12.31	0.1324	0.1320
Black and Other	13.82	10.31	0.1295	0.1334
Hispanic	11.70	11.98	0.1411	0.1555
Non-Hispanic	15.79	12.13	0.1317	0.1311
Marital Status				
Married or Partnered	14.96	10.82	0.1195	0.1228
Divorced/Widowed	16.38	14.02	0.1504	0.1467
Never Married	21.76	13.57	0.1551	0.1345
Ownership				
Homeowners	14.18	9.55	0.1142	0.1200
Non-Homeowners	21.02	21.93	0.2006	0.1871
Employment				
Working for Pay	16.81	10.30	0.1258	0.1198
Partly Retired	15.79	11.23	0.1226	0.1227
Completely Retired	15.43	12.39	0.1337	0.1342

Table 2.5 Continued

Groups of Population	Subjective Moving Probabilities	Moving Propensity	Mean Squared Errors	Weighted Mean Squared Errors†
Limitations in Activities				
No ADL	15.58	11.75	0.1276	0.1279
At Least One ADL	15.75	14.37	0.1596	0.1578
Self-Rated Health Status				
Excellent or Very Good	15.95	11.73	0.1276	0.1270
Good	15.61	11.73	0.1277	0.1279
Fair or Poor	15.04	13.21	0.1447	0.1458
Net Non-Housing Financial Wealth				
Lowest Quartile	14.05	13.29	0.1425	0.1455
Second Quartile	14.85	12.11	0.1286	0.1313
Third Quartile	15.53	11.53	0.1280	0.1285
Highest Quartile	17.74	11.69	0.1305	0.1253

1. † In the last column, the means of squared forecast errors are weighted by the overall population distribution of the subjective probability reports. See page 12 for details.
2. Weighted tabulations are reported.

Table 2.6.1: Exploring the Mean Squared Forecast Errors in Moving Expectations

WOMEN **Sub-Groups of Population**	Mean Subjective Moving Probability	Mean Conditional Moving Probability (p_{t-1}) ¶	Mean Squared Errors	Variance of ξ (σ_ξ^2)	Estimated β_1	Variance of p_{t-1} (σ_p^2)
(1) Ages 65–69 (n=5728)	17.27	12.45	0.1335	0.0289	0.3650	0.0166
(2) Ages 70–79 (n=7917)	15.35	11.01	0.1251	0.0303	0.3251	0.0146
(3) Ages 80–105 (n=3738)	14.95	15.29	0.1602	0.0352	0.2836	0.0139
(4) Ages 65–74 with More than HS Graduation (n=3453)	19.10	11.66	0.1343	0.0361	0.3377	0.0184
(5) Ages 65–74 with Less than HS Graduation (n=2626)	12.57	11.61	0.1313	0.0317	0.2943	0.0132
(6) Married Ages 65–69 with Less than HS Graduation or with HS Graduation (n=2224)	14.20	11.17	0.1161	0.0220	0.3883	0.0139
(7) Single Ages 65–69 with Less than HS Graduation or with HS Graduation (n=1532)	18.29	14.70	0.1477	0.0300	0.3894	0.0189
(8) Ages 65–74 in Excellent/Very Good Health (n=4261)	17.04	11.02	0.1254	0.0318	0.3500	0.0171
(9) Ages 65–74 in Fair/Poor Health (n=2576)	15.32	12.42	0.1388	0.0361	0.3149	0.0166
(10) Ages 75–99 with At Least One ADL (n=1478)	15.05	15.47	0.1654	0.0410	0.2848	0.0163
(11) Ages 75–99 without Any ADL (n=5755)	15.30	13.10	0.1393	0.0291	0.3227	0.0139
(12) Ages 70–79 with Homeownership (n=6348)	13.94	8.50	0.1184	0.0304	0.2863	0.0125
(13) Ages 70–79 without Homeownership (n=1569)	20.76	20.65	0.1897	0.0406	0.3646	0.0174
(14) White & Lowest Financial Wealth Quartile (n=3166)	14.45	14.75	0.1482	0.0278	0.3495	0.0149
(15) White & Highest Financial Wealth Quartile (n=3789)	18.55	11.90	0.1365	0.0355	0.3232	0.0170

Table 2.6.1 Continued

WOMEN **Sub-Groups of Population**	Mean Subjective Moving Probability	Mean Conditional Moving Probability $(p_{t-1})^{\P}$	Mean Squared Errors	Variance of ξ (σ_ξ^2)	Estimated β_1	Variance of p_{t-1} (σ_p^2)
(16) Married Ages 65–69 Working (n=438)	15.75	7.81	0.1072	0.0380	0.3109	0.0171
(17) Single Ages 65–69 Working (n=388)	17.59	11.11	0.1192	0.0325	0.4083	0.0224
(18) Married Ages 65–69 Completely Retired (n=2646)	16.24	11.55	0.1259	0.0274	0.3558	0.0152
(19) Single Ages 65–69 Completely Retired (n=1433)	18.72	15.95	0.1597	0.0329	0.3673	0.0191
(20) Hispanic (n=1155)	11.75	10.45	0.1310	0.0421	0.2035	0.0108
(21) Non-Hispanic (n=16228)	16.03	12.45	0.1354	0.0300	0.3337	0.0150

1. ¶ By construction, the Mean Conditional Moving Probability for a group is the same as the average of the Moving Propensity for that particular sub-group.
2. Single includes never married, divorced, separated and widowed.

Table 2.6.2: Exploring the Mean Squared Forecast Errors in Moving Expectations

MEN **Sub-Groups of Population**	Mean Subjective Moving Probability	Mean Conditional Moving Probability (p_{t-1}) ¶	Mean Squared Errors	Variance of ξ (σ_ξ^2)	Estimated β_1	Variance of p_{t-1} (σ_p^2)
(1) Ages 65–69 (n=4186)	17.64	12.68	0.1420	0.0358	0.3267	0.0174
(2) Ages 70–79 (n=5860)	13.83	10.85	0.1161	0.0230	0.3592	0.0129
(3) Ages 80–105 (n=2155)	14.98	12.68	0.1337	0.0272	0.3295	0.0134
(4) Ages 65–74 with More than HS Graduation (n=3246)	19.49	13.52	0.1421	0.0303	0.3691	0.0176
(5) Ages 65–74 with Less than HS Graduation (n=1969)	11.89	10.07	0.1115	0.0264	0.3458	0.0139
(6) Married Ages 65–69 with Less than HS Graduation or with HS Graduation (n=1986)	13.08	10.92	0.1247	0.0320	0.3030	0.0139
(7) Single Ages 65–69 with Less than HS Graduation or with HS Graduation (n=375)	20.92	16.00	0.1833	0.0627	0.2817	0.0246
(8) Ages 65–74 in Excellent/Very Good Health (n=3269)	16.85	12.48	0.1330	0.0289	0.3633	0.0165
(9) Ages 65–74 in Fair/Poor Health (n=1782)	14.81	12.34	0.1403	0.0396	0.2857	0.0159
(10) Ages 75–99 with At Least One ADL (n=731)	14.84	14.12	0.1591	0.0474	0.2181	0.0132
(11) Ages 75–99 without Any ADL (n=3936)	13.69	11.01	0.1165	0.0214	0.3584	0.0120
(12) Ages 70–79 with Homeownership (n=4942)	12.17	8.63	0.0999	0.0223	0.3236	0.0107
(13) Ages 70–79 without Homeownership (n=918)	22.10	21.87	0.1970	0.0344	0.3740	0.0206
(14) White & Lowest Financial Wealth Quartile (n=1738)	14.53	13.20	0.1397	0.0316	0.3372	0.0161
(15) White & Highest Financial Wealth Quartile (n=3439)	16.79	11.49	0.1236	0.0246	0.3708	0.0145

Table 2.6.2 Continued

MEN **Sub-Groups of Population**	Mean Subjective Moving Probability	Mean Conditional Moving Probability $(p_{t-1})^{\P}$	Mean Squared Errors	Variance of ξ (σ_ξ^2)	Estimated β_1	Variance of p_{t-1} (σ_p^2)
(16) Married Ages 65–69 Working (n=729)	20.43	9.52	0.1360	0.0574	0.2948	0.0240
(17) Single Ages 65–69 Working (n=120)	28.62	15.36	0.2042	0.1143	0.2604	0.0403
(18) Married Ages 65–69 Completely Retired (n=2130)	14.85	13.00	0.1259	0.0176	0.4107	0.0123
(19) Single Ages 65–69 Completely Retired (n=385)	24.92	16.44	0.2116	0.0880	0.2143	0.0240
(20) Hispanic (n=737)	11.62	14.45	0.1575	0.0490	0.2454	0.0159
(21) Non-Hispanic (n=11464)	15.43	11.65	0.1263	0.0267	0.3474	0.0142

3. ¶ By construction, the Mean Conditional Moving Probability for a group is the same as the average of the Moving Propensity for that particular sub-group.
4. Single includes never married, divorced, separated and widowed.

Table 2.7: Testing for Equality of Coefficients on Variables Explaining Subjective Probabilities of Moving and Moving Outcome

	Moving Outcome	Subjective Probability of Moving	p-value for Chi-Squared Test Statistic for Equality of Coefficients
Testing for Equality of Coefficients on All Explanatory Variables			
	--	--	0.0000
Testing for Equality of Coefficients for Each Explanatory Variable			
Age	-0.036**	-0.013**	0.0004
	(0.006)	(0.005)	
$Age^2/100$	0.021**	0.017*	0.3047
	(0.004)	(0.003)	
Female	-0.002	0.004	0.1549
	(0.004)	(0.003)	
White	0.034**	0.015**	0.0096
	(0.007)	(0.006)	
Hispanic	-0.008	-0.021**	0.2135
	(0.009)	(0.008)	
Married	-0.023**	-0.034**	0.2057
	(0.007)	(0.006)	
Widowed	-0.020*	-0.031**	0.1717
	(0.007)	(0.006)	
Less than High School Graduate	-0.021**	-0.036**	0.3358
	(0.005)	(0.004)	
More than High School Graduate	0.021**	0.040**	0.0002
	(0.004)	(0.004)	
Homeowner	-0.122**	-0.079**	0.0000
	(0.005)	(0.004)	
At Least 1–4 Health Conditions	-0.001	0.010*	0.1268
	(0.006)	(0.005)	
At Least 5–8 Health Conditions	0.026*	0.013	0.2882
	(0.011)	(0.009)	
Number of Children	0.004**	-0.001	0.0000
	(0.001)	(0.001)	
Number of Household Residents	-0.002	-0.006**	0.1802
	(0.002)	(0.002)	
$Earnings/10^6$	0.389**	0.027	0.0116
	(0.128)	(0.107)	
$Total\ Household\ Income/10^6$	-0.009	0.116**	0.0017
	(0.036)	(0.030)	
$Net\ Value\ of\ Housing/10^6$	-0.009	0.004	0.2638
	(0.007)	(0.006)	

Table 2.7 Continued

	Moving Outcome	Subjective Probability of Moving	*p*-value for Chi-Squared Test Statistic for Equality of Coefficients
Net Value of Financial Wealth/10^6	0.002	0.006*	0.2511
	(0.003)	(0.002)	
Work for Pay	-0.031**	-0.006	0.0017
	(0.007)	(0.006)	
Partly Retired	-0.012*	-0.009	0.5855
	(0.006)	(0.005)	
Disabled or Unemployed	0.011	-0.005	0.4599
	(0.019)	(0.016)	

1. The estimated coefficients from OLS regressions on the pooled sample are reported in the first two columns for the two dependent variables – Moving Outcome and Subjective Probability of Moving.
2. Standard errors are in parentheses.

Appendix

Table A.2.1: Sample Selection Criteria

	Number of Observations	
Total Number of Core Interview Obtained[1]	97729	
If Cohort and Age Eligible[2, 3]	84421	86.38%
If At Least Two Successive Interviews Obtained[4]	61688	63.12%
If At Least Age 65 in the First of Two Successive Interviews	35720	36.55%
If Subjective Probability of Moving Non-Missing	31541	32.27%
If Moving Outcome in the Subsequent Interview Non-missing	31541	32.27%
If Non-missing Respondent and Household Characteristics		
If Race/Ethnicity Non-missing	31522	32.26%
If Home-Ownership Non-missing	31339	32.07%
If Number of Resident Children Non-missing	**29584**	30.27%

1. 21384, 19580, 18167, 20129, and 18469 observations, respectively, from the 1998, 2000, 2002, 2004, and 2006 HRS Surveys.
2. Observations belong to the four cohorts in the Health and Retirement Study: AHEAD (1890-1923), CODA (1924-1930), HRS (1931-1941), and War Babies (1942-1947). Note that in 2004 another cohort – the Early Baby Boomer (EBB) cohort (1948-1953) – was introduced in the *Study*, respondents from which are not part of our analyses.
3. 20002, 18139, 16685, 15237, and 14358 observations, respectively, from the 1998, 2000, 2002, 2004, and 2006 HRS Surveys.
4. 26260 of these observations – 42.57% – are male.

Table A.2.2: Summary Statistics of Variables

Variables	Mean (Standard Deviation)
Moving Propensity	12.12
Subjective Probability	15.60 (0.27)
Age	73.87 (6.42)
Female	0.59
White	0.90
Hispanic	0.05
Married or Partnered	0.60
Widowed	0.31
Separated or Divorced or Never Married	0.09
Less than High School Graduation	0.26
High School Graduation	0.36
More than High School Graduation	0.38
Home-Ownership	0.79
1-4 Medically Diagnosed Conditions	0.84
5-8 Medically Diagnosed Conditions	0.04
No ADL	0.86
At Least One ADL	0.14
Number of Children	3.36 (2.11)
Household Size	1.95 (0.92)
Labor Market Earnings (in 2000 dollars)	3,405.63 (16911.7)
Total Household Income (in 2000 dollars)	42,450.70 (61943.3)
Net Value of Housing (in 2000 dollars)	115,851 (279968)
Net Value of Financial Wealth (in 2000 dollars)	140,256 (661678)
Works for Pay Full-Time or Part-Time	0.09
Partly Retired	0.11
Disabled or Unemployed	0.01
Completely Retired	0.79
Number of Observations	29584

Note: Weighted means are reported.

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Chapter 3

Do the Elderly Spend Down their Housing Wealth?

1 Introduction

Many papers have examined the role housing wealth plays in the life-cycle consumption and saving decisions of individuals. The cornerstone of the life-cycle theory that guides most of the economic research on the adequacy of retirement savings is the idea of consumption smoothing. In its basic formulation, the life-cycle model posits that saving behavior is forward-looking and is driven by the desire to maintain consumption during low-income periods. Thus, an important implication of the life-cycle model is that individuals will spend down their savings during retirement (Modigliani and Brumberg, 1954; Modigliani, 1986). Refinement of the standard model, allowing for uncertainty, precautionary saving and accidental bequests, may affect the age after which one should start observing wealth decumulation. It does not, however, change the basic implication that individual wealth should eventually tend to fall with age.

The relative size of housing equity in the asset portfolios of older American households suggests its potential importance for post-retirement consumption. According to the 2001 Survey of Consumer Finances[1], over 80 percent of all households with heads aged 65 and older owned a home, and these homes were valued at nearly $3.17 trillion. Including the $781 billion of other residential real estate (largely second homes), the total value of residential

[1]Source: Apgar and Di (2006). Evidence on the assets of the elderly is also reported in Diamond and Hausman (1984); Hurd and Wise (1989); Kennickell and Shack-Marquez (1992); Poterba and Samwick (2001); and Sinai and Souleles (2007).

real estate owned by the older households increased to $3.95 trillion. Consequently, in 2001 residential real estate accounted for some 30 percent of the nearly $13.2 trillion in aggregate asset holding of seniors.[2] Given such significance of housing wealth in the asset portfolio of the elderly, this paper examines the long contested issue of whether the elderly draw down their housing wealth during retirement.

The evidence in the literature on downsizing of housing wealth in later life is fairly mixed. Sheiner and Weil (1992), Skinner (1996), and Heiss, Hurd, and Börch-Supan (2005) suggest that individuals at sufficiently older ages tend to tap into housing wealth. Sheiner and Weil (1992), using data from the Panel Study of Income Dynamics (PSID), estimate that among households entering very old ages owning a home, just 41% still own when the surviving spouse dies. Skinner (1996) also uses the PSID data and shows that if the elderly downsize, 69 cents of each dollar of housing equity is spent. This evidence is taken to interpret that the elderly consume housing wealth. More recently, Heiss et al. (2005) have used data on the AHEAD cohort from the Health and Retirement Study (HRS) to explore if the elderly downsize housing by focusing on homeownership rates. They find that ownership is reduced with age. Other studies (Merrill; 1984, Feinstein and McFadden; 1989, and Venti and Wise; 1989, 1990, 2004), contrary to the ones noted above, suggest that homeowners typically do not use their housing wealth to support non-housing consumption in later life. Feinstein and McFadden (1989) look into the probability of residential mobility among the elderly relying on data from the PSID. Several of the other papers focus on changes in home equity exploiting different data sources; for instance, Merrill (1984) and Venti and Wise (1989; 1990) use data from the Retirement History Survey (RHS), and Venti and Wise (2004) use the first four waves of the HRS as well as data from eight panels of the Survey of Income and Program Participation (SIPP). All of these papers reach the general conclusion that, unless there is a change in family composition, there is little evidence that families reduce their housing wealth with age.

[2]In contrast, only 21.1 percent of all households with heads aged 65 and older owned publicly traded stocks. Expanding the concept of stock ownership to combine the direct ownership of publicly traded stocks plus stocks owned indirectly through mutual funds, retirement accounts and other managed assets, the share of seniors owning stocks increased to just 36.8 percent. Under this expanded definition, seniors owned nearly $3.4 trillion in stocks, an amount that represented 25.8 percent of their aggregate asset holdings (Source: Aizcorbe, Kennickell, and Moore; 2003. Tabulations done by the Joint Center for Political and Economic Studies based on 2001 Survey of Consumer Finances).

In this paper, we investigate changes in housing wealth with data from the 1998 and 2004 surveys of the Health and Retirement Study (HRS). The HRS is a national longitudinal biennial survey offering a rich source of information on the lives of older Americans, their health and economic status. We use data on individuals from the 1998 survey and follow them into the 2004 survey. Venti and Wise (2004) also use data from the HRS (1992–1998) for the HRS and AHEAD cohorts. The population representation in the 1998 HRS survey allows us to take advantage of a larger sample encompassing a broader age range.

In its simplest version, the life-cycle theory posits the systematic accumulation of assets during the working life and gradual decumulation during retirement. Therefore, our focus is on the already-retired individuals to determine if retirees spend down their home equity. Previous studies have examined individuals of a particular age range irrespective of their labor force status. Our sample design is more consistent with exploring possible wealth draw down in later life. In examining whether housing wealth declines during retirement, we emphasize exploring heterogeneity across population groups in housing wealth adjustments.

In the past, short of selling their homes there was virtually no other alternative for the elderly to extract housing wealth. In recent years, markets for home equity lines of credit and reverse mortgages have developed for tapping into home equity. Although these markets still remain small, they are gradually expanding. Thus, these financial instruments potentially offer increasing opportunities for the elderly to extract home equity. In view of this, we briefly examine, to the extent allowed by the HRS data, the evidence on housing equity adjustments through a type of such instruments.

Our analysis demonstrates that for non-mover retirees there is no systematic decline in housing equity. But for retiree-movers there is a decline in the median housing equity starting at age 71, and a decline in the mean housing equity from age 76. The mean change in housing equity is \$9,866.2 (−\$1,769.5, adjusting for two outliers) and the median change is −\$8,112.3 for all retiree-movers. The decline in housing equity stems from homeowners who give up ownership altogether. Typically, housing equity increases for retiree-movers who buy new houses. We find evidence of significant heterogeneity in housing equity adjustments at retirement. Nearly a quarter of the retiree-movers report that they are moving to downsize, and they do. Those with low non-housing wealth and with low income reduce housing equity

significantly more than their respective counterparts. Retiree-movers experiencing widowing or divorce reduce housing equity substantially more than those without similar experience.

It is important to put the findings in this study in the context of the results reported in the literature. Our results are similar to the findings in some of the papers in both strands of the literature that conclude in support of and against evidence for housing wealth draw down in later life. To a large extent, the different conclusions in the two sets of papers are the product of differences in interpretation.

Using data from the Health and Retirement Study, Venti and Wise (2004), for instance, find evidence of a decline in movers' housing equity in both one-person and two-person households. Their reported median decline in housing equity is very similar in magnitude to that of ours. As in their analysis, we also find that the median housing equity declines beginning at age 75. Venti and Wise (2004) also note that the large reductions in equity are typically observed only for homeowners who move and discontinue homeownership. Nonetheless, they conclude that housing wealth is not spent down because most of the older households continue to own housing, and overall housing equity appears to increase in every two-year interval.[3] Feinstein and McFadden's (1989) conclusion that the elderly households do not reduce housing equity is largely grounded on the finding that wealthier households are less likely to move and to downsize. This also is consistent with our findings. On the other side of the literature, when Skinner (1996) concludes that there is evidence of downsizing he is basing that conclusion on a mere 8.3% of his sample that moved and reduced their housing equity. Sheiner and Weil (1992) and Heiss, Hurd and Börch-Supan (2005) find evidence of average levels of home-ownership declining significantly with age. Heiss et al. note that for older two-person households home-ownership begins to fall from age 71, which is in line with the finding in our study. To a large extent indeed, our results are consistent with the existing evidence in both sides of the literature, and the different emphases of these papers mostly

[3]Venti and Wise (2004) additionally look into overall changes in housing equity in the SIPP data and find no evidence of downsizing, which is consistent with what we find. Venti and Wise (1989) report a decline in median housing equity for movers during the 1973–1975 interval by $6,044.3 (in 2004 dollars). But they also find that housing equity increased for movers during three of the five intervals they look into, and that in four of the five intervals more than half of the movers increased housing equity post-move. Thus, they conclude that those who move, on average, do not withdraw wealth from housing equity. Merrill (1984) retains initial non-homeowners in the sample of movers and she has a relatively younger sample, both of which may explain why she fails to find any indication of a decline in housing equity for movers.

are reflective of differences in interpretation of what is in the data.

The outline of the chapter is as follows. The next section describes the data used in this study. Section 3 narrates the extent to which the retirees reduce their housing equity as they age. Section 4 examines whether the elderly spend down non-housing wealth as they age, and how this compares to individuals' extraction of housing equity. Subsequently in this section, we investigate whether certain individuals for whom we might expect to see housing draw down tap into home equity more. Section 5 concludes.

2 The Data

We use data on individuals from the four cohorts in the Health and Retirement Study (HRS): AHEAD (born between 1890−1923), CODA (born between 1924-1930), HRS (born between 1931−1941), and War Babies (born between 1942-1947). The population of inference is adults born prior to 1948. We explore the change in housing wealth of individuals, and not that of the household as a unit. Since our objective is to investigate housing wealth draw down during retirement, we restrict our sample to homeowners in 1998. Table A.3.1 in the Appendix describes the sample construction steps. We follow the cohort and age-eligible respondents from the 1998 survey to the 2004 survey, and retain a sample of 11,957 observations on retirees and non-retirees. The HRS over-sampled blacks, Hispanics, and Floridians. For this, we use respondent-level sampling weights in our analysis. Table A.3.2 describes some key features about the sample in 1998 and 2004 and presents the descriptive statistics for the variables used in this paper. As expected, individuals are less likely to be married or partnered (primarily due to widowhood) and more likely to be retired at the end of the six-year interval. Household income appears to decline from 1998 to 2004, whereas, there is no sign at the outset that overall housing wealth tends to decrease over time.[4] Out-of-pocket medical expenses increase from 1998 to 2004, and so does the fraction of individuals with long-term care insurance.

Our intent is understanding the housing wealth adjustments primarily of retirees. For analytical purposes, the sample of retirees we consider consists of the respondents in one-

[4]We convert all dollar amounts to 2004-dollars using the CPI-U deflator.

person households that are identified as partly or completely retired in both 1998 and 2004, and the respondents in two-person households where both spouses are partly or completely retired in both 1998 and 2004. This way, we have a sample size of 5,503 retirees.[5]

Of the total sample of initial homeowners (n=11,957), we observe 2,782 residential moves representing a 23.27% moving rate over the six-year period[6]. For the sample of retirees (n=5,503), there are 1,290 instances of a residential move representing a 23.44% moving rate.

3 Do the Elderly Reduce their Housing Wealth as they Age?

We begin our analysis with Figure 3.1, which presents the mean and median changes in housing equity between 1998 and 2004 for (initial) 1998-homeowners. According to the life-cycle model, saving should be positive for individuals in their working years and negative when retired. Thus, we might expect wealth decumulation for the retirees, but not necessarily for the non-retirees. As such, we look into the changes in housing equity for the retirees and the non-retirees separately. The figure reveals that overall housing wealth is not spent down over the six-year period, not even for the retirees. However, the increase in housing equity is smaller for the retirees than for the non-retirees.

As noted in the introduction, there are two ways to extract housing equity: moving and using a financial instrument. In what follows we first examine housing draw down via residential moving, as it has been the focus of the literature and is empirically more relevant.

3.1 Changes in Housing Wealth through Residential Moving

The HRS asks movers about the reasons behind their residential moving. Respondents can report up to six reasons, though typically none reports more than two. Retiree-movers most

[5]Using the classification of complete retirement instead of both partial and complete retirement generates a sample of 4,147 observations. Results do not appear to be sensitive to the choice of the definition of retiree.

[6]The rate of moving reflects whether there has been any residential move for an individual. In other words, the moving rate does not capture multiple residential moves by an individual over this period.

prominently cite a reason that sounds something akin to downsizing: the intent of moving to less expensive or smaller homes. Consistent with the implication of the life-cycle model, this reason is much less important for the non-retirees in residential moving. For this group, employment related matters are more crucial in moving decisions. The reported reasons for moving, therefore, provide evidence that people move to downsize. They also indicate significant heterogeneity across individuals in moving behavior.

The housing market experienced an overall surge during much of the period between 1998 and 2004, particularly from year-2000 (Sinai and Souleles, 2007). For this, we examine the change in housing equity for non-movers along with that for the movers between 1998 to 2004. The group of non-movers provides us with a comparison group to contrast the movers' housing adjustments with. After all, housing equity can be impacted for all homeowners — movers and non-movers — by housing price changes, mortgage repayments, reverse mortgages, home equity line of credits, as well as cutting back on maintenance.

We plot the change in housing equity for retirees between 1998 and 2004 by age (age in 2004) in Figure 3.2. Panel *A* depicts the mean change in housing equity and Panel *B* displays the median change. Housing equity for retiree-movers declines from people's mid-seventies if we consider the mean change and from their early-seventies if we consider the median change. Comparison of the changes in equity by age for all movers and movers who remain homeowners reveals that the decrease in housing equity among retiree-movers stems from initial homeowners that give up ownership altogether.[7] Housing equity increases even among the oldest retirees in our sample that continue owning homes, regardless of whether they have made a residential move or not.

Among movers there are some individuals who perhaps move because they feel forced to do so. For instance, certain individuals, particularly among those who do not have a spouse or a partner, may feel compelled to move into a nursing home or a retirement facility for requiring assistance with certain aspects in their daily living. It is useful to know if changes in housing equity might be different for those who feel forced to move compared to those who do not feel forced in the same way. Unfortunately, in our sample of retiree-movers between

[7]Since Figure 3.2 suggests that homeownership tends to decline with age, we present the tabulations for ownership rates by age in Appendix Figure A.3.2. As expected, the rate of owning gradually decreases with age, a finding that Sheiner and Weil (1992) and Heiss et al. (2005) report as the evidence for downsizing in later life.

years 1998–2004, there are very few cases where at least one of the spouses in a two-person household or the individual in a one-person household enters a nursing home. All these nursing home entrant observations are for ages 76 and older. On average, these respondents reduce their housing equity substantially more than the non-institutionalized retirees in the corresponding age groups. But the number of observations experiencing nursing home entry in each of these age groups is too small for us to infer much from it. Separating out these observations from the sample of retiree-movers does not alter the pattern of declining housing equity for the relatively older movers.

3.2 Changes in Housing Wealth through Equity Extraction

In recent years, homeowners can tap into housing equity without having to sell their homes by taking advantage of financial instruments like home equity lines or credit (HELOC) or reverse mortgages. However, these markets still remain small, and during the sample period investigated in this paper (1998–2004), the use of these financial innovations were even narrower than in the last two-three years. The Health and Retirement Study (HRS) does not collect data on reverse mortgage use. But some information is available on the use of HELOC by homeowners. An increasing rate of HELOC access with age would be in line with the implication of the life-cycle model. Figure 3.3 shows the rate of HELOC access for retiree homeowners (that own in both 1998 and 2004) by age group. The access rate is relatively low in the sample and is gradually decreasing in age. In other words, the older homeowners — particularly the oldest ones in our sample — do not appear to make much use of this specific financial instrument.[8] Moreover, in Figure 3.4 we see that those accessing HELOC, on average, have slightly higher housing equity in 1998 and experience a larger increase in housing equity between 1998 and 2004 than those not accessing HELOC.[9] Thus, we do not find evidence that the elderly extract housing equity by making use of home equity lines of credit.

[8]The overall rate of home equity line of credit access among all retiree homeowners is 12.13%.

[9]The results are identical if we examine the median initial housing equity and the median change in housing equity instead of their respective means.

4 Why is there Relatively Little Reduction in Housing Wealth?

In Section 3, we find little evidence of housing equity being drawn down overall. In this section, we examine why this appears to be the case. Do other types of wealth show any decumulation? Do certain individuals for whom we might expect to see declining wealth spend down housing equity? These questions are important in understanding whether the elderly regard housing wealth as a potential means of financing consumption during retirement.

4.1 Do the Retirees Reduce their Non-Housing Wealth as they Age?

It is possible that the retirees view housing wealth differently from the rest of their asset holdings. After all, housing has a consumption value unlike any other types of wealth. If retirees spend down housing and non-housing wealth differently, then it might be indicative that the elderly generally do not want to withdraw wealth from housing equity for consumption smoothing at retirement.

We look into changes in non-housing wealth between 1998 and 2004 for retirees by focusing on net non-housing assets, which is the sum of the net value of secondary real estate (excluding primary residence), the net value of vehicles and businesses, IRA, Keogh accounts, stocks, mutual funds, and investment trusts, the value of checking, savings, or money market accounts, CD, government bonds, and T-bills, the net value of bonds and bond funds, and the net value of all other savings, less the value of other debts. The values of primary residence, mortgages, and other home loans are not included. In the two panels of Figure 3.5, we present the mean (Panel A) and the median (Panel B) changes in net non-housing assets by age group. On average, non-housing wealth starts to decline from age 65. The median non-housing wealth falls throughout all ages. Housing wealth, therefore, appears different from non-housing wealth in that the retirees seem more likely to spend down non-housing than housing wealth.

4.2 The Heterogeneity in Housing Equity Reduction

Even with little evidence of downsizing on average, we expect that certain individuals might have a greater need to extract housing wealth than others. In this section, we examine several potential sources of heterogeneity in housing equity adjustments during retirement.

4.2.1 Changes in Housing Equity by Reported Reasons for Moving

We have seen in Table 3.1 that the intent to move to a smaller or less expensive home — *downsizing* — is the leading reason for retirees in their moving decision. For these *downsizing*-movers, housing equity changes by an average of −$23,950.7; the median equity also changes by a similar magnitude of −$23,259.5.[10] For the retirees moving for any other reason but downsizing, the mean and median changes in housing equity are $9,089.4 and −$19,701.2. In fact, there are two extreme outlier values in the change in housing equity among this group of retiree-movers (we mention these two observations in the context of Figure 3.2). Setting these two outlier values equal to the next highest value of change in housing equity in the data, we find the mean housing equity for these retiree-movers declining by −$13,319.0.[11] In spite of the adjustments in the outliers, it appears that the retiree-movers who say they are moving to downsize reduce housing equity substantially more than the retiree-movers for whom the intent of downsizing is not important. To examine how the change in housing equity differs by reported reason for moving and by age, we plot in Figure 3.6 the mean and median changes in housing equity for *downsizing*-movers and *non-downsizing*-movers. The retiree-movers who move to downsize spend down housing equity nearly at all ages.[12] The mean and median housing equity for the retiree-movers who move for other reasons also begin to decline at relatively older ages. Interestingly, once

[10]Of the retiree-movers (n=1,290), we have data on reasons for moving from 845 observations (mentioned earlier in relation to Table 3.1). The mean and median changes in housing equity for whom we do not have data on reasons for moving are $25,834.4 and $6,953.4, respectively.

[11]For all retiree-movers (those that give up home-ownership and those that buy new houses), the mean change in housing equity is $9,866.2 (−$1,769.5, adjusting for the two outliers) and the median change in housing equity is −$8,112.3. (Note that in Figure 3.1 we consider the mean and median changes in housing equity for both movers and non-movers.) Retiree-movers for whom we have non-missing data on reasons for moving, the mean and median changes in housing equity are $956.5 (−$15,936.0, adjusting for the two outliers) and −$20,860.1, respectively.

[12]Except that the mean and median housing equity increase very slightly for these movers at ages 76-80 and ages 66-70, respectively.

these movers begin extracting housing wealth their equity reductions are more sizable than the equity reductions observed for the *downsizing*-movers. But then the ages when housing equity declines for *non-downsizing*-movers are the same ages when housing wealth declines overall for the retiree-movers (Figure 3.2). All in all, retiree-movers moving for downsizing certainly reduce housing equity more and sooner if life than their counterparts who move for other reasons.

4.2.2 Do People with Low Wealth Reduce Housing Equity More?

It might be that due to the consumption value of housing, housing wealth is spent down last. Thus, we might observe declining housing equity for those with low wealth — especially, non-housing wealth — but not necessarily for those who have relatively abundant wealth. To assess this point, we plot the changes in housing equity for retiree-movers by non-housing wealth quartiles and by age in Figure 3.7 — Panel *A* (for mean changes) and Panel *B* (for median changes). Indeed, retiree-movers in the highest non-housing wealth quartile tend to extract housing equity only at the oldest ages. Retiree-movers who are in the lowest quartile and in the second and third quartiles of non-housing wealth reduce their housing equity much sooner in life.[13]

4.2.3 Adverse Events, Alternative Insurance Availability, and Housing Equity Reduction

Life events, such as, widowhood, divorce, nursing home entry, and prolonged or expensive medical treatments involving substantial out-of-pocket expenses, can influence housing draw down in retirement. Change in household structure leading to a smaller family size at the very least can make the existing housing appear too large. Illness or declining health may signal reduced life expectancy and accelerate decumulation of wealth.[14] Homeowners can self-

[13]Also, people with less household income (mostly, non-labor income, except for where the individuals are partly retired) may find it necessary to draw down housing equity. The relationship between household income and changes in housing equity by age is examined in Appendix Figure A.3.3. Results appear to closely mirror those reported with respect to non-housing assets.

[14]Certain health conditions might require individuals to migrate to regions with suitable climate or better availability of health care amenities. House moves from such considerations might result in increasing housing wealth.

insure against adverse health events in old age by saving in the house. In that case, having alternative forms of insurance, such as, children, or simply a long-term care insurance, may reduce the need to spend down housing wealth. Having children can potentially provide the elderly with alternative sources of monetary and non-monetary support. Parents with children may also be more willing to preserve housing equity out of bequest intentions. Either way, retirees without children may spend down housing equity more than their counterparts with children.

To examine these many sources of heterogeneity in housing equity adjustments of retirees, we estimate a descriptive-type regression equation with the *change in housing equity between 1998 and 2004* as the dependent variable. We estimate the equation for the retirees who are initially homeowners (who may or may not be homeowners in 2004), and also for retirees who are homeowners in both 1998 and 2004. We present the OLS estimates as well as the median regression estimates. The median regression estimates are likely to be less affected by the presence of outliers in the data. As regressors in the specification, we include a dummy variable, *Moved*, indicating whether the retiree has made any residential move between 1998 and 2004. The coefficient on this variable should indicate by how much more retiree-movers change their housing equity relative to non-movers over this period. Of course, if moving takes place to tap into housing equity, the estimated coefficient should be negative. In order to capture the importance of age in housing equity reductions, we include in the regression dummy variables for age, with the age group of 56−60 as the omitted category. We add a dummy variable for *female* to control for possible gender differences in housing wealth adjustments in retirement. Two dummy variables for education are included to examine if housing equity adjustments vary in education. We also add dummy variables representing household income and non-housing wealth quartiles.

We include in the regression specification a dummy variable indicating spousal death or divorce and a dummy variable indicating if the retiree (respondent or the spouse) has been in relatively poor health condition from the beginning of the six-year period.[15] Moreover, we add an interaction term between whether the individual has moved and whether the individual has experienced spousal death/divorce. Similarly, we include an interac-

[15]We consider a composite health measure incorporating doctor-diagnosed serious medical conditions and limitations in activities of daily living (ADLs).

tion term *Moved*Health Condition/ADL*. The sum of the estimated coefficients on *Spousal Death/Divorce* and *Moved*Spousal Death/Divorce* gives the change in housing equity of movers who experience divorce or widowing in relation to movers without similar change in household structure. The sum of the coefficients on *Moved*, *Spousal Death/Divorce*, and the interaction term *Moved*Spousal Death/Divorce* tells us the change in housing equity of movers who experience widowing or divorce in relation to non-movers without such experience. Similarly, with respect to health conditions, the sum of the coefficients on *Health Condition/ADL* and *Moved*Health Condition/ADL* gives the change in housing equity of movers who have had poor health in relation to movers without similar health conditions. And, the sum of the estimated coefficients on *Moved*, *Health Condition/ADL*, and *Moved*Health Condition/ADL* gives the change in housing equity of movers in poorer self/family health in relation to non-movers without any major illness in the family.

With respect to housing equity adjustments between movers and non-movers, the regression results in Table 3.2 tell us the similar story as in Figure 3.2. Movers appear to reduce housing equity significantly more than the non-movers. Besides, comparison of the coefficient estimates on *Moved* in the first two and the last two columns of Table 3.2 reveals that the significantly greater housing equity reduction of the retiree-movers is due to those who discontinue homeownership altogether. Continuing homeowners do not seem to reduce their housing equity post-move. In relation to the youngest age group of retirees in our sample, individuals ages 71 and older reduce housing equity significantly more. Retirees with more than high school graduate education increase housing equity substantially more than retirees with high school graduation. Those with relatively low household income and other wealth reduce housing equity substantially more compared to those who have the largest amounts of household income and other wealth, respectively.

Retiree-movers experiencing spousal death or divorce reduce housing equity significantly more than movers not experiencing similar change in family composition. Moreover, compared to non-movers without any change in household structure, retiree-movers experiencing widowing or divorce reduce housing equity substantially and significantly more. These results hold whether we take into account the initial homeowners or continuing homeowners.

The median housing equity declines more for retirees in poorer health than for retirees

in good health. The median reduction in equity of movers in poorer health is more sizable than the median reduction for movers without reported severe illnesses. On average, however, movers in poorer health do not reduce housing equity any more than movers without reported severe illnesses. Finally, movers in poor health reduce housing equity significantly more than non-movers in good health. None of these health effects on changing housing equity, however, are significant in the regressions for continuing homeowners.[16]

We also estimate the same regressions including dummy variables for whether the retiree has any children, any long-term care insurance, and a life insurance. Having long-term care insurance is negatively correlated with changes in housing equity. It might be that the retirees who perceive the need to have a long-term care insurance also need to extract housing equity more to deal with adverse health conditions. We do not find any statistically significant influence on housing equity adjustments with respect to having children, or a life insurance.

5 Summary and Concluding Remarks

In this paper we examine whether retirees extract housing equity as part of a gradual decumulation of assets accumulated in preparation for retirement. For the period investigated, non-movers do not appear to systematically reduce housing equity by taking advantage of home equity lines of credit or reverse mortgages. But the median housing equity for movers declines starting at age 71, and the mean housing equity declines from age 76. The overall mean change in housing equity among retiree-movers is \$9,866.2 (−\$1,769.5, adjusting for two outliers) and the median change is −\$8,112.3. Large reductions in housing equity, however, are observed for homeowners who move and discontinue ownership. Typically, housing equity increases for retiree-movers who continue homeownership.

Retirees are more likely to spend down their non-housing instead of housing wealth, which suggests that overall retirees might perceive housing equity differently from the rest of their asset holdings. But there is certainly evidence of heterogeneity in housing equity adjustments at retirement. Nearly a quarter of the retiree-movers report that they are moving to downsize,

[16]Except that the median equity reduction for movers in poor health is larger than the median reduction for non-movers in good health.

and they do. We examine whether certain individuals are more likely to extract housing equity because they may have a greater need to use that source of wealth. We find that retirees with low wealth as well as retirees with low income reduce housing equity significantly more than their respective counterparts. Additionally, retiree-movers experiencing widowing or divorce reduce housing equity substantially more than those without similar experience.

The heterogeneity in housing equity draw down among the retirees offers evidence that at least certain groups of people treat housing as a fungible source of wealth that can be used to finance general consumption needs during retirement. But at the same time, we have seen that housing appears to serve predominantly as a consumption good rather than as a consumption-smoothing saving option for a large segment of the retirees. Our findings are, in fact, largely consistent with the existing evidence in the literature regarding downsizing in later life. This study does not disprove or bolster either side of the debate on the role of housing wealth in financing retirement needs. But it highlights that the choice of emphasis regarding which side of the debate holds is often reliant on how one chooses to interpret what is in the data.

Figure 3.1: Mean and Median Changes in Housing Equity
Between 1998 and 2004 for 1998–Homeowners (in 2004-dollars)

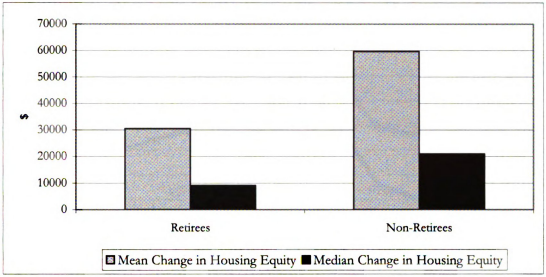


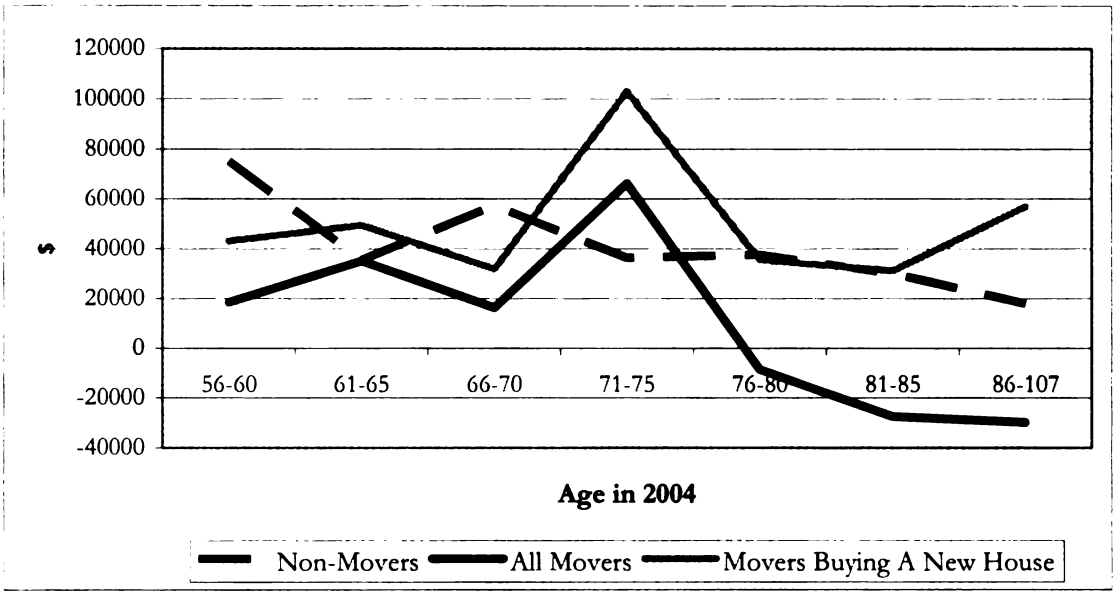
Table 3.1: Movers' Reported Reasons for Residential Moving

Reasons for Residential Moving	% Reporting	
	Retirees (n=845)	Non-Retirees (n=977)
To Move to Less Expensive or Smaller Home	24.70	14.44
To be Near or With Child	21.96	13.69
Health Problems or Services Availability	20.58	4.30
Climate or Weather/Leisure Activities	11.17	9.30
To be Near or With Other Relatives/Friends	8.97	6.87
Change in Marital Status	6.83	9.47
Work or Retirement Related Move	6.71	20.84
To Move to a Larger Home	4.84	10.16
Other	31.65	36.58

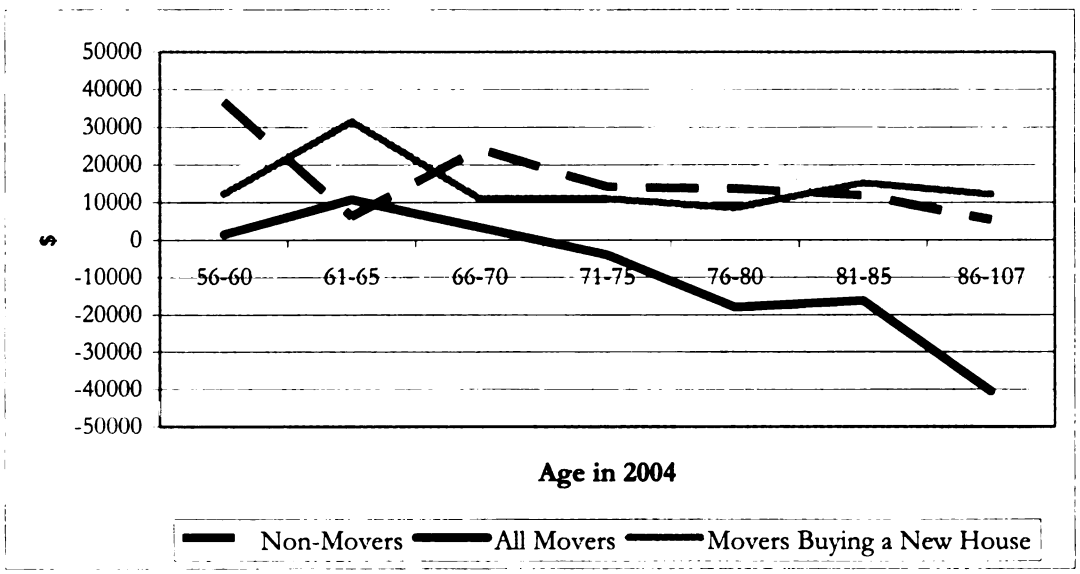
1. Sample consists of non-missing responses from 1,822 movers of the total 2,782 moving observations in the whole sample of the paper.
2. "Other" includes reasons such as: old neighborhood/location bad; old home too expensive; natural disaster; new neighborhood/location better; moved to retirement housing or complex; financial reasons; family problems; could not live by self; negative change in economic status of respondent or spouse/partner (e.g., respondent or spouse/partner laid off or unemployed); positive change in economic status (e.g., received inheritance); to care for relative/family member, to own instead of rent, etc. Clearly, some of these reasons are already implicit in the main reasons reported by the movers.

Figure 3.2: Changes in Housing Equity for Retirees by Age

Panel A: Mean Change in Housing Equity for Retirees by Age[¶]



Panel B: Median Change in Housing Equity for Retirees by Age



[¶] Among retirees, there are two extreme outlier observations in changes in housing equity, both of which belong to the age group 71-75, producing the huge spikes in Figure 3.2 Panel A. These change amounts seem consistent with the education, household income, and other assets that these individuals report. Still, if we consider the mean change in equity for movers excluding those two observations, the mean change in equity for all movers is $7,187.1 and the mean change in equity for movers buying a new house is $27,890.9. We present in the Appendix Figure A.3.1 an alternative to Figure 3.2 Panel A, where the two extreme outlier values have been replaced by the next highest value for the change in housing equity (instead of excluding the observations).

Figure 3.3: Rate of Home Equity Line of Credit Access by Age
(For Retiree Homeowners Throughout 1998–2004)

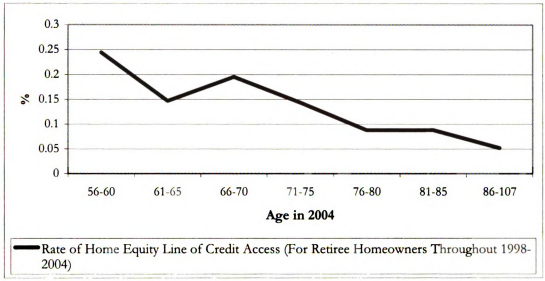


Figure 3.4: Initial Housing Equity and Change in Housing Equity For Non-Movers by Home Equity Line Of Credit (HELOC) Access

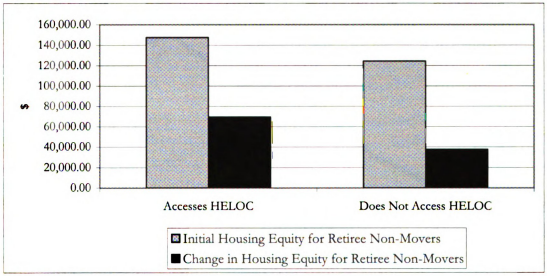
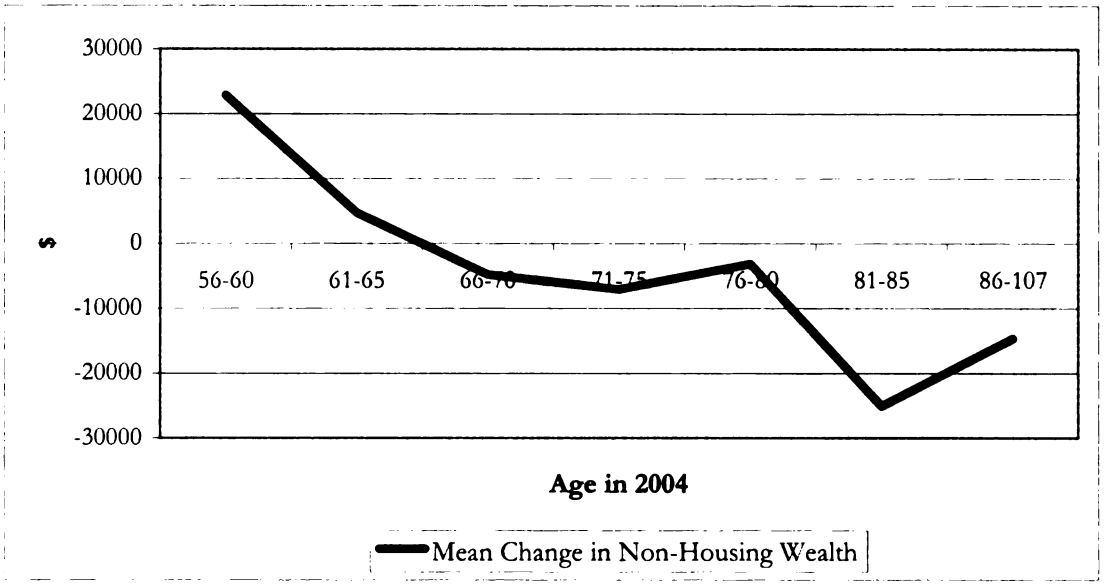


Figure 3.5: Changes in Non-Housing Wealth by Age

Panel A: Mean Change in Non-Housing Wealth by Age



Panel B: Median Change in Non-Housing Wealth by Age

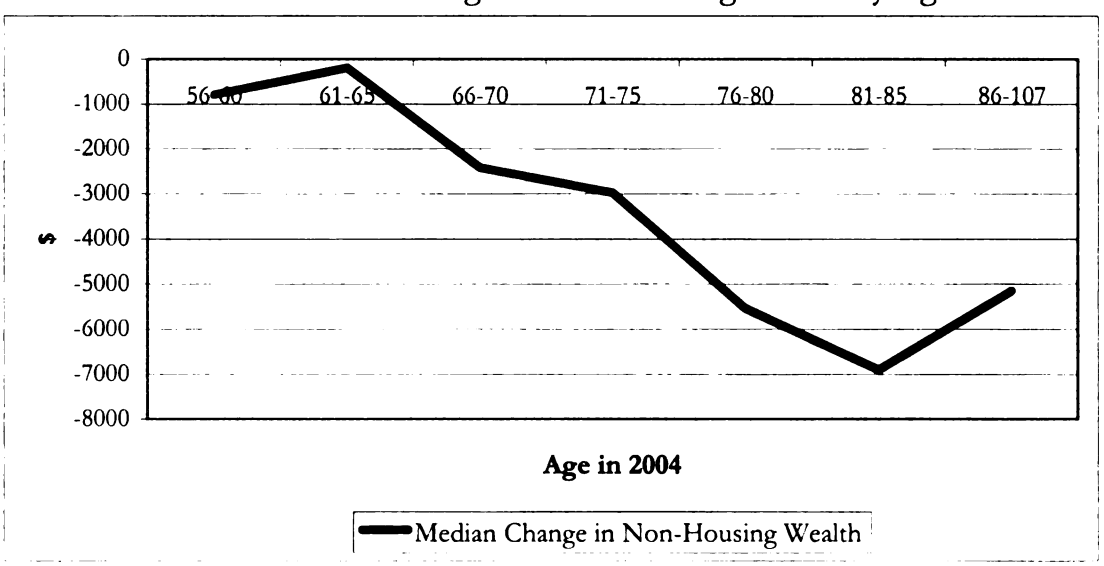
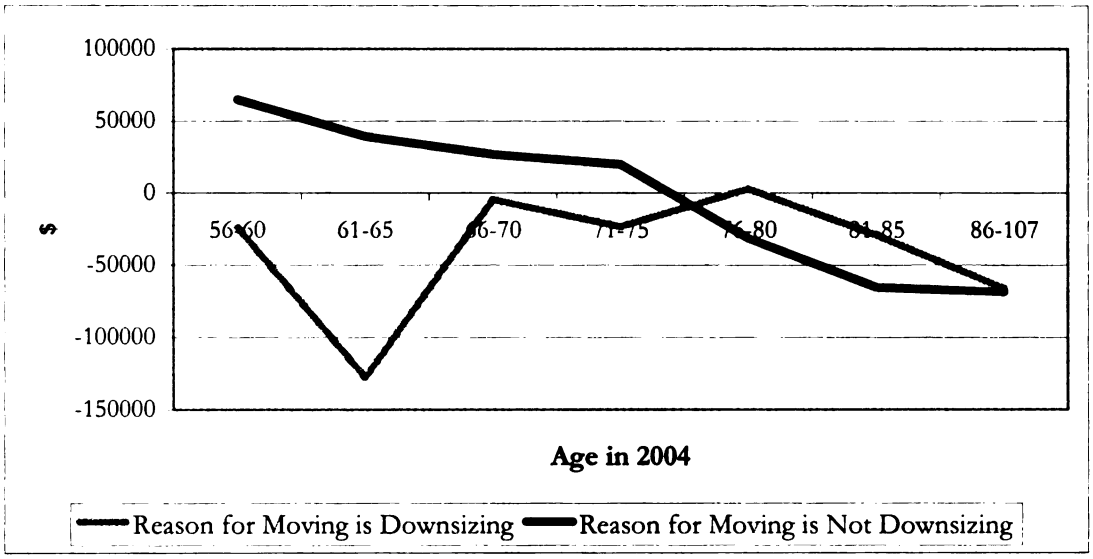


Figure 3.6: Changes in Housing Equity among Retiree Movers By Reported Reason of Moving and By Age

Panel A: Mean Change in Housing Equity among Retiree Movers By Reported Reason of Moving and By Age:

Movers who say they are moving to downsize versus movers who report other reasons



Panel B: Median Change in Housing Equity among Retiree Movers By Reported Reason of Moving and By Age:

Movers who say they are moving to downsize versus movers who report other reasons

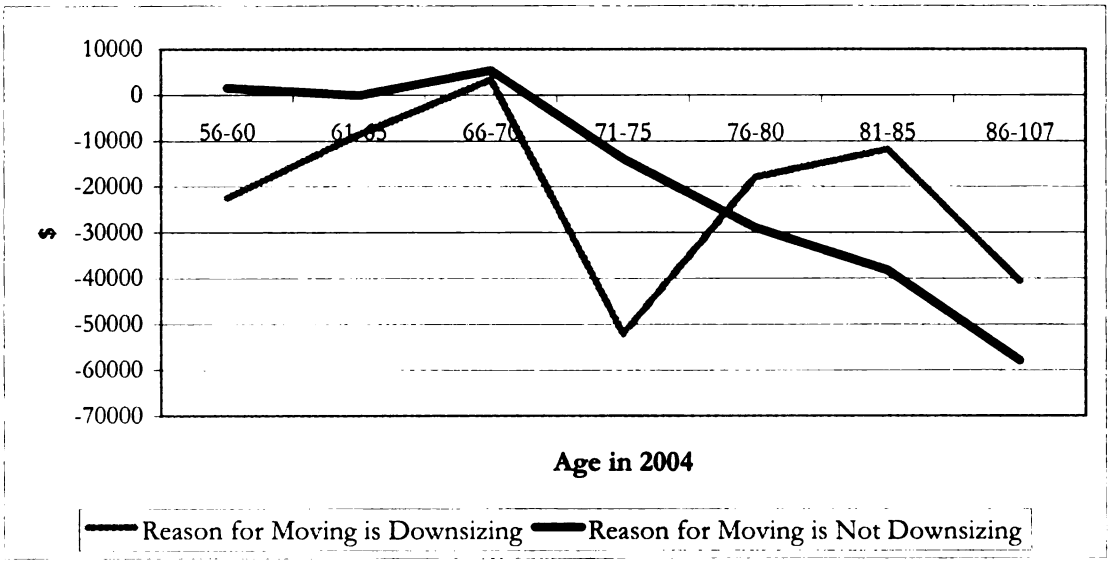
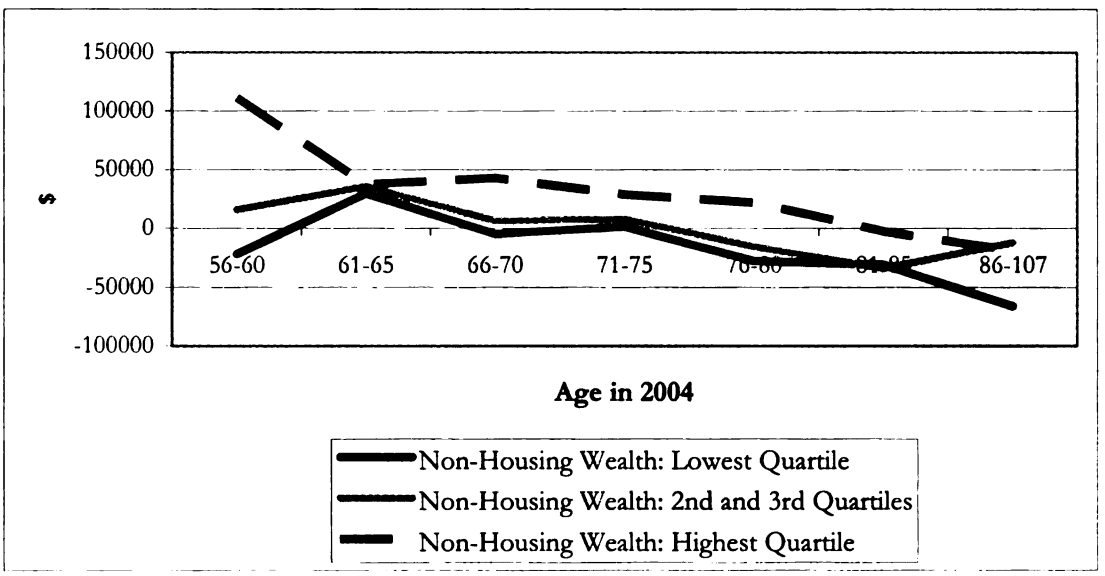


Figure 3.7: Changes in Housing Equity among Retiree Movers By Non-Housing Wealth Quartiles and By Age

Panel A: Mean Change in Housing Equity among Retiree Movers By Non-Housing Wealth Quartiles and By Age



Panel B: Median Change in Housing Equity among Retiree Movers By Non-Housing Wealth Quartiles and By Age

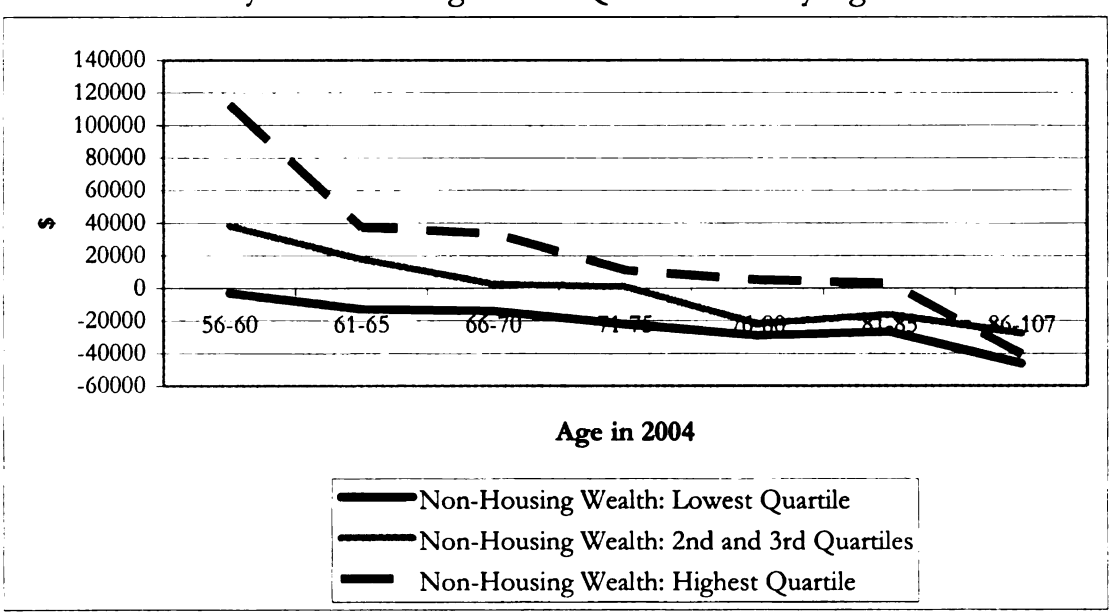


Table 3.2: The Heterogeneity in Housing Equity Extraction

Dependent Variable: Change in Housing Equity Between 1998 and 2004				
Independent Variables	Initial Homeowners: Retirees		Always Homeowners: Retirees	
	OLS	Median Regression	OLS	Median Regression
	(1)	(2)	(3)	(4)
Moved	**-26,600.4***	**-20,870.7****	-14,589.5	-2,456.4
	(10,766.7)	(4,272.7)	(11,352.8)	(4,875.0)
Ages 61–65	**-25,782.6+**	**-19,335.6****	**-28,072.4+**	**-18,778.9***
	(14,239.6)	(7,275.4)	(14,689.6)	(8,057.1)
Ages 66–70	-16,027.5	**-13,991.9***	-17,320.6	**-13,615.6+**
	(13,329.8)	(6,817.2)	(13,747.0)	(7,579.1)
Ages 71–75	**-31,378.1***	**-19,849.7****	**-30,164.8***	**-17,806.1***
	(13,003.0)	(6,738.9)	(13,426.4)	(7,497.5)
Ages 76–80	**-32,043.2***	**-20,457.3****	**-27,020.5***	**-17,109.3***
	(13,023.9)	(6,751.6)	(13,469.6)	(7,518.1)
Ages 71–85	**-41,080.0****	**-21,551.7****	**-30,494.7***	**-16,839.7***
	(13,144.3)	(6,800.2)	(13,637.8)	(7,587.4)
Ages 86–107	**-47,707.2****	**-28,193.0****	**-29,079.4***	**-20,135.6****
	(13,607.5)	(6,936.7)	(14,247.0)	(7,784.9)
Female	-4,234.4	-287.4	-3,575.2	30.1
	(3,784.0)	(1,558.5)	(3,935.7)	(1,725.1)
Education<HSG	-6,041.2	**-3,925.0***	-7,859.2	**-4,053.9+**
	(4,833.3)	(1,987.8)	(5,112.2)	(2,235.8)
Education>HSG	**12,833.2****	**6,887.1****	**15,255.8****	**8,706.9****
	(4,271.5)	(1,769.5)	(4,441.9)	(1,961.9)
Household Income				
Lowest Quartile	**-23,769.3****	**-13,038.0****	**-31,435.3****	**-16,101.7****
	(7,198.2)	(2,960.3)	(7,471.1)	(3,286.9)
Second Quartile	**-20,191.3****	**-12,401.9****	**-24,940.8****	**-15,389.5****
	(6,369.7)	(2,601.6)	(6,587.4)	(2,872.5)
Third Quartile	**-15,367.9***	**-9,636.6****	**-22,093.1****	**-10,288.2****
	(6,048.1)	(2,474.7)	(6,199.8)	(2,711.7)
Non-Housing Wealth				
Lowest Quartile	**-19,217.6****	**-15,233.1****	**-15,745.3***	**-11,624.1****
	(6,535.9)	(2,681.5)	(6,877.8)	(3,016.5)
Second Quartile	**-18,808.1****	**-12,701.2****	**-15,023.1***	**-10,354.5****
	(5,718.5)	(2,328.1)	(5,969.4)	(2,589.6)
Third Quartile	-3,003.6	**-4,458.1***	-3,665.7	**-4,362.7+**
	(5,207.1)	(2,142.7)	(5,342.7)	(2,349.3)
Death/Divorce	-1,870.1	1,569.5	1,070.6	4,208.0
	(6,677.8)	(2,671.4)	(6,831.3)	(2,916.1)
Moved*Death/Divorce	**-52,999.0****	**-31,871.7****	**-44,666.8****	**-22,415.9****
	(12,347.7)	(4,881.5)	(15,922.0)	(6,646.0)

Table 3.2 Continued

	OLS	Median Regression	OLS	Median Regression
	(1)	(2)	(3)	(4)
Health Condition/ADL	-2,148.6	**-7,327.6****	-2,974.5	**-7,379.9****
	(5,565.6)	(2,264.7)	(5,610.2)	(2,437.7)
Moved*Health Condition/ADL	-8,021.5	-1,045.3	9,123.8	2,734.0
	(11,637.0)	(4,651.0)	(12,510.5)	(5,405.6)
High Out-of-Pocket	-8,763.6	187.7	-6,737.1	1,009.7
	(5,920.9)	(1,509.8)	(6,420.1)	(1,684.8)
Living Children[4]	-1,749.4	-213.1	-2,441.0	1,042.2
	(6,820.3)	(2,958.2)	(7,095.3)	(2,732.6)
Long-Term Care Insurance[4]	**-12,137.3***	**-5,764.2****	**-13,087.9****	**-6,199.5****
	(4,882.9)	(2,035.8)	(5,030.8)	(1,884.2)
Life Insurance[4]	-4,697.1	1,738.6	**-7,229.8+**	1,587.9
	(4,026.7)	(1,703.1)	(4,253.5)	(1,611.1)
Constant	**98,343.8****	**59,109.5****	**100,603.3****	**57,024.5****
	(14,491.9)	(7,242.0)	(14,930.2)	(8,036.1)
Observations	5503	5503	4956	4956
R-squared	0.11		0.10	

1. Standard errors in parentheses. + Significant at 10%; * Significant at 5%; ** Significant at 1%.
2. Omitted age group 56–60; omitted education group high school graduation.
3. Also omitted are the dummy variables for the highest quartile of household income and the highest quartile of net non-housing wealth.
4. The estimates for these variables are from a regression using a sample of 5445 observations in Columns (1) and (2), and a sample of 4913 observations in Columns (3) and (4). We lose several observations from the original samples due to missing data on these variables. The estimated coefficients for the other covariates are virtually unchanged in the regression using the somewhat smaller samples.

Appendix

Table A.3.1: Sample Selection Criteria

	Number of Observations	
Total Number of Core Interview Obtained in 1998	21384	
If Cohort and Age Eligible[1]	20002	93.54%
If 2004 Interview Non-missing[2]	14380	67.25%
If Homeowners in 1998	11983	56.04%
If Race, Ethnicity, and Education Non-missing	11967	55.96%
If Ownership in 2004 and Marital Status in 1998 & 2004 Non-missing[3]	11957	55.92%

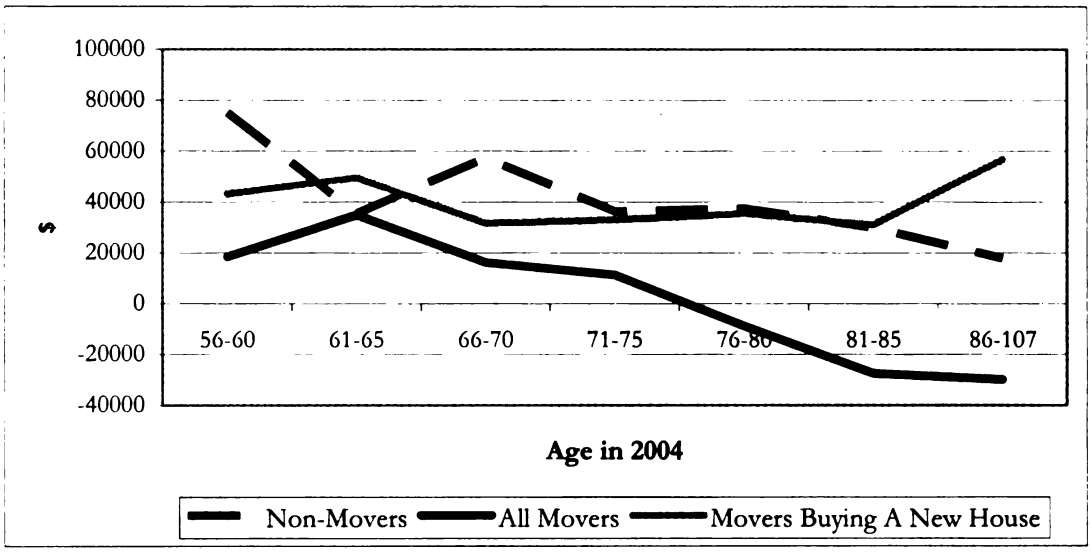
1. Observations belong to the four cohorts in the Health and Retirement Study: AHEAD (1890-1923), CODA (1924-1930), HRS (1931-1941), and War Babies (1942-1947). Note that in 2004 another cohort – the Early Baby Boomer (EBB) cohort (1948-1953) – was introduced in the Study, respondents from which are not part of our analyses.
2. The 2004 survey in total interviews 15237 age-eligible respondents from the four cohorts.
3. 6,750 of these observations – 56.45% – are female.

Table A.3.2: Housing Wealth, Net Worth, and Demographic Features In 1998 and 2004

	1998	2004	1998	2004
	All Initial Homeowners n=11957		Homeowners Both Periods n=11083	
Age of the Respondent	62.83	68.84	62.47	68.47
	(9.16)	(9.22)	(8.96)	(9.01)
Less Than High School Graduation	20.58%		19.97%	
High School Graduation	35.54%		35.28%	
More Than High School Graduation	43.88%		44.75%	
Married or Partnered	74.11%	67.59%	75.73%	70.31%
Respondent Partially or Completely Retired	53.82%	70.95%	52.83%	70.31%
Respondent Completely Retired	45.52%	61.42%	44.46%	60.43%
Respondent/At Least One Spouse Partially or Completely Retired	64.18%	79.31%	63.49%	79.12%
Respondent/Both Spouses Partially or Completely Retired	43.96%	61.31%	42.60%	60.13%
Respondent/Both Spouses Completely Retired	34.69%	49.59%	33.31%	48.03%
Home-Ownership	100%	92.84%	100%	100%
Net Worth	433,777.8	548,661.6	445,916.7	576,501.2
	(833,523.9)	(1,941,638.0)	(844,031.6)	(2,000,244.0)
Household Income	72,627.9	63,811.6	74,786.0	65,888.3
	(97,775.7)	(102,415.6)	(99,872.08)	(102,079.9)
Gross Housing Wealth	159,711.0	205,433.2	162,932.8	221,285.3
	(360,086.3)	(530,005.4)	(371,899.6)	(546,877.9)
Housing Equity	125,190.1	172,827.3	127,912.5	186,164.2
	(352,335.8)	(510,094.3)	(364,526.8)	(527,060.4)
Out of Pocket Medical Expenses	3,669.9	6,888.9	3,674.6	6,953.9
	(6,900.1)	(20,505.52)	(6829.7)	(20,932.5)
Any Child	93.10%		93.07%	
Has Life Insurance	83.97%	78.41%	84.72%	79.57%
Has Long-Term Care Insurance	13.92%	16.33%	14.00%	16.82%

1. Weighted tabulations are reported.
2. Standard deviations in parentheses.
3. Dollar amounts in year-2004 $ (CPI-U deflator).

Figure A.3.1: Mean Change in Housing Equity for Retirees by Age
(Adjusting for the Two Extreme Outlier Values for Change in Housing Equity)



Note: The two extreme outlier values of *change in housing equity* for movers are replaced by the next highest value of housing equity change in the sample of retirees.

Figure A.3.2: Rate of Home-Ownership in 2004 for 1998-Homeowners By Age

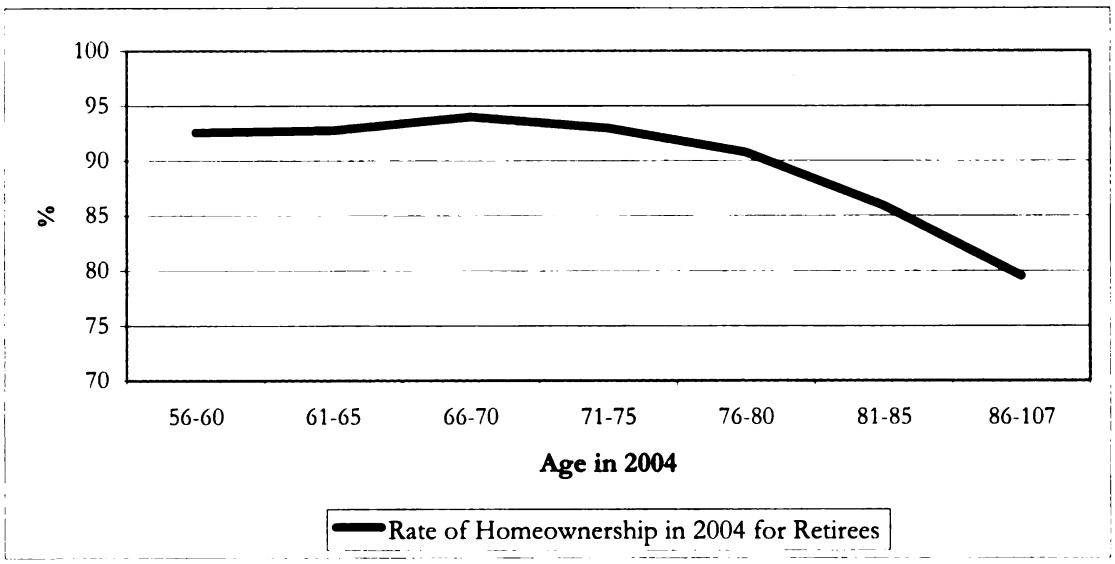
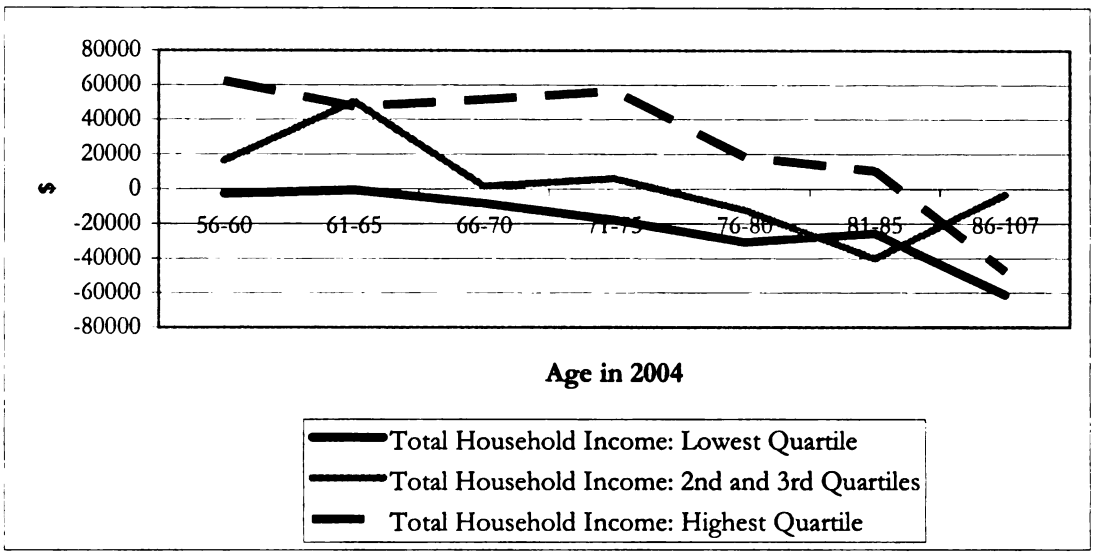
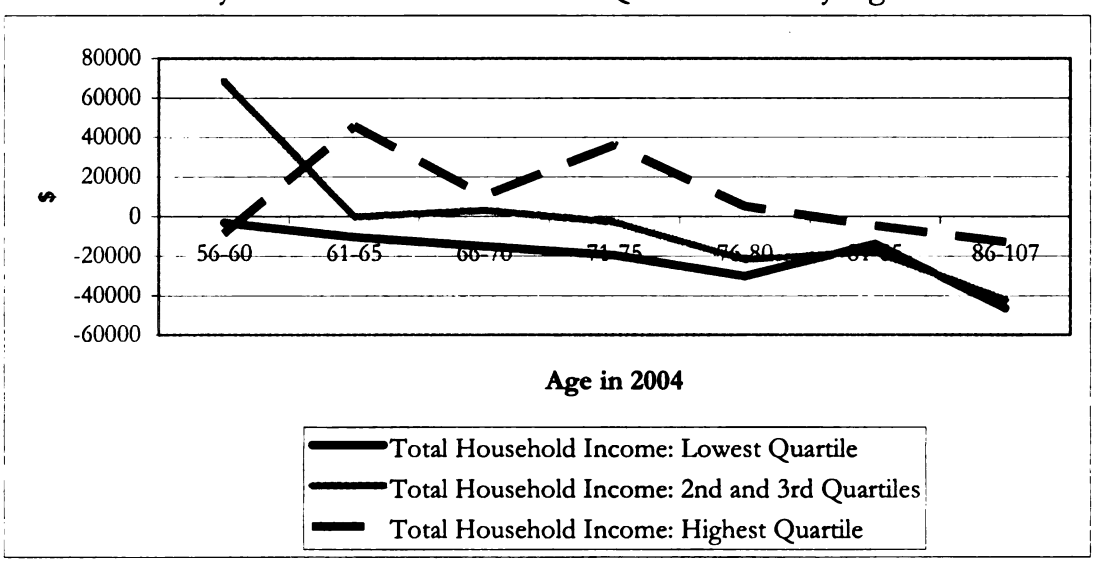


Figure A.3.3: Changes in Housing Equity among Retiree Movers By Total Household Income Quartiles and By Age

Panel A: Mean Change in Housing Equity among Retiree Movers By Total Household Income Quartiles and By Age



Panel B: Median Change in Housing Equity among Retiree Movers By Total Household Income Quartiles and By Age



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