THREE ESSAYS ON THE HEALTH AND FAMILY BEHAVIOR

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This dissertation is comprised of three papers on health and household behavior. Two of the papers focus on the influence of family on health outcomes. The third paper examines household member preferences and their association with outcomes for other individuals within the family unit.

The first paper tests the relationship of adult-child and elderly-parent contact frequency on elderly cognitive functioning (dementia) using the Health and Retirement Study (HRS). The paper examines various mechanisms through which the intensity of contact with adult, nonresident children impacts elderly cognitive functioning. An instrumental variables model is used to account for the endogeneity in the level of parent-child contact. Results indicate a positive association between intensity of contact from nonresident adult children and mothers' cognitive functioning; however, no causal relationship is found suggesting that higher levels of contact are due to selection.

The second paper examines the prediction of stated, altruistic, preferences on an individual's revealed preferences, observed intergenerational family transfers. Measures of altruism toward children and parents are constructed, using hypothetical questions in the 1996 wave of the HRS that assess individuals' willingness to transfer income to others, and evaluated for their additional explanatory power, within traditional models of intergenerational transfers, on observable transfer behavior. Results indicate that higher levels of altruistic preferences are associated with higher probabilities of transfers and larger transfer amounts from respondents to children; however, transfers to parents do not appear to be related to the altruism measure.

The final paper investigates the link between relationship status and body mass index. There are four hypotheses (selection, protection, social obligation and marriage market) that might explain the

relationship between marital status transitions and changes in Body Mass Index (BMI). Using the National Longitudinal Survey of Youth 1979, individual fixed effects models are estimated to examine associations between the change in log BMI, and the incidence of overweight and obesity, and changes in relationship status. There is no support for the marriage protection hypothesis. Rather evidence supports the social obligation and marriage market hypotheses—BMI increases for both men and women during marriage and in the course of a cohabiting relationship.

BIOGRAPHICAL SKETCH

Joanna Eliza (Asia) Sikora was born in Krakow, Poland. She immigrated to the United States via Athens, Greece, where she and her family lived for a year, at age five. In the United States her family settled in Denver, Colorado. She attended the University of Denver, from 1999-2003, for her baccalaureate studies and majored in international business and economics in the Daniels College of Business. Nearing the completion of her undergraduate degree, Asia realized that she wanted to pursue her studies in economics further. Asia entered the Masters program in the Department of Economics at the University of Colorado Denver in 2003 and completed her degree in 2006. While at the University Asia was given the opportunity to be a research assistant for Dr. Laura M. Argys. Through coursework and her involvement on Dr. Argys' research, Asia developed a strong interest in labor economics, specifically family/welfare policy and health economics. As a result, Asia realized her affinity for academic research and decided to pursue a doctoral degree. She entered the PhD program in the Department of Policy Analysis & Management at Cornell University in the fall of 2006. There Asia had the honor to work under the guidance of Dr. Donald S. Kenkel, Dr. H. Elizabeth Peters, and Dr. John H. Cawley. In addition, Asia had the opportunity to be a research assistant for several distinguished faculty members, Dr. Sharon Tennyson, Dr. R. Rick Geddes and Dr. H. Elizabeth Peters. Asia Sikora successfully defended her dissertation with concentrations in health policy, family and social welfare policy, and demography in the summer of 2011. She looks forward to continuing her research on social capital, intergenerational care, and elderly health, as well as teaching, as an Assistant Professor in the Department of Health Promotion, Social & Behavioral Health in the College of Public Health at the University of Nebraska Medical Center in Omaha, Nebraska.

For my parents – thank you for all of the sacrifices you made in your lives to provide all the opportunities in mine.

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The University of Michigan Health and Retirement Study (HRS) surveys more than 22,000 Americans over the age of 50 every two years. Supported by the National Institute on Aging (NIA U01AG009740) and the Social Security Administration, the HRS is a large-scale longitudinal project that studies the labor force participation and health transitions that individuals undergo toward the end of their work lives and in the years that follow. No direct support was received from grant U01 AG009740 for this analysis.

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THE EFFECT OF PARENT AND ADULT-CHILD CONTACT ON ELDERLY COGNITIVE FUNCTIONING

Abstract

Previous research on social engagement and elderly cognitive functioning (dementia) provides evidence that social contact is associated with higher levels of cognitive functioning in older adults; however, no causal direction has been determined. In addition, this research generally combines all types of social engagement into a single aggregate measure and does not take frequency of engagement into account.

This article tests whether the frequency of social contact between elderly parents and their adult, nonresident children has an effect on elderly cognitive functioning, as measured by immediate and delayed memory recall scores, using the Health and Retirement Study. Because the frequency of child contact with an elderly parent is positively correlated with the parent's cognitive functioning, an instrumental variables model is used to account for the endogeneity in the level of parent-child contact.

Least squares results support previous studies suggesting that higher levels of parent-child contact are associated with higher cognitive functioning of elderly parents. Quantile regressions illustrate the association is strongest for those individuals in the upper half of cognition distribution. Controlling for endogeneity through two-stage least squares fails to reject the hypothesis that contact with nonresident, adult children has no causal impact on cognitive functioning. The association between contact and cognition is therefore a result of selection bias.

Introduction

There are currently an estimated 5.3 million Americans with Alzheimer's disease (Alzheimer's Association, 2010), with predicted estimates for 2050 ranging between eleven and sixteen million, unless methods to effectively prevent and treat the disease are found. Currently, one in eight individuals age 65 and over has Alzheimer's disease (Alzheimer's Association, 2010). Seschadri et al (2006) estimate that one in five women and one in six men, who reach the age of 65, will develop some form of dementia in their lifetime.[1]

There is no effective cure for dementia, but the costs of care are not trivial. In addition to foregone earnings, unpaid caregivers incur out-of-pocket costs averaging $219 per month and experience higher levels of stress as well as negative impacts on their own health, employment, income and financial security (Alzheimer's Association, 2010). Furthermore, the increasing incidence of dementia and high utilization of medical services by patients results in high costs for Medicare. In 2010, the total cost of health and long-term care for all dementia beneficiaries was expected to be $172 billion, with $123 billion paid for by Medicare and Medicaid (Alzhiemer's Association, 2010).

One vein of literature examines social interaction and elderly cognition, finding more social contact is associated with higher levels of cognitive functioning in older adults (Ertal, et al, 2008, Fratiglioni et al, 2000 & 2004, Barnes, et al, 2004, Bassuk, et al, 1999); however, no causal direction has been established and this research generally combines all forms of social interaction into one aggregate measure. Further, this literature does not account for frequency of contact. A recent panel of researchers, at the request of the National Institutes of Health, was charged with the task of assessing "whether previous research on purported risk or protective factors for Alzheimer's disease (AD) and cognitive decline is of sufficient strength to warrant specific recommendations for behavioral, lifestyle, or pharmaceutical interventions/modifications targeted to these endpoints (Williams, 2010)." The panel

[1] The greatest risk factor for development of dementia is advanced age. Women are more likely to develop due to longer life expectancies (Plassman et al, 2007). Studies on age-specific incidence of dementia have found no significant difference by gender (Bachman et al., 1993; Fillenbaum et al., 1998; Fitzpatrick et al., 2004; Kukull et al, 2002; and Rocca et al, 1998); however, the incidence of dementia increases with age (Plassman et al, 2007).

found little evidence that low social support increases the risk for AD and little evidence of an association between social support and cognitive decline.[2] Furthermore, of the five studies the panel focused on, only one included contact with children as a form of social engagement (Fratiglioni et al, 2000). However, the panel stated that further research was required to clarify and confirm the findings on social engagement and AD.

This paper uses the Health and Retirement Study to test the effect of frequency of social contact between the elderly and their adult, nonresident children on elderly cognitive functioning. Because the presence of children is demonstrated to reduce the risk of dementia (Fratiglioni et al., 2000), the first objective of this paper is to examine the correlation between contact frequency and cognitive functioning. The second objective is to determine whether there is a causal relationship between contact and cognitive functioning. The study applies various econometric methods in an effort to determine the nature of the relationship between contact and cognition and explores how contact context is associated with cognition. Results support previous research finding an association between parent-child contact and cognition, especially for those in the upper half of the cognitive functioning distribution; however, controlling for the endogenity of contact, the evidence fails to reject the null hypothesis that the relationship is not causal.

This is not the first article to estimate a causal relationship between a lifestyle and cognition. Rohwedder and Willis (2010) use retirement policies from twelve different countries to predict the endogenous choice of retirement for men and its effect on cognitive functioning. Their results indicate that earlier retirement causes lower cognitive scores due to less mental stimulation. Glymour et al (2008) use state compulsory schooling laws to instrument for educational investment and find that, decades after their completion of school, individuals who obtained more education have higher cognitive scores.

[2] The panel reviewed a total of 43 potential factors. Moderate evidence was found of increased risk of AD for carriers of the apolipoprotein E-ε4 (APOE ε4) genotype and use of conjugated equine estrogen with methyl progesterone. Cognitive training showed a high level of evidence of decreasing the risk of cognitive decline.

Cognitive functioning, Social Contact and What We Know

Investigating the social determinants of cognitive change is valuable because even small changes in cognitive functioning can be signs of loss ranging from mild cognitive impairment to dementia, the most common form of which is AD.[3] Mild cognitive impairment (MCI) is defined by problems with memory, language or other essential cognitive functions that are severe enough to be noticeable to others and show up on tests, but not severe enough to interfere with daily life. Dementia on the other hand is a clinical syndrome associated with a loss or decline in memory and other cognitive abilities that impact daily life.[4]

The literature that examines social integration of the elderly and its relationship to cognitive functioning and dementia has generally grouped all forms of social interaction into one index as the sum of various types of interaction; i.e. whether there is a spouse present, whether the person has children and/or living parents, whether they have any contact with their neighbors and/or participate in volunteer activity. A recent paper by Ertal et al (2008) created such an index and examined how the most socially integrated (highest quartile) compared to the less integrated individuals (lower 3 quartiles). Using flexible growth curve models, their results find that high social integration predicts slower cognitive decline. Barnes et al (2004), using the Chicago Health and Aging Project, found the same results with a slightly different index.[5] Saczynski et al (2006) found that mid-life social engagement was not associated

[3] AD comprises of 60 to 80 percent of all dementia cases (Alzheimer's Association, 2008; Plassman et al, 2007).
[4] In particular a diagnosis of dementia must meet the following criteria, as defined by the Alzheimer's Associations 2008 release of *Alzheimer's Disease Facts and Figures*:

1. It must include decline in memory and in at least one of the following cognitive abilities:
    a. The ability to generate coherent speech and understand spoken or written language;
    b. The ability to recognize or identify objects, assuming intact sensory function;
    c. The ability to execute motor activities, assuming intact motor abilities, sensory function and comprehension of the required task; and
    d. The ability to think abstractly, make sound judgments and plan and carry out complex tasks.
2. The decline in cognitive abilities must be severe enough to interfere with daily life.

Vascular dementia, mixed dementia, dementia with Lewy bodies, Parkinson's disease, Frontotemporal dementia, Creutzfeldt-Jakob disease and normal pressure hydrocephalus are all types of dementia with the most common being AD. For specific definitions of these types of dementia refer to Alzheimer's Association, 2008 available at: http://www.alz.org/national/documents/report_alzfactsfigures2008.pdf

[5] Social networks were based on the number of children, relatives, and friends seen at least once a month. Social engagement was measured with four items related to social and productive activity.

with an increased risk of dementia, but those with the lowest levels of social engagement in late life have a risk 2.3 times higher than those with the highest level of social interaction. Fratiglioni et al (2000) used Swedish data and found that those without social ties were 1.5 times more likely to develop dementia and single people had a 1.9 times higher risk of dementia than married people. Finally, Bassuk et al (1999) compared those with very high levels of social ties to those with no social ties and found that the three year odds of developing dementia were 2.2, six year odds were 1.9, and 12 year odds were 2.4, for those with no social ties.

Related literature examining social integration through alternate definitions and/or the examination of other cognitive outcomes also finds evidence to support that more engagement is better for cognitive outcomes. Glei et al (2005) examined both social contact, through networks, and social activities on the performance of various cognitive tasks in a nationally representative sample of elderly Tiawanese and found the number of people in various social networks was not associated with cognitive performance.[6] Wilson et al, (2007) followed up the research of Barnes et al (2004) with a study on emotional loneliness, perceived social isolation, and AD risk and observed a risk for AD twice as large for lonely individuals, 3.2 versus 1.4 for those not lonely.[7] Glymour et al (2008) examined stroke patients to determine whether social ties (an index defined as intimate ties, personal ties, and organizational ties) had an effect on cognitive recovery after stroke.[8] They found that those with more social ties and emotional support have better cognitive scores at the 6-month follow up.

These studies all consistently find a positive association between social engagement and a reduced risk for cognitive decline; however, the limitation of this literature is that they do not account for people selecting different forms of contact; i.e. whether they marry, have children, associate with their

[6] The cognitive tasks examined were the ability to state their own address; give the age in years; identify the date (month, day, year), identify the weekday, and subtract the number three from twenty a total of four consecutive times. This test is the Chinese equivalent to the Mini Mental State Exam.
[7] The study included covariates for social network size and average frequency of social participation.
[8] Intimate ties were defined as having a spouse or live-in partner, personal ties were defined as having weekly contact with one or more children, two or more friends, and two or more relatives, and organizational ties are defined as unpaid volunteer or community work, paid work, religious attendance and attendance at civic organizations.

neighbors or volunteer. This is important because cognitively healthier people are able to interact with more social groups; therefore, those with the most contacts have better scores and slower decline than those with the fewest. Such selection represents reverse causality. The decision to limit social engagement to parent-child contact is supported by Hughes and Waite (2004), who find that relationships with adult children are inherently different from relationships with friends and more distant kin and thus are likely to have a stronger impact on health.

Grouping all forms of social engagement together into an aggregate measure masks the variation between specific types of social contact and cognitive decline. Further, choosing to participate in any one of the activities included in these studies is endogenous to varying degrees (i.e. "going to the museum" versus "having kids", the vast majority of the elderly population have at least one child regardless of economic status, while museum attendance could be highly correlated with socioeconomic status, education, etc.). The primary contribution of this paper is that it looks at a specific form of social engagement, contact with adult-children, and tests its relationship with cognitive functioning to determine whether a causal relationship exists. This paper goes beyond simply using indicators of the existence of specific social ties by examining a finer measure, the frequency contact, which is expected to capture the impact of social engagement better than simply controlling for the presence for contact.

Previous research identifies three hypotheses regarding the link between lifestyle and the risk of cognitive decline and dementia: the cognitive reserve, the vascular, and the stress hypotheses (Fratiglioni et al, 2004; Stern, 2002). The cognitive reserve hypothesis suggests that mental activity, learning, and social interaction prevent or reduce cognitive deficits by activating brain plasticity. Evidence supporting this hypothesis is that those with higher levels of education have a lower risk for Alzheimer's disease.[9] The vascular hypothesis suggests that social, mental, and physical activity prevents or reduces the risk for dementia or AD through reduction of cardiovascular disease and stroke. Finally, the stress hypothesis

[9] Stern, et al, 1994; Evans et al., 1997; Kukull et al., 2002.

suggests that active individuals have more positive emotional states and reduced stress, leading to lower susceptibility to AD.

Increased social contact, particularly contact with adult children can influence cognitive functioning in several ways. Specifically, contact with children may induce cognitive stimulation though conversation which promotes learning and the formation of new ideas which would support the cognitive reserve hypothesis. Contact can also induce physical activity which helps vascular health and supports the vascular hypothesis. Another possible mechanism is a greater sense of purpose or emotional validation which could have direct neurohormonal benefits and support the stress hypothesis (Fratiglioni et al, 2004). Contact with children also serves as a possible reminder to take care of one's own health. These reminders may results from children, directly, noticing health declines and helping parents seek help before conditions develop into chronic disease or, indirectly, through pressure to take care of oneself for the sake of their children.

Data and Econometric Model

Data: Health and Retirement Study

The data are from the Health and Retirement Study (HRS) which is a longitudinal study administered biannually sponsored by the National Institute of Aging (grant number NIA U01AG009740) and conducted by the University of Michigan's Institute of Social Research.[10] Created to collect detailed information about the economic circumstances of older Americans, the HRS is a rich source of data on respondent assets, income, benefit use, pensions, earning, savings and spending. It also collects a vast array of demographic and health information including health conditions, health care utilization and direct

[10] Specifically, I use the RAND HRS, Version J with select variables merged in from the RAND-enhanced Fat Files. Contact with children variables come from the original HRS data files. Both are available at http://hrsonline.isr.umich.edu/.

measures of cognition required of this analysis (National Institute on Aging (NIA) and National Institutes of Health, 2007).[11]

Sample

By the last wave, in 2008, the HRS interviewed 30,548 primary respondents and spouses. The HRS administered cognitive functioning questions to both primary respondents and spouses; all surveyed respondents are included in the analysis.[12] Of this total the data are further restricted in several ways, implemented list-wise. The administration of the cognitive recall scores, described below, changed in 1998; therefore, interviews before 1998 are not used in the sample so that all respondents' cognitive scores are administered in the same manner. Pooling 1998 to 2008 the remaining respondents resulted in 154,944 person-year observations. For this remaining sample, the entire 2006 wave is dropped because the HRS did not ask respondents about the contact they had with their children, leaving 129,120 person-year observations. Next 43,829 observations are dropped due to attrition.[13] Non-parents and those with missing child contact information (13,960 observations) are also excluded.[14] Next, 1,253 observations are dropped due to missing race data.[15] Observations in the top 1.28 percent of the contact distribution are

[11] Currently the HRS is made up of five nationally representative cohorts. The original study cohort, known as the HRS cohort, interviewed a sample of over 12,000 individuals between the ages of 51 and 61 (strictly born from 1931 to 1941) and their spouses in 1992. Spouses in all subsequent cohorts were interviewed regardless of age. The next cohort in the survey referred to as the Study of Assets and Health Dynamics among the Oldest Old, or AHEAD, was interview in 1993. This sample includes over 8,000 individuals who were age 70 or older (born in 1923 or earlier) at time of interview and their spouses. In 1998 the two cohorts were integrated into one large survey and two additional cohorts were added to the survey to fill in the gap between the HRS and AHEAD cohorts and to "refresh" the sample, adding a sample of individuals in their early fifties. The former cohort is known as the Children of the Depression Age, or CODA, with individuals born between 1924 and 1930 and raised during the Great Depression. The latter cohort is known as the War Baby cohort with respondents born between 1942 and 1947, around the time of World War II. In 2004, the Early Boomer cohort, born 1948-1953, was added to the study and in 2010 the Mid-Boomer cohort, born 1954-1959, will enter the study. These "refresher" cohorts were added to account for aging and attrition in the survey (NIA, 2007). For further information see the National Institute of Aging data book *"Growing Older in America: The Health and Retirement Study"* or visit the HRS website http://hrsonline.isr.umich.edu/.

[12] The analysis excludes the Early Boomer cohort, which was not interviewed until 2004 to keep the sample period consistent.

[13] Of the 43,829 observations dropped for attrition, 23.25 percent was due to survey non-response; 65.63 percent was due to death; 8.57 percent due to respondents asking to withdraw from survey participation; and 2.55 percent was spouses who had not yet entered the survey through marriage.

[14] The contact questions were asked only for respondents who had nonresident children. Therefore, this number includes many the younger respondents who still had any of their children living at home.

[15] This group is omitted because it is a heterogeneous group and the RAND HRS files do not allow for the identification of finer race categories.

dropped eliminating 896 observations.[16] 7,227 observations are dropped due to missing cognitive scores. This does not mean respondents were not interviewed. Those respondents who are not found capable of taking the cognitive recall test are assigned proxy respondents to evaluate their cognition.[17] 273 respondent observations are dropped because their contact information was provided by proxy respondents. Proxy respondents, especially nonfamily members, are less likely to have an accurate idea of the contact frequency between parents and their adult-children; thus observations for those individuals who were not able to respond for themselves were dropped. 5,565 observations are dropped for new spouses, of existing respondents, that entered the survey after 1998.

Two more restrictions are made to create the final analysis sample. 7,308 person-year observations are dropped because respondents reside with their children. There are two situations in which older parents would live with their adult children. In the first scenario, parents move in with one of their children because they themselves need help due to deteriorating health or a change in financial status after retirement. In the second case, one or more children move in with the parents due to some health or financial problem of the children. This exclusion is made because the reason for parents and children residing together is unclear in the data, making determining the effect of contact between resident parents and children very difficult; thus resident parents are not included in the analysis.[18]

Finally, 18,189 person-year observations were dropped for men. This exclusion is made because the measure of contact is a household level measure which is primarily answered by women, 83 percent

[16] The distribution is highly skewed to the right; therefore, it is also possible that there is greater reporting error at tail given the maximum contact value reported is 5110 contact days, equivalent to daily contact with 14 children. The cut off at the top 1.28 percent of the sample is 1460 total child contact days, representing daily contact with four children. 84.5% of the sample at this step has 4 children.

[17] Descriptive statistics of the sample of respondents with missing cognitive scores are available in the Technical Appendix. The main difference between respondents without reported cognitive scores is in contact. Respondents report more days of contact with their children in the previous year. However, the sample is also older, less educated, exhibits more adverse health conditions at baseline and is overall more disadvantaged along most demographic characteristics.

[18] The final nonresident sample is overall quite similar to the initial nonresident sample; see Appendix Tables A1.1a and A1.1b, Initial Nonresident Sample and Final Nonresident Sample, respectively in the Technical Appendix. The only notable difference is that the mean cognitive recall score is about one point lower for the initial sample.

versus 17 percent for men.[19] That being the case, the variable appears to not be an adequate measure of contact between men and their nonresident children as none of the results indicate a significant association between contact and cognitive functioning. Alternately, contact with nonresident children may truly have no relationship with men's cognition; however, given the crude nature of the variable this paper is unable to make any conclusions about men's contact with their children and its effect on cognition.[20] The remaining final analysis sample is 27,699 person-year observations (7,374 unique women) spanning 1998 to 2008.

Variables

Table 1.1 shows cognitive recall scores, contact, and descriptive statistics of all covariates for the initial and final full sample, by gender, residence status, and for those with no children. The definition and derivation of the dependent variable and other key variables are discussed below.

Cognitive measure. The HRS employs a set of questions to measure several aspects of cognitive function.[21] As the survey has evolved these measures have changed slightly with some being eliminated and others added. [22] The measures that have remained relatively consistent throughout include the immediate and delayed free-recall tests used in this analysis.

The immediate free-recall test is a series of 10 short, concrete, high-frequency nouns that are read to the respondents at two-second intervals. Immediately following the list respondents are asked to recall

[19] The HRS assigns respondents the role of family or financial respondent to be responsible for answering questions on behalf of the household in that domain. In the case of married or partnering households the responsibility is divided among the couple while in households with uncoupled individuals the respondent is responsible for both sets of questions. In the case that neither member of a married/coupled household or the respondent in the uncoupled household is found fit to participate in the study a proxy respondent is assigned. Married men are even less likely to be family respondents, only 11.5 percent.

[20] Results for men are available in the Technical Appendix upon request from the author.

[21] The goal is to provide descriptive information on a comprehensive range of cognitive functions, span all difficulty levels from competent cognitive functioning to cognitive impairment, be sensitive to change over time, be administrable in a survey environment with lay interviewers, over the phone, in a short time, and be valid and reliable (Herzog and Wallace, 1997).

[22] For a complete description of cognitive measures in the HRS refer to Ofstedal, Fisher and Herzog (2005) and/or McArdle, Fisher and Kadlec (2007).

as many of the words as possible.[23] The delayed free-recall test asks the respondents to recall the words previously listed after a five minute interval during which other cognitive measure questions are administered. The scores of the two tests are added together, as is common in the literature, for a total score, which is used as the dependent variable and is a representative measure of episodic memory (Small and Hultsch, 1993; Glymour et al, 2005; Adam et al, 2006; and Ertal et al, 2008, define cognitive recall similarly).[24]

This test is similar to the Hopkins Verbal Learning Test – Revised (HVLT-R) (Brandt, 1991; Benedict et al, 1998; Aretouli and Brandt, 2010) which has been validated for healthy adults and several neurological diseases; Alzheimer's, Parkinson's, and Huntington's diseases. Benedict et al (1998) provide normative data on the HVLT-R for adults ages eighteen to eighty-eight. For adults fifty-five to sixty-nine years old the mean total recall was 76 percent for words and the delayed recall was 82 percent; while adults seventy to eighty-eight year old adults average total recall and delayed recall were 70 and 73 percent, respectively.[25] Aretouli and Brandt (2010) find that those diagnosed with AD recall an average of 42 percent of words in total recall and six percent in delayed recall.[26] In the sample for this paper the average scores for immediate and delayed recall are 61 and 53 percent for women ages 55-69 and 52 and 40 percent for women ages 70-88, respectively. The immediate recall averages are closer to those found in Benedict et al (1998) after the first trial recall (see footnote 24) and the delayed recall scores are lower because respondents did not have word lists read to them three times.

[23] In the 1992 and 1994 waves of the HRS the word lists were of 20 words, which were later shortened due to the greater level of complexity and for comparability when the HRS and AHEAD were merged. The greater degree of complexity for these two waves resulted in scores for the immediate and delayed recall test being on average lower than those scores for the 10 words tests. In 1998, the HRS also changed their lists to a set of four that are randomly assigned to respondents and made sure that spouses were not asked the same list. For these reasons the analysis period starts with the 1998 wave.

[24] A subcategory of declarative memory, episodic memory is the type of long term, declarative memory in which we store memories of personal experiences that are tied to particular times and places (Tulving, 1993).

[25] The HVLT-R reads a list twelve words to respondents three times and has them recall words after every round. The numbers above represent percent of Total Recall, which is the sum of the words recalled after all three rounds. After the first round (comparable to immediate recall in the HRS) adults 55-69 recalled 62 percent and adults 70-88 recalled 56 percent of the words read.

[26] Percentages are age adjusted.

The drawback in using this measure, in the HRS, is that the recall tests are only administered to those respondents who agree to take the test and who have the mental capacity to answer the questions.[27] The most cognitively impaired are selected out of the sample; therefore, it is important to note that the results in the paper should be interpreted as determinants of MCI and not necessarily dementia/AD.[28]

Examining the cognitive recall scores within the sample described above, Figure 1.1 shows the scores, over the period of 1998 to 2008, which appear normally distributed with a mean score of 10.5 words recalled. Figure 1.2 illustrates a trajectory of cognition by age for women score.[29] The trajectories show a slower rate of decline at younger ages and faster rate of decline for the oldest respondents. Additional patterns of cognitive functioning can be examined in the Technical Appendix Data Validity Section, available from author.

Contact measure. Ideally, data on parent and adult-child contact would be obtained through a randomized control trial, where varying levels of contact frequency or intensity could be imposed on the treatment group. In addition, ideal data would include detailed information about the activities parents and adult-children engage in or the degree of engagement between the two groups (contact intensity), the length of time they are engaged in these activities, and the nature of the relationship between parents and children. Unfortunately, such data is not available; however, the HRS asks respondents about the frequency of contact that they have with their nonresident biological children. This information comes from respondents answering how many times they have had contact with each child in the form of an in person meeting, telephone conversation, or by written communication in the last year. Specifically the respondent is asked to provide a number and qualify it in terms of days, weeks, months or years. These

[27] Non-response averages between 8 and 12.5 percent per wave, decreasing over time. In each wave, less than one percent of non-response was due to refusal, which should not bias results.

[28] Appendix Table A1.2, in the Technical Appendix, provides the summary statistics for those who have cognitive recall scores and those who do not. It supports the idea that the cognitive recall scores are indicative of MCI as those with missing data are older, have more contact with their children, have higher levels of health problems, have higher frequencies of living with their children, and have higher frequencies of children living within ten miles of their residence.

[29] The fitted model, based on a fully interacted quadratic ordinary least squares model, is $C_i = \alpha_0 + \alpha_1 age_i + \alpha_2 age_i^2 + \alpha_3 X_i + \alpha_4 X_i * age_i + \alpha_5 X_i * age_i^2 + \varepsilon_i$, where X_i is the characteristic of interest.

responses are used to calculate the days of contact for each child then contact days are added for all nonresident children.[30] Alternately, it is a measure of total child-contact days a respondent had with their children.

Returning to Table 1.1, women engage in contact with their children an average of 397 child-days. Figure 1.3 shows the distribution of the contact measure. It is evident that mothers tend to report contact with children with a relatively large amount of heaping that appears to occur in about 50 day, or 2.5 month, intervals. This is a result of most parents reporting contact in weeks and may bias results due to reporting error.[31] In 1998, the respondents from the original HRS cohort were not asked about contact with their nonresident children, only the new respondents for the CODA and War Babies cohorts. In this case the contact with children for the HRS respondents was calculated by taking the mean reported contact in the 1996 and 2000 waves.[32] The HRS did not ask any respondents about contact with their children in 2006, this wave is completely omitted from the analysis, as mentioned above. A limitation of this measure is that it does not provide any information about the nature of the interaction between parents and adult children, most importantly whether their interaction is active and cognitive stimulating in some manner, or passive.[33] There is also no ability to identify the duration of any child contact spell which can be very heterogeneous across individuals.

Health variables. Aging is associated with a higher prevalence of adverse health changes; thus, it is important to control for any health conditions that may potentially impact cognitive functioning (Bynum et al, 2004). The vast array of health information available in the HRS allows for various

[30] Respondents who said they saw one child multiple times in a day were coded as having only one contact per day with a maximum for 365 days for any child.
[31] This bias, if any, will result from estimation and not inability to recall contact as respondents with proxy respondents and those who are not able do not qualify to take the Immediate and Delayed Recall questions are not included in the sample.
[32] Analyses were done omitting the 1998 wave (with variations using both the 1998 and 2000 baseline characteristics, separately); there were no statistical differences in the results across all the models therefore the observations for 1998 are kept in all analyses in this paper. An indicator variable is included in all models to control for the interpolated data or for observations where contact was not reported for all nonresident adult children, 17 percent.
[33] The 2004 and 2008 waves asked a random subsample of respondents about contact frequency by mode of contact (in person, telephone, or written) and about their overall perception about their relationship with all of their children through a battery of questions. Analysis for these measures is measures are included in Tables 1.6 and 1.8.

conditions can be controlled in the analysis. Specifically, models include a baseline measure of The Center for Epidemiologic Studies Depression Scale (CES-D), number of chronic illnesses, any limitations in activities of daily living (ADLs) and any limitations of instrumental activities of daily living (IADLs).[34] These controls are similar those used in Ertal (2008). The models also control for other functional limitations, and fine motor index at baseline.[35] Table 1.1 shows descriptive statistics for these conditions.

Methods: How Contact Predicts Cognitive Functioning

The Grossman (1972) health production model, in which an individual receives utility from health, is used to examine whether more contact between parents and their adult children results in higher levels of cognitive functioning in old age. While parent-child contact is not assumed in the original model to be an investment in health production, this paper treats the frequency of contact with adult children is a time investment in one's health through the direct and indirect mechanisms mentioned above. The goal of this study is to examine the marginal product of contact with their children in producing cognitive functioning. In the Grossman model, an individual receives utility from health and the consumption of other goods. Health can be produced by combining various inputs, such as medical care and time. The level of health investment is set where the marginal benefit from investment in health equals the marginal cost of investing. The specific investment in this case is contact between an older parent and their nonresident adult children. However, the parent is not the only one who determines the level of contact

[34] The CES-D is the sum of five "negative" indicators and two "positive" indicators (reversed in definition to be negative resulting in a scale of 0 to 7). The negative indicators measure whether the respondent experienced the following sentiments all or most of the time: depression, everything is an effort, sleep is restless, felt alone, felt sad, and could not get going. The positive indicators measure whether the respondent felt happy and enjoyed life, all or most of the time. The number of chronic illnesses is the sum of the following conditions: high blood pressure, diabetes, cancer, lung disease, heart problems, stroke, arthritis, and/or back pain. Problems with ADLs is the report of having problems with any of five tasks of bathing, eating, dressing, walking across a room, and getting in or out of bed. Problems with IADLs is the report of having problems with any of the five tasks of using the telephone, taking medication, handling money, shopping, preparing meals.

[35] Other function limitations include having difficulty with one for the following tasks: walking several blocks, walking one block, sitting for about 2 hours, getting up from a chair after sitting for long periods, climbing several flights of stairs without resting, climbing one flight of stairs without resting, lifting or carrying weights over 10 lbs, stooping kneeling, or crouching, reaching arms above shoulder level, pushing or pulling large objects, and picking up a dime from the table. The fine motor index uses the picking up a dime, eating, and dressing activities.

that is received. A child has his or her own utility function, which may be maximized at a different level of contact than their parents may desire, given the other activities they may want to participate in; therefore, the observed level of interaction is one that jointly maximizes utility. Put another way, observed contact is the equilibrium between parental demand for contact and children's supply of contact.

Supply of contact is not exogenous. Problems of endogeneity arise because children's contact is a function of parental cognitive functioning. This would lead to a non-monotonic relationship between child contact and parent cognition, i.e. as cognitive functioning begins to decline adult children are less likely to enjoy interaction with their parents and contact will decrease; however, as cognitive functioning continues to decline the supply of contact will increase again in order to provide parents with help and supervision. Identification requires an exogenous source of variation in the supply of contact to independently predict the effect of contact. The source of variation used in this analysis is the number of female children, given the number of children an individual has; see *Instrumental Variables (IV)* below.

Ordinary Least Squares (OLS)

The first step is to determine whether contact between parents and their adult, nonresident children exhibit the same patterns as those found in previous research on overall contact and cognitive functioning. The OLS model is

$$C_{ij} = \beta_0 + \beta_1' X_{i0} + \beta_2 contact_{ij} + \varepsilon_{ij} \qquad (1)$$

where C_{ij} is the cognitive recall score, as accessed by the Immediate and Delayed Recall Scores, for person i in round j; X_{i0} is the matrix of baseline covariates and $contact_{ij}$ is the measure of contact. There is no previous work examining the relationship between the frequency of contact with children and cognitive functioning; therefore, several functional forms of contact are examined in the OLS specification to determine the most appropriate way to model contact. The functional forms examined here are a linear and squared term and a log-normal transformation.[36] The data are pooled; therefore, the

[36] A set of dichotomous variables for quintile in the contact distribution as a nonlinear specification and linear and log transformed models controlling for whether a parent had daily contact with their children was also implemented. Results are in the Technical Appendix; available from author.

standard errors are clustered on the individual level. The variables in vector X_{i0} include race, years of education, number of children, age, and age-squared, as well as, work status, log income, log wealth, marital status and health conditions measured at baseline.[37] Clustered standard errors account for the correlation of errors on the individual level due to the pooled nature of the data.

Quantile Regression

OLS provides coefficient estimates that are based on the conditional mean of the conditional-on-covariates distribution of cognitive functioning. If the distribution of cognitive functioning is symmetric then the conditional median and conditional mean are equal and the quantile regression at the median and the OLS results will be the same. However, along the cognitive functioning distribution, the distribution of covariates, such as contact, may change. As hypothesized in the health production model above, the relationship between cognitive functioning and contact is non-monotonic, suggesting that the distribution in contact changes across the distribution of cognitive functioning. A quantile regression examines the association between cognitive functioning and parent-child contact for different points along the cognitive recall distribution allowing for the observation of change in the distribution of contact. The quantile regression provides information about the effects on the sample distribution, not individual respondents. Therefore, the results from these indicate whether those at certain levels of cognitive functioning benefit from the receipt of more contact from their children over those individuals who do not.

Instrumental Variables (IV)

Equation (1) models the relationship between contact of parents and children with the assumption that contact is exogenous; however, as stated earlier contact may not be exogenous, but a product of a host of underlying factors, such as the marital status of parents, health of the parents, etc. Furthermore, contact with children is also a function of children's desires to interact with their parents, which could be either altruistic or motivated by expected financial gains, such as receipt of a bequest or in-vivo transfers (Becker, 1991: Altruism; Cox, 1987: Exchange Theory). Contact with children may also be a result of a

[37] The variables age, age-squared, number of children and marital status are time variant.

parent's failing health. An estimated 11 million family members, friends, neighbors and other unpaid caregivers provide about 12.5 billion hours of care annually for patients with some dementia valued at $144 billion dollars in 2009 (Alzheimer's Association, 2010), suggesting that reverse causality between contact and health exists.[38] Given that parents cannot be randomized into groups that keep in touch with their kids to varying degrees, the next section of analysis attempts to explain levels of contact, independent of any of the endogenous reasons for why certain parents would receive more contact than others, with a quasi-experimental method.

Using an instrumental variables approach, the natural variation in the gender mix of a family's children is exploited to predict the level of contact a parent may receive from her children. An instrument is only valid if it predicts the endogenous variable of interest and is not correlated with the error term in the estimation of the independent variable, Equation (1). The gender of a particular child is random and provides a natural experiment. If parents have a gender preference they cannot influence the sex of their child and can only affect gender mix by having additional children, holding number of children constant (Dahl and Moretti, 2008; Angrist and Evans, 1998); thus, gender mix, or the proportion of children of either gender, is the result of random natural processes and should not affect cognitive functioning many years after fertility decisions have been made. Number of children is not itself exogenous as total fertility is associated with socioeconomic factors that are also correlated with cognition such as education (Michael, 1973) and labor force participation (Devaney, 1983). Other stimuli, such as distance between parents and children or expected bequests, may be supply shifters; however, these examples do not provide clean natural experiments due to their correlations with the first stage error term.

The number of female children, or gender mix, is an appropriate predictor of contact between parents and children based on the intergenerational care literature, where women are referred to as "kinkeepers" because they are more likely to maintain connections between family members (Rosenthal,

[38] This estimate, done by the Alzheimer's Association (2008), is based on hours of care valued at $11.50 per hour, which is the average of the minimum wage ($6.55 per hour) and the average wage of a home health care aide in July 2007 ($16.44 per hour).

1985; Hagestad, 1986). It is expected that those parents who happened to have a larger number of female children will have more contact with their children than those parents who have more male children. Figure 1.4 supports this hypothesis illustrating that the average number of contact days between parents and children increases as the number of female children increases. Previous literature that has made use of child gender to instrument for endogenous processes include Ananat and Micheals (2008) and Bennedsen et al. (2007) , both using dummies for male first born children as instruments for divorce and family firm succession, respectively.

Contact is modeled by Equation (2), including Z_{ij} for instruments (i.e. the first stage of estimation):

$$contact_{ij} = \gamma_0 + \gamma_1' X_{ij} + \gamma_2 Z_{ij} + \varepsilon_{ij} \qquad (2)$$

The first stage results are used to compute an alternate estimate of β_2, β_{2IV}, by using the covariates from the Equation (1) in instrumental variable (two-stage least squares – 2SLS) estimation. This method allows for the calculation of a consistent estimate of the effect of the contact with children on cognitive recall scores. Instrumentation also eliminates any reporting error in the first stage with the independent estimation.

Results

Ordinary Least Squares

As previously stated, there is no existing analysis of the frequency of contact between parents and adult children and cognitive functioning. Using two different functional forms of contact, the first analysis examines the relationship between the contact and cognition. The OLS results in Table 1.2 show the coefficients on the various specifications of contact by gender. For each functional form, the results for women indicate that there is a significant positive relationship between contact and cognitive recall.[39]

[39] The cognitive recall scores were also treated as count variables in a Poisson model and fixed effects, generally estimated equations and lagged models were examined. No models yielded results quantifiably different from the OLS models. Models were also run with bounded values on missing contact data. Neither setting all missing values

In Model 1, where the contact variables are a linear and squared term for contact, the terms are significant at the five and ten percent level, respectively. While small in magnitude, it appears there is a diminishing return to increased contact from children; however, a woman would have to have more than 625 days of contact from her children in order for contact to be a negative impact on her cognition. Women who have less than a year of contact with their children, for example 9 months or 270 days, have a 0.11 word increase in their cognitive recall or a one percent increase for those who score at the mean of 10.54 words; however, women who have 365 days of contact with their children receive a 1.2 percent increase and women who have 625 days of contact with their children have a 1.5 percent increase in their cognitive scores.[40]

The next model, Model 2, examines the natural-log transform value of days of contact. Here the significant positive relationship between contact and cognitive recall can be interpreted as a one percent increase in contact being associated with a 4.2 percent increase in word recall. At the mean, 10.54 words, this would increase word recall to 11 words. The log transformation provides an easier interpretation of nature between contact and cognition than Model 1 and none of the other covariates are statistically different across models; therefore, the rest of the analysis will focus on this functional form.[41] The remaining coefficients for the covariates in the models in Table 1.2 are consistent with the extant literature. A discussion of the association between the remaining covariates and cognition can be found in the Technical Appendix.

Fixed effects models, not shown, were run to control for individual heterogeneity and confirm that holding invariant characteristics constant continues to yield the same association between contact and cognition.[42] The fixed effects model, however, is limited in getting around the issue of selection as

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to 0 or maximum possible contact value changed the results significantly. The maximum possible contact value is equal number of possible child contact days based on number of children (i.e. 365 for 1 child, 730 for 2 children, etc.). All results available from author.

[40] Nine months of contact is arbitrarily chosen simply for interpretive reasons. 625 days is the maximum point of quadratic specification.

[41] Results for all analysis is available for each functional form from the author.

[42] The fixed effects models include only time variant characteristics: age, age-squared, number of children, and marital status.

individual fixed effects only captures individual heterogeneity; however, it does not address the heterogeneity in the level of contact provided by the children. Fixed effects models only eliminate the time invariant characteristics of the children, but would not address the changes in behavior the children made because of their parents' cognitive functioning. In addition, number of children is time-variant and that variation comes from losing a child, which affects the level of contact a parent receives from their children.

Quantile Regression

As mentioned above, the distributions of contact as well as other observables may change along different points of the cognitive functioning distribution. Table 1.3 examines the association between contact and cognition along various points of the distribution of cognitive recall scores. The association between contact and cognitive functioning remains the same across the distribution of cognitive scores; however, the results from these models support the existence of selection bias between contact with children and cognition.

Those at the median of the cognitive recall distribution receive similar benefit from increased contact with children and those in the 75^{th} percentile of the contact distribution have an association between contact and cognition that is over one and a half times as large as the OLS estimate, while the lowest and highest deciles exhibit no benefit from contact. The lowest decile of the distribution may have a level of cognitive impairment low enough that contact is a result of failing health, reinforcing the idea that contact may be a product of cognitive decline and therefore endogenous. The highest decile receives no significant benefit from more contact likely due to those in the upper end of the distribution being able to engage in other forms of social engagement such that the marginal product from additional contact with children is negligible.

The association between contact and cognition is strongest within the interquartile range. Those in the middle of the cognitive distribution appear to benefit from increased levels of contact from their children than those in the same segment of the distribution who receive less contact. The largest

association appears to be for those in the 75th percentile of the distribution. The individuals at that point of the distribution will have experienced the least cognitive decline therefore the marginal product of contact is largest at that point of the distribution.

Two-Stage Least Squares

Now that the relationship between amount of contact and cognition has been established, the 2SLS model can be examined. As stated before, the instrument used in this analysis is the number of female children controlling for the total number of children. Table 1.4 indicates that the number of female children strongly predicts contact with parents, column1. The first-stage estimation shows that the instrument has enough power to predict contact, with an F-statistic above 10 for the endogenous contact variable, F=38.72. The third column shows the second stage results. There appears to be no causal relationship between contact and cognitive scores for women. These results are not surprising, as the reduced form equation, second column of Table 1.4, where the instrument is substituted for contact variable (in Equation (1)), does not indicate a statistically significant relationship between number for female children and cognition. If the coefficient in the reduced form models was statistically significant, it would be assumed that the path through which child gender mix affects cognitive functioning is contact and does not itself directly affect cognition. The Hausman tests reject exogeneity, p=0.011, indicating the OLS estimates are not consistent and therefore the 2SLS estimator provides the better results for examining contact frequency and cognition.[43]

A check to see if contact with children has an effect on elderly cognitive functioning was done by including the sample of respondents who have never had children into the analysis sample, see Table 1.1 for summary statistics. The assumption is that individuals with no children, and by default have no contact treatment, should be statistically different from those respondents with children if contact with children effects cognitive functioning. The OLS results, not shown, do not vary statistically from the OLS results in Table 1.2 and the coefficient on No Children is insignificant. The 2SLS results (fourth

[43] LIML and GMM specifications were also run, with no difference in the results.

column of Table 1.4) do not yield statistically different results from those in the third column and the coefficient on No Children, while negative, is not statistically significant. These estimates do not reject OLS as the consistent estimates, but provide further evidence that the relationship between parent and adult-child contact is a result of selection and not causal.[44]

Exploring the Selection of Adult Child Contact

The OLS results in Table 1.2 show significant association of the frequency of child contact on mothers' cognitive functioning, but Table 1.4 fails to show a causal relationship of contact in the instrumental variables approach, suggesting that heterogeneous treatment effects of contact on cognitive functioning may exist. Quantile regressions, Table 1.3, indicate that those at various points of the cognition distribution have differing associations with contact, which is not captured in the OLS results. The following analyses attempt to examine the association between parent-child contact and cognitive functioning by focusing on various factors that predict contact. Table 1.5 examines living arrangements, Table 1.6 examines mode of contact, and Table 1.8 examines quality of parent-child relationships.

Different living arrangements of parents who do not live with their children (e.g. those who live independently as opposed to an assisted living environment or those who live further from their children) may mediate the connection between contact and cognition. Table 1.5 examines this possibility. The left panel examines individuals by whether they live independently or in an assisted living situation.[45] The coefficients on the contact variables are consistent with previous models; however, residing in an assisted living environment is associated with a significant loss of almost a full word of recall. The interaction term is not significant indicating the rate of cognitive decline does not differ from those who live independently.

[44] Results for both OLS and 2SLS models for the sample with childless respondents are available from author.
[45] Assisted living is defined by any individual who responded to living in a nursing home, senior citizen housing, retirement community/center, or assisted living. While each of these may differ in the amount of independence for one's personal care, there are too few respondents who report living in any one of these places and are eligible for the Immediate and Delayed Recall questions to analyze them separately. Due to lack of sample size these models are also run using fully interacted models to preserve sample size.

Another mediator of contact on cognition could be the proximity to ones' children; parents or children may have moved closer to each other because of a parent's declining health (in this case cognition). The right panel of Table 1.5 continues to show the same pattern of contact on recall scores, with significant coefficients on days of contact and proximity to children. Those who live closer to their children have a recall score half a word lower than those who live further from their children, but again the rate of change does not differ.

While days of contact is an interesting measure in its ability to capture the frequency of contact between parents and their nonresident, adult children, an important question arises about the type of contact parents and children are engaged in. As mentioned before, the HRS does not have record of the types of activities individuals engage in with their children, but it does provide, in the 2004 and 2008 waves, some information about the mode of contact between parents and their children.[46] A random subsample of respondents were chosen to answer questions about how often they have in person, phone or written contact with their children by mode of contact.[47]

Figures 1.5a-1.5c show the distribution of answers for each mode of contact by the quartile of contact they report to have with their children in days (in the original measure). Figure 1.5a examines "In Person" contact. Those in the highest quartile of contact have seen at least one of their children weekly.[48] The lowest quartile of contact days generally sees any of their children monthly.[49] Figure 1.5b looks at "Phone" contact. Those in the highest two quartiles of contact primarily had phone contact 3+ times a week. This indicates that those reporting high levels of contact with their children are largely referring to phone calls; again these phone calls may result from both supervision and closer relationships. Those who have the least amount of contact still report having relatively frequent phone contact (1-2 times a week to 1-2 times a month). Phone contact frequency is highest in large part because it may be the

[46] The 2006 wave also includes these variables, however because contact was not measured this information could not be used.
[47] The answers were ranged from "3+ times a week" to "less than once a year or never."
[48] The responses were primarily "1-2 times a week" or "3+ times week."
[49] The responses were primarily "1-2 times a month" or "every few months."

cheapest form of contact. First, it does not require any extra time or travel to achieve interaction and, in the case of written contact, it does not take any time to wait for a response, nor does it require parents to learn new technologies to engage in (e.g. e-mail and computers). Figure 1.5c shows that across all contact quartiles most respondents state they have written contact less than once a year or never with their children.

The responses to these questions allow for the construction of days of contact by mode.[50] Table 1.6 examines how "Phone", "In Person" and "Written" contact relates to cognitive scores. For the full sample, only written contact is a significant predictor of cognition; however, results broken down by living arrangement show significant associations for mode of contact for women. For women in assisted living, increased "Phone" and "Written" contact is associated with higher scores. Again, the case for selection is supported as parents can only engage in telephone contact if they are able to comprehend who the person on the other end is and understand the conversation or written contact if they are able to read and write. Increased meetings with children for those in assisted living may indicate that a respondent may not be able to engage in phone or written contact often or at all supporting reverse causality; although children who are more altruistic or have better relationships with their mothers would also be more inclined to make personal visits with their mothers. If the first case is true, then the negative, coefficient on "In Person" contact, although insignificant, is the expected result. Proximity to children show similar results with positive significant results for written contact for those who live within ten miles of their children and negative significant results for "In Person" contact for women who live further than 10 miles from any of their children.

The final set of analyses attempts to examine how perceived quality of the parent-child relationship could influence how contact impacts cognitive functioning. In 2004 and 2008, the same respondents that were asked about the mode of contact with their children, were also asked questions

[50]The mean number of contact days that could be had per group (e.g. 3+ times a week is assigned an average of 5 days of contact per week multiplied by 52 weeks which equals 260 days contact). This measure is cruder than days of contact due to the broader categories of contact frequency.

about the nature of the relationship with all of their children. Six questions were asked about the parent's perceived relationship with all their children.[51] Table 1.7 shows the factor loading matrix indicating the positive questions load on the first factor and the negative question regarding criticism loads as the second factor. Two variables "supportive", the average of the 3 positive questions, and "critical" are created to represent parents' relationships with their children.

Table 1.8 shows the OLS results when these factors are included in the model. There are no significant coefficients for contact or quality of relationship when only the indexed variables are included, which indicates that quality of relationship between parents and children mediates the influence of contact on recall, but does not influence it directly.[52] When interactions terms are included for quality and contact, the coefficients continue to be insignificant. The rate of decline is faster for those who perceive their children to be critical of them. This again supports selection as those may be starting to experience cognitive decline and may perceive their children's attention to their cognitive deficits to be critical of them and not helpful.

The previous three sets of analysis, by living arrangement, mode of contact, and relationship quality all indicate that selection has a large role in predicting the effect of parent-child contact on cognitive functioning.

Conclusion

The rise in the elderly population, with the aging of the Baby Boomers, is of great concern among policy makers. With the rapid increase in the proportion of older individuals, the nation will be burdened with obligations of medical, retirement and disability benefits to retirees (Lee and Skinner, 1999). The

[51] A seventh question of how demanding one's children were perceived to be was also available in 2008, but is left out of the analysis for consistency between the two years. Three questions asked about positive aspects of their relationships with their children, and three about negative. All negative questions were recoded onto the positive scale (e.g. from lowest to highest) and a factor analysis was done to examine the correlation between these questions to find a more parsimonious set.

[52] The insignificant coefficients on quality of relationship could also be insignificant because CES-D scores are included in these models which could be absorbing the effect of the quality measures. Excluding CESD score does not change the estimates, results not shown.

health care system will be overwhelmed by larger numbers of patients seeking care for chronic conditions while facing a shortage health care professionals with geriatric training (Committee on the Future Health Care Workforce for Older Americans, Institute of Medicine, 2008). With age comes a wide variety of health problems, risk of cognitive decline and dementia among them. Currently there is no cure for dementia and costs for the care of those affected by the disease are not trivial. While research continues to search for better pharmaceutical treatments, there is an increase in research being done on lifestyle choices and their influences on cognitive functioning. This paper examined one such factor, the time spent with children, to determine whether there is more than an associative connection with cognitive functioning.

The first objective was to determine whether spending more time with children was linked to cognitive outcomes for elderly adults. The motivation for parent and adult child contact and its association with cognitive functioning can be a result of selection, direct causation or reverse causality, e.g. children increasing contact to supervise their parents' declining health. The OLS results show that contact with children is positively associated with better cognitive recall scores for women. The quantile regression results suggest contact is associated with increased scores for women in the interquartile range of the cognitive distribution, specifically, those in the 75^{th} percentile of the cognitive distribution.

Unfortunately the data do not provide information about the nature of activities during the time spent between parents and children, the duration of time spent engaged in interaction, or the quality of relationship between parents and children. Later waves do include limited information on the closeness respondents feel with their children and mode of contact. The analysis of these data supports both selection in contact and reverse causality. Future research is planned to utilize the American Time Use Survey to examine how it is that the elderly spend time with their adult children.

The second aim of this paper tested whether a causal relationship between the frequency of contact and cognitive functioning exists. Results did not show any causal relationship between contact with their children and cognitive scores. Several explanations exist for the null result found in the two –

stage least squares estimation of the causal relationship between contact frequency with children and older parents. First, as the Hausman test suggests, the 2SLS estimator is the valid estimator of contact on cognition, and there is no causal relationship. Second, the local average treatment effect estimated on the variation of female children as the exogenous predictor for differing levels of contact may not pick up the aspect of contact that is relevant to cognition. Third, the data on contact may not be adequate for examining how contact affects cognition. Contact quality and not contact frequency may play a greater role in protecting against cognitive decline; however, the nature of the data in the current analysis does not allow for the measurement of contact quality, i.e. cognitively stimulating or not.

Previous studies on social engagement and cognitive functioning have found that more forms of social contact are correlated with higher levels of cognition. The current work made the first attempt to identify the causal nature of this association by focusing one aspect of social engagement. The evidence indicates that relationship between higher levels of contact between elderly parents and their adult, nonresident children is not causal but an artifact of selection. Policy recommendations like those proposed by Bassuk et al (1999) for the development of social policies and programs that promote social engagement for older individuals will help keep them involved in their communities and stay cognitively stimulated. Public health professionals however should be conscious of the difference between association and causality and not rush to promote social engagement as a tool to slow or delay cognitive decline. Instead social engagement should be promoted and monitored as a potential signal for cognitive problems if significant social isolation becomes apparent. In particular, children can be advised to observe their parents' behavior to analyze whether they perceive noticeable changes in the levels of interaction initiated by their parents. The lack of causal evidence in the paper has shed light on several important aspects of relationship between contact and cognition and provides a foundation for more research to be done into the nature of interaction between parents and their adult children that may be protective against cognitive decline.

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Tables and Figures

Table 1.1: Summary Statistics of all Variables

	Nonresident Sample		Nonresident Women		Resident Sample		No Children	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Dependent Variable								
Cognitive Recall Score	10.12	3.52	10.54	3.55	10.03	3.66	9.87	3.90
Contact Variables								
Days of Contact - Total Child Contact Days	377.82	294.91	396.83	297.87	384.99	319.49	0.00	0.00
Ln(Days of Contact)	5.47	1.35	5.58	1.19	5.43	1.38	-4.61	0
Instrument								
Number of Female Children	1.40	1.13	1.41	1.14	1.84	1.34	0.00	0.00
Control Variables								
Female	0.59	0.49	1.00	0.00	0.66	0.47	0.60	0.49
Black	0.06	0.24	0.07	0.25	0.14	0.34	0.09	0.28
Hispanic	0.04	0.19	0.04	0.19	0.12	0.32	0.03	0.17
Baseline Characteristics								
Age	68.43	9.37	68.54	68.28	65.65	9.75	69.31	12.21
Years of Education	12.62	2.85	12.44	12.89	11.84	3.34	12.89	3.50
Work Status	0.46	0.50	0.40	0.49	0.50	0.50	0.44	0.50
Log Income	9.89	1.07	9.81	1.06	9.07	1.38	9.86	1.41
Log Wealth	10.89	2.69	10.78	2.81	9.47	3.24	10.42	3.57
Never Married	0.00	0.07	0.01	0.07	0.01	0.10	0.34	0.47
Partnered	0.02	0.14	0.02	0.13	0.01	0.10	0.02	0.15
Married	0.65	0.48	0.57	0.50	0.55	0.50	0.27	0.44
Divorced	0.12	0.33	0.13	0.33	0.15	0.36	0.14	0.35
Widowed	0.20	0.40	0.29	0.45	0.28	0.45	0.23	0.42
Health Conditions at Baseline								
CES-D score	1.37	1.80	1.52	1.88	1.67	1.96	1.46	1.77
Number of Chronic Illnesses	1.45	1.19	1.46	1.20	1.47	1.24	1.50	1.26
Activities of Daily Living Problems	0.22	0.74	0.24	0.78	0.27	0.82	0.31	0.88
Other Functional Limitations	2.32	2.68	2.73	2.83	2.61	2.88	2.38	2.77
Instrumental Activities of Daily Living Problems	0.19	0.58	0.24	0.62	0.26	0.68	0.23	0.63

Table 1.1 Continued	Nonresident Sample		Nonresident Women		Resident Sample		No Children	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Fine Motor Skill Problems	0.12	0.40	0.13	0.41	0.14	0.42	0.15	0.44
Other Characteristics								
Proxy Respondent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Live with Children	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Live in Assisted Living Environment	0.03	0.16	0.03	0.17	0.01	0.08	0.03	0.18
Children Live within 10 Miles	0.59	0.49	0.61	0.49	0.62	0.49	0.25	0.44
Foreign Born	0.06	0.24	0.06	0.24	0.11	0.31	0.06	0.23
Sample Size	45888		27699		7308		2921	

Note: All means are weighted. Initial Sample consists on all observations for respondents who were surveyed between 1998 and 2008, excluding 2006. The samples for resident respondents and those with no children include men and women. Summary statistics for the missing indicator variables can be found in the Technical Appendix – Appendix Table A1.1a, available from author.

Table 1.2: OLS Estimates of the Relationship between Contact with Children and Cognitive Recall Scores for Women

	Model 1		**Model 2**
Total Day of Contact	0.0005**	Ln(Total Days of Contact)	0.042**
	(0.0002)		(0.021)
Total Day of Contact Squared	-0.0000004*		
	(0.0000002)		
Number of Children	0.009	Number of Children	0.01
	(0.019)		(0.019)
Age	0.271***	Age	0.270***
	(0.035)		(0.035)
Age-Squared	-0.003***	Age-Squared	-0.003***
	(0.000)		(0.000)
Years of Education	0.238***	Years of Education	0.238***
	(0.012)		(0.012)
Black	-0.908***	Black	-0.910***
	(0.098)		(0.098)
Hispanic	-0.320**	Hispanic	-0.322**
	(0.135)		(0.135)
Never Married	0.061	Never Married	0.060
	(0.334)		(0.334)
Partnered	-0.094	Partnered	-0.096
	(0.183)		(0.182)
Divorced	0.314***	Divorced	0.314***
	(0.092)		(0.093)
Widowed	0.159**	Widowed	0.161**
	(0.067)		(0.067)
Baseline Characteristics			
Worked	0.283***	Worked	0.282***
	(0.068)		(0.068)
Log Income	0.144***	Log Income	0.143***
	(0.039)		(0.039)
Log Wealth	0.110***	Log Wealth	0.110***
	(0.021)		(0.021)
Health Conditions at Baseline			
CES-D score	-0.056***	CES-D score	-0.055***
	(0.016)		(0.016)
Number of Chronic Illnesses	-0.060**	Number of Chronic Illnesses	-0.059**
	(0.027)		(0.027)
Activities of Daily Living Problems	0.086	Activities of Daily Living Problems	0.086
	(0.060)		(0.060)
Other Functional Limitations	-0.040***	Other Functional Limitations	-0.040***
	(0.014)		(0.014)

	Model 1		Model 2
Instrumental Activities of Daily Living Problems	-0.344***	Instrumental Activities of Daily Living Problems	-0.343***
	(0.053)		(0.053)
Fine Motor Skill Problems	-0.088	Fine Motor Skill Problems	-0.089
	(0.101)		(0.101)
Year Indicators			
2000	0.059	2000	0.059
	(0.078)		(0.078)
2002	0.0641	2002	0.064
	(0.081)		(0.081)
2004	-0.149*	2004	-0.148*
	(0.082)		(0.082)
2008	-0.003	2008	-0.001
	(0.091)		(0.090)
Constant	0.293	Constant	0.249
	(1.283)		(1.289)
Observations	27699	Observations	27699
R-Squared	0.272	*R-Squared*	0.272

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. All estimates are unweighted. Standard errors are clustered on the individual. Models also included whether a respondent had a missing value for any demographic characteristics or baseline health conditions. Models were also run (separately) excluding the CES-D score and the interpolated contact data for the 1998 to determine whether these changes changed the results of the main model; the results were not statistically different.

Table 1.3: OLS and Quantile Regression Estimates of the Relationship between Contact with Children and Cognitive Recall Scores for Women

	OLS	Quantile Regression					
	Model 2	0.10	0.25	0.50	0.75	0.90	Observations
Ln(Total Days of Contact)	0.042**	0.040	0.035*	0.036*	0.071***	0.042	27699
	(0.021)	(0.029)	(0.021)	(0.020)	(0.025)	(0.027)	
R-Squared	0.266						

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered on the individual. Covariates include: age, race, years of education, number of children, marital status, baseline work status, (log) income and (log) wealth, baseline health variables, and whether any demographic characteristics or baseline health conditions are missing. See Table 1.2 for full models covariates.

Table 1.4: Two-Stage Least Squares (2SLS) Estimates of Relationship between Contact with Children and Cognitive Recall Scores for Women

	First-Stage OLS	Reduced Form		2SLS	2SLS w/ Childless Sample
Dependent Variable	Ln(Days of Contact)	Cognitive Recall Score		Cognitive Recall Score	Cognitive Recall Score
Number of Female Children	0.130***	-0.049	Ln(Days of Contact)	-0.375	-0.378
	(0.011)	(0.032)		(0.246)	(0.246)
Observations	27699	27699		27699	29575
R-squared	0.145	0.272	Hausman Test Statistic	6.50	2.41
F-Statistic	38.72	--	Hausman Test p-value	0.011	0.121

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All estimates are weighted with inverse probability weights to control for attrition. Standard errors are clustered on the individual. All models include the same covariates as shown in Table 1.2. In the last column, the coefficient on the "Childless" indicator variable is -3.640, $p = 0.116$.

Table 1.5: OLS Estimates of the Relationship between Contact with Children and Cognitive Recall Scores for Full Sample, by Living Arrangements for Women

Assisted Living		Children Live within 10 miles	
	Women		Women
Ln(Days of Contact)	0.035	Ln(Days of Contact)	0.044*
	(0.022)		(0.026)
Live in Assisted Living Environment	-0.822**	Children Live within 10 Miles	-0.509**
	(0.419)		(0.237)
Ln(Contact) * Assisted Living	0.039	Ln(Contact) * Children Nearby	0.057
	(0.075)		(0.042)
Observations	27699	Observations	26739
R-squared	0.273	*R-squared*	0.272

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All estimates are weighted with inverse probability weights to control for attrition. Standard errors are clustered on the individual. All models include the same covariates as shown in Table 1.2. Only 3% of the sample lives in an assisted living environment, therefore the models for living arrangements have been run with interaction terms to keep consistency and retain sample size. 61% of respondents have at least one child living within 10 miles. Assisted Living is defined by an individual living in any on for the following: nursing home, senior citizen housing, retirement community/center, or assisted living, due to lack for sample size.

Table 1.6: OLS Estimates of the Relationship between Mode of Contact with Children and Cognitive Recall Scores for Full Sample, by Living Arrangements for Women

	Full Sample	Assist Living	Not in Assisted Living	Child lives within 10 miles	Child does not live within 10 miles
Ln(Phone Contact)	-0.047	0.430*	-0.100*	-0.075	-0.066
	(0.060)	(0.248)	(0.059)	(0.087)	(0.083)
Ln(Person Contact)	-0.022	-0.345	0.009	0.052	-0.139**
	(0.040)	(0.241)	(0.040)	(0.055)	(0.068)
Ln(Written Contact)	0.074**	0.353*	0.063**	0.067*	0.08
	(0.030)	(0.210)	(0.030)	(0.038)	(0.049)
Observations	2464	90	2374	1458	1002
R-squared	0.260	0.553	0.253	0.248	0.293

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All estimates are weighted with inverse probability weights to control for attrition. Standard errors are clustered on the individual. All models include the same covariates as shown in Table 1.2. Data on mode of contact are only available in the 2004 and 2008 waves of the HRS.

Table 1.7: Factor loadings (pattern matrix)

Variable	Factor1	Factor2
How much do they really understand the way you feel about things?	**0.7347**	-0.3496
How much can you rely on them if you have a serious problem?	**0.7474**	-0.3764
How much can you open up to them if you need to talk about your worries?	**0.7513**	-0.4378
How much do they criticize you?	0.5265	**0.6387**
How much do they let you down when you are counting on them?	0.7242	0.2977
How much do they get on your nerves?	0.6621	0.4760

Note: Responses available are “a lot”, “some”, “a little” or “not at all”.

Table 1.8: OLS Estimates of Factor Analysis Relationship Quality Measures and Contact with Children and Cognitive Recall Scores for Women

	Baseline Mode	Interacted Model
Ln(Days of Contact)	-0.026	0.141
	-0.053	(0.124)
Supportive Children	0.033	0.041
	(0.098)	(0.288)
Critical Children	-0.053	0.388
	(0.074)	(0.253)
Ln(Contact)* Supportive		-0.001
		(0.050)
Ln(Contact) * Critical		-0.081*
		(0.044)
Observations	2694	2694
R-squared	0.269	0.270

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All estimates are weighted with inverse probability weights to control for attrition. Standard errors are clustered on the individual. All models include the same covariates as shown in Table 1.2. Data on "relationship quality" are only available in the 2004 and 2008 waves of the HRS.

Figure 1.1. Distribution of Cognitive Recall

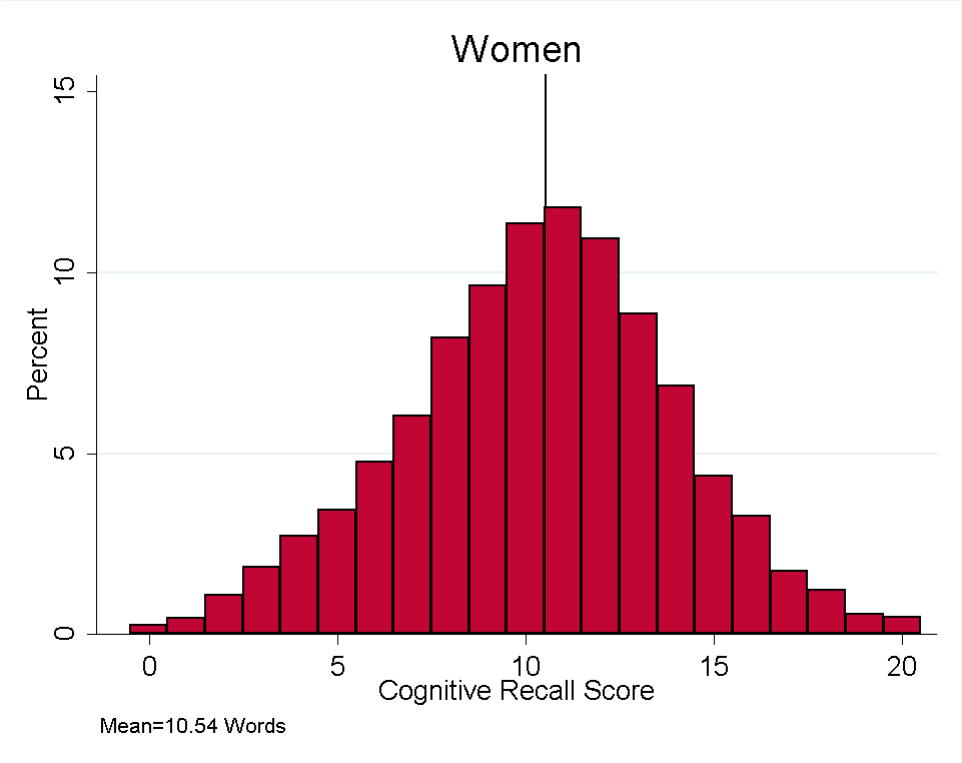


Figure 1.2. Cognitive Trajectories - Quadratic OLS Models

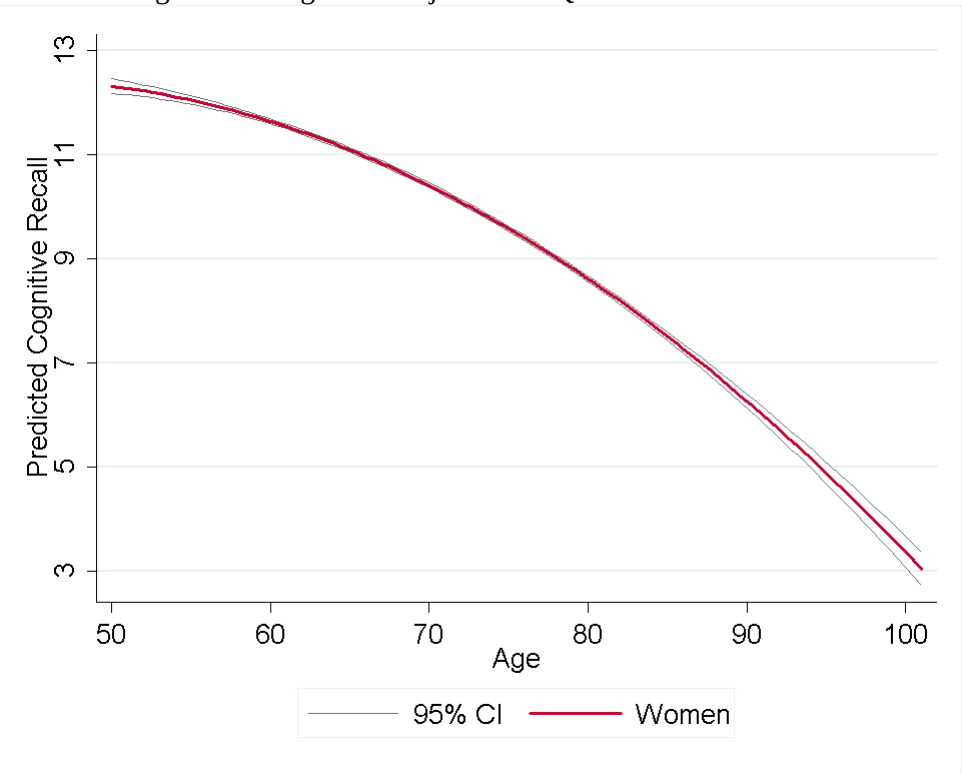


Figure 1.3. Distribution of Contact with Nonresident Children

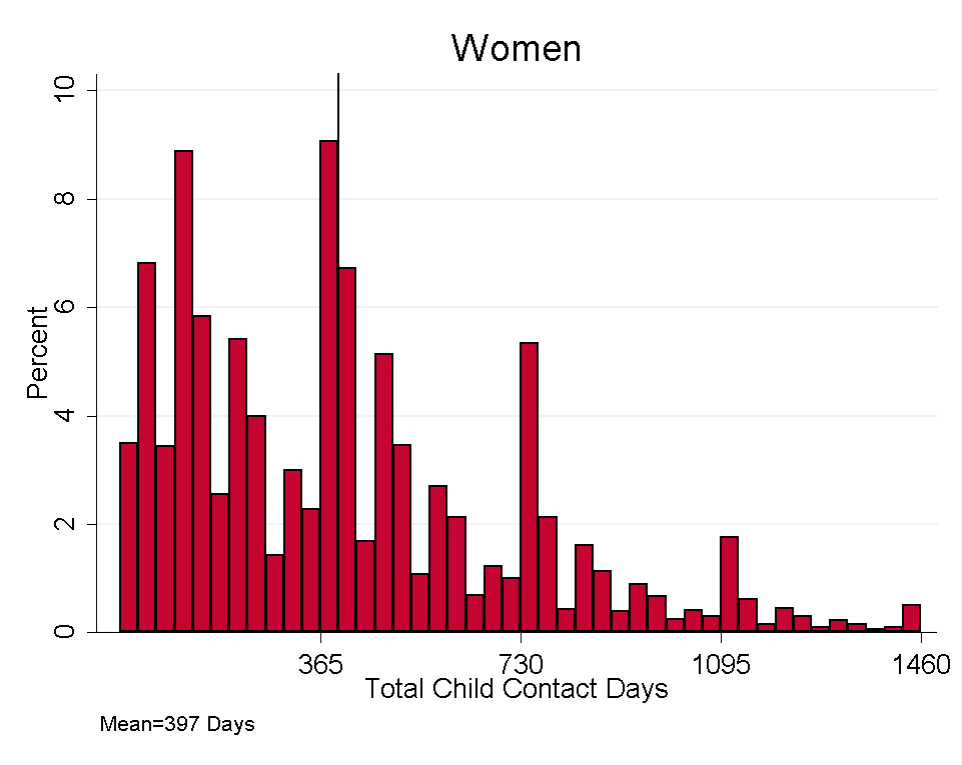


Figure 1.4. Days of Contact and Number of Female Children

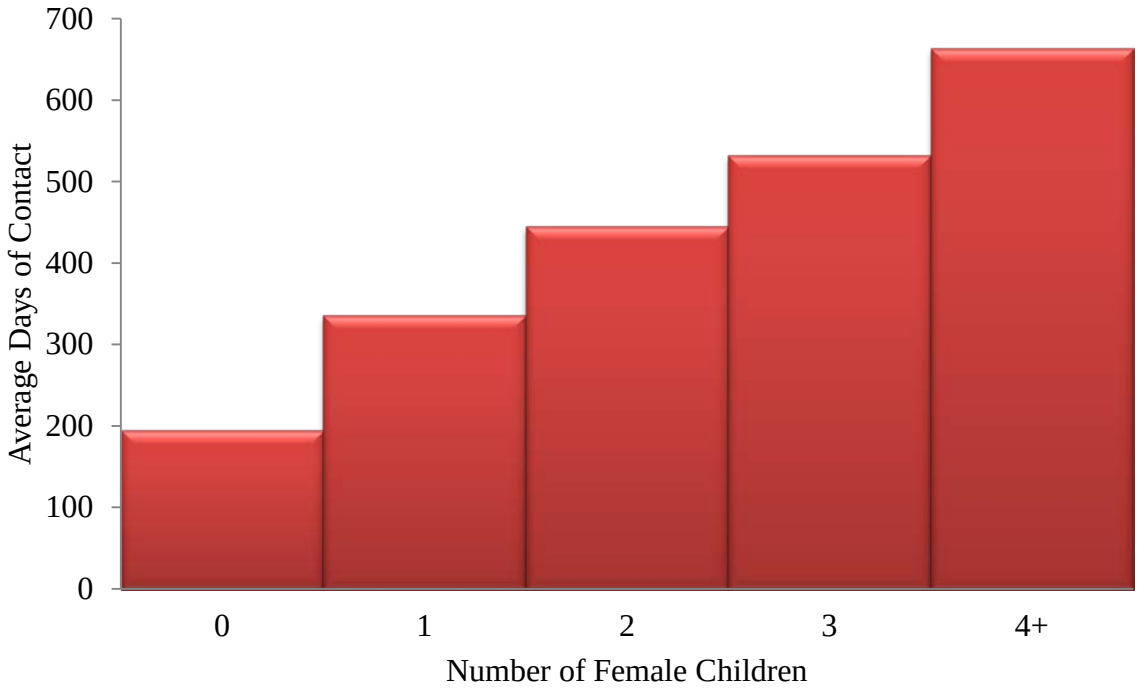


Figure 1.5a. In-Person Contact Frequency

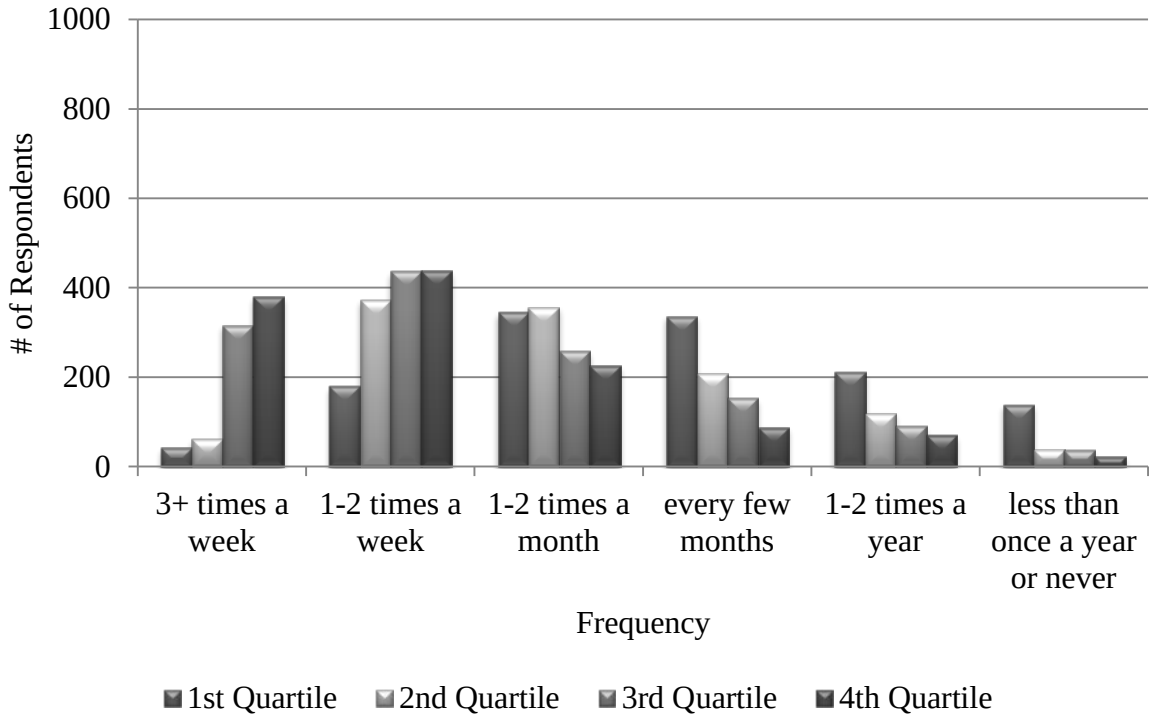


Figure 1.5b. Phone Contact Frequency

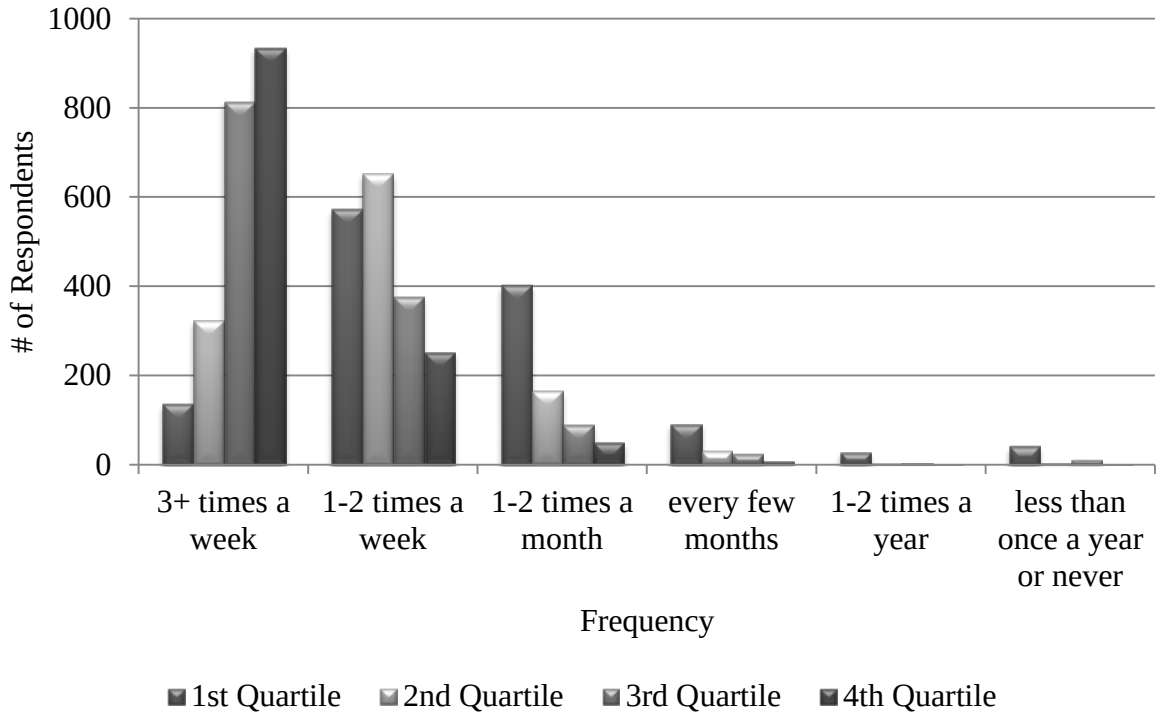
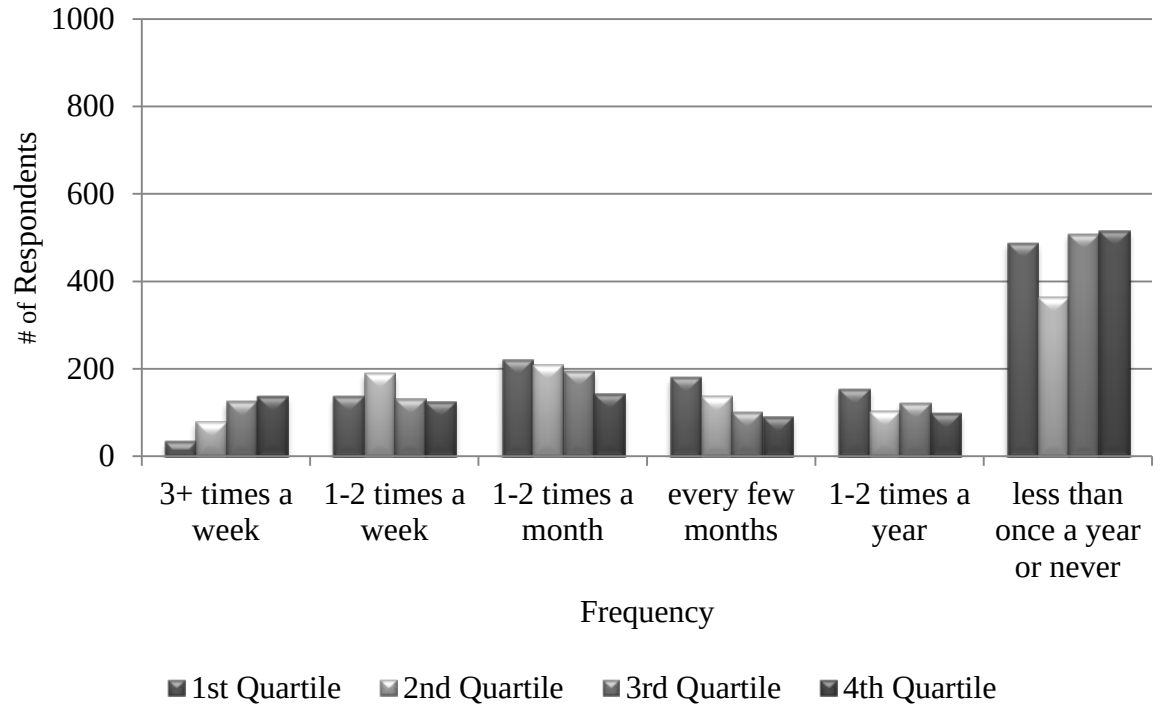


Figure 1.5c. Written Contact Frequency



Abstract

Previous literature has focused on observable family characteristics to explain the occurrence of intergenerational transfers. Specifically, economic theory focuses on resources of donors and needs of recipients. This paper assesses the power of subjective measures of altruism to explain intergenerational transfers. Hypothetical questions asked in the Health and Retirement Study that assess individuals' willingness to transfer income to others, are used to construct several measures of altruism toward specific recipients: children and parents. From these questions measures representing the respondents' indicated levels of altruism toward recipients are created. These measures are included in economic models of intergenerational transfers to evaluate the additional explanatory power of stated altruistic preferences on observable transfer behavior. Results indicate that higher levels of altruistic preferences are associated with higher probabilities of transfers and larger transfer amounts from respondents to children; however, transfers to parents do not appear to be related to the altruism measure.

Introduction

Families have been undergoing many changes in demographic, social and economic nature that have significantly affected family behavior. Increases in divorce and nonmarital childbearing have weakened ties within families. Simultaneously, a rise in the number of individuals who remarry and cohabit, as well as, the growth of multigenerational families, due to increased life expectancy, has resulted in greater family complexity. Remarriage and cohabitation, also result in an introduction of new members into family networks that might alter existing familial obligations between members. Additionally, policy changes loom on the horizon in social safety net programs such as Social Security, Medicare and Medicaid. All of these changes increasingly confound long-standing family dynamics such as intergenerational transfers and care. As people continue to live longer and family structures become more complex, the question of who will care for whom throughout the life course takes on greater significance.

One form of care that remains important throughout the life course is that of financial support. Individuals transfer money within the family to cover a wide variety of needs; investment in the human capital of children, facilitating purchases of expensive durable goods, and assisting each other in times of financial hardship. Economics and sociology have proposed two overarching models to explain the occurrence of intergenerational transfers (for recent synopses see Bianchi, Hotz, McGarry, & Seltzer, 2008; Peters & Ünür, 2001): exchange and altruism. This paper focuses on the second of these two hypotheses for intergenerational transfers by utilizing experimental questions from a module administered in the Health and Retirement Study (HRS) in 1996 that measure attitudes about giving within the family. The responses to these questions, the stated preferences for willingness to transfer money to individuals within the family under hypothetical conditions, are interpreted as the degree to which a person is altruistic towards that individual. The responses to these survey questions are examined to access the degree to which individuals differ with regard to giving between recipient groups and for within person consistency across recipient groups: adult children and elderly parents. Subsequently, how those

responses reflect household transfer behavior is examined to determine whether controlling for such preferences yields any additional explanatory power to traditional intergenerational transfer models.

The results from this work provide greater insight in to the motivation or preferences individuals may have when transferring money to family members. Furthermore, the traditional economic approach for identifying altruistic behavior from revealed preferences is modified by using direct measures of altruism. Family structures and behaviors are changing with family ties becoming more complex and social programs being relied upon to help those with less financial stability. Therefore, it may be that individual altruistic preferences will help determine which recipients will suffer due to the crowd out from current and future government transfer programs.

Theoretical Motivation

There are two main hypotheses that aim to get at the motivation behind (interfamily) transfer behavior. The first concept, commonly known as exchange theory, is based on transfer behavior stemming from individual self-interest which results in transfers being made as some form of exchange or obligation for the recipient to reciprocate at some point in the future (Cox, 1987). Thus transfers to children would be made with the assumption that those children would later make transfers back to parents in the future either through time, money or care, while transfers to elderly parents from adult children would be explained as fulfillment of the obligation they have to their parents for the investments made earlier in their lives or because of the promise of receiving more money in the future through bequests (Bernheim, Schleifer, & Summers, 1985). Two offshoots from this theory are the "demonstration effect" proposed by Cox and Stark (1996), where family transfers are a result of behavioral imitation (i.e. repeating behavior observed at an earlier point in life), and the generalized exchange theory, which moves away from the general dyadic analytical approach and includes chains of exchange within small, closed populations (Bearman, 1997; Ribar & Wilhelm, 2001).

The second idea posits that transfers are made based on individual preferences of caring or altruism by the person making the transfer. One version of this is the "warm glow model", where an

individual makes transfers to others because the act of making a transfer makes them feel good or because the praise they receive for giving makes them feel good (Andreoni, 1989). Alternately, economists define altruism as a donor's utility being a function of their own consumption and the utility function of the recipient which includes the recipient's consumption (Becker, 1991). The donor chooses to make transfers to the recipient that will equalize the donor's marginal utility of consumption with the recipient's marginal utility of consumption. Furthermore, the model does not require that the donor and recipient's consumption be equally weighted by the donor, but allows for a weight to be assigned to the child's well-being. This implies that altruistic parents whose children have identical utility functions will provide transfers to each child such that all children will attain the same level of utility; therefore, those children who are initially worse off financially will receive larger transfers. This theory makes certain other predictions about transfer decision-making within the household. First, the model implies that the family, household head, will choose the level of consumption of the members of the family based on the total income the family has access to, referred to as the income-pooling restriction. Second, an exogenous increase in the recipient's income will result in a reduced transfer from the donor, referred to as the transfer-recipient income prediction. Finally, an extension of the second point, a simultaneous $1 increase in the income of a donor and $1 decrease in the income of the recipient will results in a $1 increase in the amount of the transfer, referred to as the transfer-income derivative restriction.

Research on altruism in economics has focused primarily on "revealed preference" with the assumption that rational actors will act in accord with their preferences and thus observed behavior can be used in lieu of direct measures of altruism. In order for such analysis to be done, data on the income of the donor and recipient must be available to the researcher as well as information about the occurrence of or amount of the transfer to the recipient. This research, using "revealed preference" for altruism, has yielded mixed results as to whether altruistic theory holds up empirically. For instance, Altonji et al (1992) use the Panel Study of Income Dynamics (PSID) to test the income-pooling prediction amongst family members and find it not to hold true. Later, the same authors test the transfer-income derivative to

see whether an exogenous increase in the donor's income and decrease in the recipient's income of $1 results in the predicted $1 increase in transfer between parent and child (1997). They find that there is evidence that an increase in transfer occurs, however the results are not large enough to support the empirical existence of the transfer-income derivative. However, studies are more consistent finding support for compensatory inter-vivos transfers that would be associated with altruistic transfer motives. Dunn and Phillips (1997) find that while bequests, or the division of estates which occur after a donor has passed way, are generally split equally among the recipients, recipient financial needs were considered in transfers made while donors were alive with poorer recipients receiving more. McGarry and Schoeni (1997), using the Asset and Health Dynamics Study (AHEAD), also find that transfers are directed disproportionately to children who are financially worse off and find no evidence that transfers are made in return for caregiving from children. Finally, McGarry (1999) finds compensatory inter-vivos transfers with equally divided bequests in data from the HRS and the AHEAD. Additionally, her work extends the traditional altruistic model into a three period model and finds that inter-vivos transfers are sensitive to changes in the recipient's current income while differences in bequests are associated with indicators of the child's permanent income.

To date, there has been little research that has attempted to directly identify the altruistic preferences in survey data. Cox and Soldo (2004) examine the "Benevolence and Obligation" module administered to HRS respondents in the 2000 wave strictly analyzing the patterns in responses and to not extend their work to see if those answers are related to transfer behavior. The aim of the module used in their paper is to determine how people view themselves with respect to the help and support they provide their family members and the motivations for doing so and thus their analyses of survey answers are couched primarily in exchange theory rather than altruism. Questions, for example, include "I'm hurt if I do something for others and it isn't recognized…agree/neutral/disagree", "I only help relatives and friends who've helps me in the past...agree/neutral/disagree" and "I only help relatives and friends whom I want to have help me in the future…agree/neutral/disagree".

Light and McGarry (2004) use responses from the National Longitudinal Surveys of Mature Women and Young women to examine the motivations women provide for leaving unequal amounts of their estates to their children. Although almost two-thirds of women said they would allocate equally among children, those who answered bequeathing different amounts provide reasons that primarily fall into three categories; "I plan to give more to my poor children", "I plan to give more to the child who takes care of me" and "I plan to favor my biological children". To a large extent mothers state they will make equal transfers to their children, however, for those women who deviate from this decision, their decisions equally support altruism and exchange theory.

The analysis in this paper builds on this scant literature for measured altruistic preferences by using direct questions about the willingness of individuals to make transfers under hypothetical circumstances to various recipients and see whether those preferences do in fact support their behavior.

Data and Econometric Method

Data and Sample

The Health and Retirement Study (HRS), which is a longitudinal study administered biannually sponsored by the National Institute of Aging and conducted by the University of Michigan's Institute of Social Research, is used for the analysis in this paper. It was created in order to collect detailed information about the economic and health circumstances of older Americans. It is a rich source of data on the assets, income, benefit use, pensions, earning, savings and spending, and for the purposes of this work has information on transfer amounts from respondents to various recipients (individual children, parents) as well as the characteristics of recipients[1]. The original study cohort interviewed a nationally representative sample of over 12,000 individuals, consisting of over 7,500 households, between the ages of 51 and 61 (strictly born from 1931 to 1941) and their spouses in 1992[2].

[1] Characteristics are available for all living children and parents. There are not specific characteristics for charities and transfers for charities are cumulative not broken down but recipient organization.
[2] Spouses in all cohorts were interviewed regardless of age.

For this project, the 1996 (third) wave of the original HRS cohort is utilized. In 1996, almost 11,000, and over 6,500 families, of the original respondents were surveyed[3]. The data provide information on the respondent's demographic characteristics (age, sex, race, marital status and education) as well as household information (income, assets and employment status and health of respondents and their spouses, if any).[4] Furthermore, the 1996 wave contains a module that was administered to a randomly selected group of respondents about hypothetical income transfers to family members and other individuals/organizations. The questions from Module 8, called "*Attitudes toward inter-familial transfers*", allows for the person level measures of altruism, described below, which allow for an examination of whether stated transfer preferences can predict the amount and likelihood of transfer to different recipients. This work supplements the "revealed preference approach", which is generally used in economic literature on altruism, and additionally rely on "stated preference" from what Cox and Soldo (2004) call "point-blank" survey questions. Specifically, the analysis focuses on transfers to adult nonresident children (over age 25), so that transfers made for reasons of financial need and not those that could be characterized as investments (e.g., education) are captured.[5] Attitudes and transfers to the respondents' elderly parents are also examined.

Altruism Measures

In 1996, the HRS randomly sampled 983 respondents to examine income transfer generosity under hypothetical conditions, see Figure 2.1 "*HRS Module 8 Sample Question on Hypothetical Transfers*" below.[6] The questions first primed respondents to imagine a scenario where they would not be repaid for any transfers that were made and that the given recipients are not in financial trouble due to any actions of their own. They then started by assessing whether respondents were willing to give five

[3] The 1996 wave retained 85.2% of the original respondents.
[4] Due to the variability in available recipient characteristics, recipient covariates are discussed below in the appropriate sample descriptions.
[5] It is recognized that this age cut off does not necessarily eliminate parental transfers for help with home purchases, which can be given regardless of child's financial need.
[6] These questions were asked again in the 2000 wave, of the survey to a different randomly selected group of respondents, Module 4: *Economic Altruism*". Originally these two samples were to be pooled to increase sample size, however due to a significant amount of invalid skips on the second question the construction of the same transfer preference ranges is not possible. The measures between the two waves are not comparable.

percent of their own income to a recipient, child or parent, if the recipient's income fell to certain level below their own. A follow-up question, based on the response to the first question, is asked to narrow the range in which the respondent would be willing to transfer their own funds to another family member given their relative incomes, question 2 or 3 in Figure 2.1.[7]

In most cases only one person in the household answered these questions, however, there are 34 households where both spouses answered the question. In these instances one member for that household was randomly chosen for the household measure[8]. Module responses are valid and complete if the respondent answered both module questions such that their response could be accurately classified in the appropriate transfer preference category. These questions were asked separately for several categories of potential recipients: the respondent's children, parents (including in-laws), siblings, friends and charities[9]. It is important to note, that respondents only answered the child and/or parent questions if they had a living child or parent.

[7] The Technical Appendix provides the Module 8 questionnaire with the exact question wording taken from the on-line HRS documentation.

[8] Due to the length and depth of the HRS questionnaire, households with married couples assign each spouse to be either a family respondent, focused primarily on questions related to the family structure and demographic information, or a financial respondent, focused primarily on questions related to household financial matters. Of the 34 households where both spouses answered the module questions, the common preference assumption generally holds. For responses of hypothetical transfers to parents 82 percent of spouses provided the same response in their level of altruism. Of the remaining couples, 15 percent reported altruism preferences within one level of each other and only one couple (3 percent) reported complete disagreement. Responses for hypothetical transfers to children had lower overall concordance in responses. 62 percent of spouses reported the same level of altruism, 29 percent had answers within one category and 12 percent (3 households) reported complete disagreement.

[9] The analysis only uses those questions that pertain to children and parents as there are specific questions that inquiry about dollar transfers made in that year to these groups. Transfers to siblings, friends, and charities were asked as a cumulative amount transferred to both groups, for which the number of recipients is not available, nor are there individual characteristics available to create recipient specific datasets, thus these two groups are not included in the analysis.

Figure 2.1 HRS Module 8 Sample Question on Hypothetical Transfers

Intro: Sometimes people give substantial financial help to relatives or friends. We would like to find out about situations where you (and your husband/wife/partner) might be willing to give substantial help to others. You should suppose that any help you give will not be repaid, and that the person you might help has been unlucky rather than lazy.

1. Suppose that one of your children had only half as much income per person to live on as you do. Would you be willing to give your child 5 percent of your own family income per month, to help out until things change – which might be several years?

Yes □ (go to 2)

No □ (go to 3)

2. Suppose that they had three-quarters as much income per person as you. Would you be willing to give 5 percent of your family income to help out?

Yes □

No □

3. Suppose that they had one-third as much income per person as you. Would you be willing to give 5 percent of your income to help out?

Yes □

No □

Using the responses to the Hypothetical Transfer questions, measures are constructed that represent the degree to which a household is willing to transfer income to different recipient groups, holding constant donor and recipient resources. These as measures are interpreted as altruism. Households are defined as being more altruistic if they exhibit a willingness to transfer income to parents or children whose income falls to levels relatively close to their own. These households are willing to

make financial contributions to recipients who experience relatively low levels of financial difficulty compared to households who are only willing to make transfers when recipients' face greater financial hardship relative to their own financial circumstance. The variables created are categorical variables that increase with higher levels of altruism and are assumed to reflect the transfer behavior at an individual or household level as married couples are asked about their joint willingness to transfer income. The husband and wife are assumed have the same willingness to transfer based on the common preference model, which assumes that family members act to maximize a single utility function. For questions of *Hypothetical Child/Parent Transfers*, the variable of *Altruism* takes on the value 1 if the household responds it is only willing to transfer when the potential recipient's (child's or parent's) income is less than one half of respondent's household income (*Low Altruism*); 2 if it is willing to transfer when recipient's income is one half to three quarters of household income (*Medium Altruism*); and 3 if it is willing to transfer when recipient's income is greater than three quarters of household income (*High Altruism*).[10]

Patterns in Altruism

This paper examines the *Attitudes towards inter-familial transfers* module in the 1996 wave of the HRS and its ability to predict revealed financial interfamily transfers. This is the first analysis using this particular module and these constructed measures of altruism; therefore, the measures themselves are examined first.[11] There are two distinct, and valid, ideas of altruism that these variables could measure. The first would be that these variables represent a general, or underlying, level of altruism: an individual who is altruistic toward one individual or group will then to be altruistic toward most individuals or groups. The second is that altruistic preferences could differ depending on the type of recipient. Tables 2.1a-2.1e provide cross tabulations of the two measures of altruism, towards respondents' children and

[10] The *Low Altruism* categories could be further broken down into *Low Altruism* (those willing to transfer when recipient's income is 1/3rd to ½ of household income) and *Very Low Altruism* (those only willing to transfer when the recipient's income is less than 1/3rd of household income). The bottom two groups are combined due to small sample sizes and inconsistent estimates in analysis results. These analyses are available from the authors upon request.

[11] This claim has been confirmed through private communication with the HRS Help Desk received July 27, 2011.

older parents, by various characteristics of the respondent's family. For the full sample of households, Table 2.1a shows that three-fourths of the responses to the altruism measure are the same for altruistic preferences toward parents and children, with 63 percent having a high level of altruism toward both children and parents. Another eighteen percent provide responses that are one altruism level apart, with higher altruism being reported toward elderly parents. Only five percent of households answered having a two level difference in altruistic preferences between recipient groups, again favoring elderly parents. In addition, most respondents claim to have high levels of altruism, 76 percent of households reporting the highest level of altruism toward parents, while only 68 percent answer accordingly for children. This is consistent with Cox and Soldo (2004) which finds that evidence of a social desirability bias, respondents looking at their behavior to be seen in a positive light. It could also result from respondent viewing their own parents as dependent on them, whereas adult children maybe viewed as capable of helping themselves during financial difficulty because they are working age adults. Additionally, any expression of preference by respondents can be influenced by the attributes associated with the survey questions and the response (Payne, Bettman, & Schkade, 1999). In this case, as with Cox and Soldo (2004), respondents may want to be perceived as givers and care takers, although their behavior may not in fact reflect those characteristics. However, as with the "Mercenary Reciprocators" who would not give help to family members unless it was followed with reciprocal help in Cox and Soldo's paper, there is a non-trivial number (10 percent) of respondents who state they would either not make transfers to recipient children, or only help those most in financial need. With respect to responses toward parents, only 3.5 percent of respondents stated that they would not help at all or help only those parents with the greatest financial need.

The next two tables examine the cross tabulations for different household characteristics. For instance, respondents who have more siblings may answer the hypothetical transfer questions differently from those who do not have siblings because they know they have additional help to care for their parents or are able to free-ride on their assistance they know their siblings will provide. Table 2.1b examines the

reported levels of altruism by whether households have siblings to help provide financial assistant for an elderly parent or not. Panel A, for the 32 households without siblings, indicates that 84 percent of households report the same level of altruism towards both recipient groups. In Panel B, for the households with siblings to help care for elderly parents, 76 percent of households report the same level of altruism towards respondents. The two groups of households are not statistically different in their responses toward recipient groups therefore it is unlikely that answers are provided with the thought of free-riding off siblings in mind.[12] Table 2.1c examines altruism levels for households with different child characteristics. This cross-tabulation is done with similar motivation as the previous one by household sibling characteristics. If household respondents are answering the question based on how many children they have as potential recipients or based on their children helping each other, then the two groups would be expected differ in their responses to the hypothetical transfer questions. Panel A, for those with only one child, does not statistically differ from Panel B, for households with multiple children.[13] Overall, it appears that respondents' answers to the hypothetical transfer questions are correlated, reporting similar levels of altruism across recipient groups. These tables indicate that households provide stable answers to the hypothetical transfer questions and have similar altruistic preferences across recipient groups; however, households appear to have a bias in favor of giving to parents over their children.

Table 2.2, summarizes respondents' transfer behavior by altruism group. Transfer behaviors are conditional making a transfer to at least one recipient in the given group and the average amount transferred to the recipients in each group. An interesting pattern across both groups, it is those respondents who exhibit "medium" altruistic preferences are most likely to give to at least one recipient in each group. However, conditional on giving, those in the highest altruism groups transfer more money on average to recipients, than those in lower altruism groups.

[12] The t-statistic for altruism toward children by the number of siblings (0 versus 1 or more) is 0.162. The t-statistic for altruism toward parents by number of siblings is -0.504.
[13] The t- statistic for altruism toward children by number of children (1 versus 2 or more) is 0.435. The t-statistic for altruism toward parents by number of children is -0.934.

The intent of the altruism question is to ask the respondent to predict transfer behavior conditional on some hypothetical income level. However, it is possible that a respondent might answer the question based on what he or she knows about the actual situation of the intended recipient. For instance, despite the conditioning of the question, respondents will be aware of the general welfare of their children and parents and may respond to these questions based on the recipient's resources, perhaps providing more favorable answers when they know that the recipient is more likely to need assistance. Thus it is important to understand if any observable characteristics of the respondent or intended recipient predict the reported level of altruism (i.e. hypothetical transfer behavior). In order to determine what predicts a respondent's level of altruism ordered probit models are estimated. Two separate models are estimated for each recipient group. The first model assumes that respondents answer conditional on their own and the recipient's income; therefore, it does not include any of the recipient's characteristics as those should be captured in the response. Alternately, as previous literature has shown (McGarry & Schoeni, 1995; Dunn & Phillips, 1997; and McGarry, 1997), resources tend to play a significant role in intrafamily transfer behavior, thus respondent answers may be more favorable as an ex-post realization rather than true altruistic preferences. The second model, therefore, includes recipient characteristics in determining the stated level of altruism.

Table 2.3 presents the results of these different ordered probit regressions.[14] The first and third columns predict altruism toward children and parents based on the respondents' characteristics alone. Blacks are more likely to be more altruistic to children, but not more likely to be more altruistic to parents. Berry (2006) finds that while African Americans are less likely to make financial transfers to their children, they compensate for the differences in financial transfers with coresidence with their adult children, extended family exchange, and proximity. Those with higher education are less likely to be

[14] The variables included in these models are respondent's and recipient's gender, age, race, education, assets and income, marital status and the number of living parents and children, as this may influence how much could be transferred to all recipients. The order probit for altruism toward parents also includes the number of living siblings as Wolf et al (1997) show that intensity of parental care is correlated with family size. Financial transfers are one form of family care that could be effected by the number of potential donors elderly parents have other than the respondent.

altruistic toward children, but not toward parents. Holding income constant, higher assets reduce reported altruism toward children. Both of these variables are positively correlated between parents and children thus recipient's well-being may be taken into account when answering questions. Income is generally not significant. Marital status is also not jointly significant. Households where one respondent is in poor health are less likely to be altruistic toward both children and parents. Finally, household with more living parents are less altruistic toward children, while number of living children reveals higher altruism towards parents.

Altruism towards *children* when child characteristics are included, in column 2 of Table 2.3, do not change the estimates on respondents' characteristics; however, number of living children that a respondent has becomes significant.[15] This is not surprising, as a respondent answering the hypothetical transfer questions with their children's resources in mind would also consider how many children are at risk for assistance at the same time. Many of the child characteristics are significant: age, marital status, home ownership, and the proximity of the child. The child's financial status is also significant, with respondents being more altruistic towards children with better financial situations. This is contrary to the theory of altruism which predicts that children with higher incomes are less likely to receive transfers than those with lower incomes.

Altruism toward *parents*, regardless of model specification, appears to be predicted by few observable characteristics.[16] In column 4, including parent's characteristics does not alter the estimates on the respondents' characteristics, although *ceteris paribus* poor health of a respondent or spouse becomes a significant predictor of lower altruism. This is consistent with economic theory as a ill respondent would be decreasing their own utility by being more altruism toward their parent. As with the models for children, proximity and financial status are again positive predictors of altruism. Because

[15] The likelihood ratio χ^2 statistic is 117.7 (p=0.000) for the model in column 1 and 186.0 (p=0.000) for the model in column 2.

[16] The likelihood ratio χ^2 statistic is 30.5 (p=0.032) for the model in column 3 and 61.9 (p=0.001) for the model in column 4.

altruism is higher of both poorer and better of financial status than the respondent, it may be that these questions are not picking up altruism toward parents, but obligations or exchange. Thus, regardless of parents' financial status respondents are more willing to state they are likely to make a transfer in the hypothetical transfer module. It may also be an artifact of social desirability bias. Education and gender of the recipient does not appear to predict higher altruistic behavior for either recipient group, nor do any other characteristics of need.

Transfers

The outcome of interest with each recipient group is the information on transfers reported by respondents. Specifically we use questions that ask whether the respondent or their spouse/partner provided any financial assistance to any of the potential recipients in the last two years (between the 1994 and 1996 waves) and what the amount of those transfers were to each recipient.[17] Contemporaneous measures of transfers are used in the analysis as the sample size transfers to parents in 1998 is too small for analysis conditional on having been in the Interfamilial Transfer module in 1996. Furthermore, it is important to know that transfers were only recorded for those respondents that had given over $500.00 to recipients since the last wave of the survey and that the transfer question includes loans respondents made to recipients which are not altruistic in motivation.

Table 2.4 shows the household (respondent) level characteristics of transfers to children, parents and charities. There are 844 households that have non-resident children age 25 or older, with seventeen percent making financial transfers to at least one child. Of those families, 81% have fewer than four children. As the number of children in a household increases the total proportion of children receiving financial help decreases, however, this pattern is not monotonically decreasing. This is not the same pattern found by McGarry and Schoeni (1995). They examined interhousehold transfers in the 1992 wave of the HRS and found a relatively constant level of giving across family size in the proportion of

[17] Financial Transfer is defined as giving money, helping pay any bills, or covering specific types of costs such as those for medical care or insurance, schooling, down payment for a home, rent, etc. The financial help can be considered support, a gift or a loan.

households giving to children. Additionally the proportion of households with more than one child transferring to children is much lower than what McGarry and Schoeni found. This difference could be due to the difference in time periods, smaller sample size, or as a result of older children needing less financial help from their parents. However, the total proportion of children receiving financial help is consistent with the findings by Freedman el al (1991), who document that 15 percent of children age 19 and over receive regular financial support in the 1998 National Survey of Family Growth. The mean dollar amount transferred to each child, conditional on receiving a transfer, is just over $3,500, almost identical to McGarry and Shoeni (1995).

Turning to Panel B of Table 2.4, and examining interhousehold transfer characteristics for the 495 households that have living parents, we see that about nine percent of households make transfers to parents and the proportions transferring by number of parents are much more constant that those for interhousehold transfers to children. Freedman et al (1991) and McGarry and Schoeni (1995), also document nine percent of their samples of transfers to one or more parents. The mean transfer amount per parent is $3,315 and decreases with the number of parents. For 1992, McGarry and Schoeni (1995) found average transfers to parents of $2,100[18].

Empirical Model

The traditional model of altruism assumes that the well-being of a donor depends on the well-being of the recipient such that transfers increase the greater is the well-being of the donor relative to the well-being of the potential recipient. In a standard empirical economic intergenerational transfer model, equation 1, transfers made by donors are regressed on recipient and donor characteristics. These characteristics reflect the relative well-being of the donor and recipient.

$$Transfer_{i,j} = \alpha + \gamma_{i,j} recipient_{i,j} + \delta_i donor_i + \varepsilon_{i,j} : \text{eq. 1}$$

The model we estimate expands the standard model, equation 2:

$$Transfer_{i,j} = \alpha + \beta_{i,k} Altruism_{i,k} + \gamma_{i,j} recipient_{i,j} + \delta_i donor_i + \varepsilon_{i,j} : \text{eq. 2}$$

[18] Dollar amounts in 1996 real dollars.

Where transfers ($transfer_{i,j}$) to recipient *j* in family *i* are estimated using characteristics of the recipient ($recipient_{i,j}$) and respondent ($donor_i$) and the respondents' hypothetical transfer measures ($Altruism_{i,k}$). The recipient and donor characteristics in this model are the same as those used by McGarry and Schoeni (1995) who examined intergenerational transfer behavior in the first wave of the HRS. The coefficients of interest are those on *Altruism*, which is a set of dichotomous variables broken down into low, medium, and high levels of altruism (low is the omitted category in all model specifications). These are expected to be increasingly positive as the level of altruism increases.

We utilize three sets of analysis to examine the potential explanatory power for elicited altruistic tendencies (from hypothetical transfer questions described above). We first estimate Logit models to examine the likelihood that a transfer occurs; then estimate OLS models to examine change in the dollar amount of the transfers and percentage change in amount of transfers (log-linear dependent variable); and Tobit models to control for the left hand censoring for the large proportion of potential recipients who did not receive a transfer in this time period (over 80% and 90% of children and parents, respectively, did not receive any transfers from respondents, see Table 3). [19]

As many families have more than one child or living parent, analyses cluster the errors on the family level. Fixed effects analysis cannot be performed to control for respondent level unobservables as the variable of interest, level of altruism, does not vary across children/parents. Finally, while we focus only on our model in the results shown in this article (eq. 2), each model specification was run for each sample (children, parents) using the standard economic model (Eq. 1). There are no significant differences between the recipient and donor coefficients in the two models and those results are consistent with previous literature (McGarry and Schoeni, 1995).[20]

[19] Tobit models are only run on the dollar transfers, not on the log linear transfers. Zero transfers are included in the model and replaced with 0.001 for the log-transformation.

[20] F-tests were done to test the statistical difference between equations with and without the altruism measures. For transfers to children, the F-statistics ranged from 4.13 to 7.03, all with p-values of 1. For transfers to parents, the F-statistics ranged from 1.56 to 10.15, with p-values of 1.

Results

Multivariate Sample Analysis

The following subsections discuss the separate subsamples used for analysis and report results found by recipient group. Descriptive statistics tables can be found in the Technical Appendix.

Transfers to Children

The multivariate analysis in Table 2.5a, shows the regression results for the logit, OLS and Tobit models with and without the altruism level variables, although only those models with the altruism variable included are discussed through this paper as results across model specifications for all other variables are consistent.[21] In the logit model (column 1), the altruism measures are not significant and are not associated with an increased probability that a child will receive a transfer.[22] Higher levels of altruism are associated with both more dollars received and greater percent change. The OLS model (Column two), which uses the dollar transfer amount as the dependent variable, reveals that those children whose parents state they have a high level of altruism receive about $326 more than children whose parents have a low level of altruism toward their children.[23] Medium level altruism is also positive, although insignificant, with children receiving roughly $140 more than those whose parents have low altruism. Using the log-normal transformation of dollars transferred in our model, Column 4, shows the same pattern as the OLS results in column 2. Children whose parents exhibit medium level altruism receive 71 percent more in transfers than those children whose parents have low altruism, while children with highly altruistic parents receive 81 percent more in transfers, significant at the .10 and .05 levels respectively. Controlling for censoring in the Tobit model, Column 3, reveals a pattern similar to the OLS results where only high altruism is significant. The coefficients on the latent variable are about five times larger than those in the OLS model, with children receiving $1,163 and $1,675, at the medium and high levels of altruism respectively, than children whose parents have low altruism. However, the

[21] The Logit models have 19 fewer observations due to dropped observations due to prefect prediction from the missing indicators on employment status and income.
[22] The model coefficients are logistic coefficients, not marginal effects.
[23] The unconditional transfer amount is $459.

marginal effect for those children who receive transfers $273 if the respondents report the highest level of altruism than those who report the lowest and $220 if the respondents report medium level altruism.[24]

An examination of the child level characteristics across models yields fairly consistent patterns, with children who have fewer resources being more likely to receive transfers and receiving larger transfers. As expected, those children that are older, own a home, or have higher incomes are significantly less likely to receive transfers and receive lower amounts in transfers. Being currently married is negatively associated with transfers; however it is only significant in the Tobit model. Living within 10 miles is positively associated with transfers. Having a child and working part time, compared to not at all, is positively associated with financial help. Part-time employment status can be associated with increased transfers if income remains low and requires further assistance to the child. A child having their own child, e.g. respondents' grandchildren, increases transfer outcomes across models. Child gender and education do not appear to be deterministic in whether a child receives transfers. This pattern in education differs slightly from McGarry and Schoeni (1995) who find that having more than a high school education has a significant positive association with receiving financial assistance.

Looking at the respondent and household level characteristics, similar patterns with access to resources are apparent. Education of the respondent is positive, but not significant, in most models. Higher incomes and assets are positively association with transfer behavior, but are not jointly significant. Having more potential child recipients, more children, significantly decreases the likelihood and size of transfers in all model specifications. Black and other race respondents make fewer and lower transfers to children in comparison to white respondents, though only the coefficients on Black were significant across all models. Berry (2006) found that African-Americans and Latinos were less likely to make financial transfers to their children than whites. There is a negative relationship between the amounts of

[24] The marginal effect the expect value of y for uncensored observations is

$$\frac{\partial E[y|y>0]}{\partial x_k} = \beta_k \left\{ 1 - \lambda(\alpha) \left[\frac{X_i \beta}{\sigma} + \alpha(\alpha) \right] \right\} \text{ where } \lambda(\alpha) = \frac{\varphi\left(\frac{X_i \beta}{\sigma} \right)}{\Phi\left(\frac{X_i \beta}{\sigma} \right)}.$$

transfer children receive when a parent is in poor or fair health. Marital status is does not appear to be significantly associated with the probability of a transfer to children occurring. In the OLS model, the coefficients on the marital status variables are positive and significant, but are not statistically different from each other, therefore, children of whose parent are not single and never married receive higher transfers regardless of the respondent's marital status. The OLS model, also indicates a positive and significant association between the amount of transfers and the head of household or their spouse being unemployed; however, there is no relationship between parental employment and transfer behavior across the other models.

The previous results use 1996 transfers between recipients and respondents to measure the predictive power of the altruism measures on transfer behavior. However, there arises a problem in this estimation if the answers to the altruism questions are based on contemporaneous transfer behavior that a respondent is already engaged in. The reason 1996 transfer behaviors are examined is because the sample size of 1998 transfers to elderly parents of respondents is too small for any analysis to be conducted; thus the decision was made for consistency between the analysis for child and elderly parent recipients . However, to examine if the altruism measure in fact predicts transfers generally, and is not simply a reflection of a respondent's current behavior, 1998 levels of transfers were used in place of the 1996 transfers for children.[25] Table 2.5b shows the four models presented in Table 2.5a in the paper. In each model all the coefficients on the altruism measures are significant and larger, although not statistically different, than the estimates in Table 2.5a. Interestingly, the gradient is not the same in this analysis. In two of the four models, those with medium level altruism have higher probabilities of making transfers and make larger transfers than those reporting the highest level of altruism. This is likely driven by the fact that the medium altruism group is making more and larger transfers than they did in 1996, for the families, who are making transfers to any of their children in 1998, see Table 2.4.

[25] All other covariates are from 1996.

Transfers to Parents

The multivariate analysis for parents differs slightly from the analysis for children.[26] Wolf, et al (1997) finds that the number of siblings that a donor has influences their transfer behavior. As such, the models for transfers toward parents also include the number of siblings respondents have to help their parents financially.[27] In addition, whether a parent is also receiving help from one or more of the respondents' siblings is included.[28]

The altruism measures across models are positive and significant; however, the two levels of altruism are not statistically different from each other. Thus, parents of respondents who are not in the lowest altruism category are more likely to receive transfers and get larger transfers. Siblings providing financial assistance to parents positively impacts transfer behavior of respondents. While this is contrary to expectations, which would predict that the respondent would free-ride off their siblings, it could result from greater need on the part of the parent or a competition among siblings to look good in the eyes for their parents. Older parents are more likely to receive transfers and receive larger transfers. The parents' biological status (biological parent or in-law) do not matter across specifications; however, fathers receive more money than mothers.[29] This is counterintuitive to previous studies; Kalmijn, 2007 finds that men are less likely to get support from their children. Whether parents own a home, are currently married, live close within ten miles of respondents or their education level do not influence receipt of financial transfers from respondents. The only other strongly significant parental characteristic is the parents' financial situation relative to the respondents'. However, across all specifications both parents who have better and worse financial situations are less likely to receive and receive less than parents who are in

[26] The parent sample pools biological parents and in-laws due to the sample size restrictions of both.
[27] The number of siblings assigned for each parent is the number of siblings that the respondent of the parent has. For in-laws of the primary respondent, the number of siblings is the number of siblings the spouse of the respondent has. The, total number of siblings is not the sum of the siblings between spouses.
[28] Unfortunately, the HRS does not ask how much siblings contribute financially to their elderly parents. However, as it is the respondents who provide this information, they may not have a clear idea how much their siblings may transfer to their parents but are sure to know if any transfers are made by their siblings. Therefore, the measure used will have less reporting error than would a measure of how much was transferred.
[29] The coefficient on male parent is positive and significant only in the Tobit specification at the .10 level and the coefficient on in-law status is negative and significant at the .10 level in the logit specification.

relatively the same financial situation as the respondents. This unexpected pattern would imply that respondents of poor parents are more likely to help their parents that respondents with middle class parents due to financial need and respondents of wealthy parents are more likely to help than their counterparts with middles class parents due to potentially expected bequests. On the respondent level, non-white respondents are significantly more likely to transfer and make larger transfers than the other two groups.[30] Fingerman et al (2011) support this, finding that Blacks are more likely to help their elderly parents then whites. While, the HRS Respondents with the highest income, 4th quartile, help their parents the most, significant at the .10 or better across models; however, the income variables do no statistically differ.

To see if the altruism measures are associated with financial transfers in general or if the measures are predictive of other transfer behavior an analysis on help with personal care provided to parents is conducted.[31] Table 2.6b reveals the altruism variables are positively associated with personal care, but are not statistically significant. This seems to indicate that the altruism measures then are appropriately capturing respondents' altruistic preferences for financial help.

Sensitivity Analysis

In order to check the how robust our results are to different model specifications, several sets of sensitivity analysis are conducted. The sensitivity analysis is restricted to examining financial transfers.

The first set of analyses, Tables 2.7a and 2.7b, attempts to examine how the presence of transfers to other recipients affects transfer behavior of respondents to a particular respondent group. It is logical to think that if respondents are making transfers to other recipients, either the presence of those transfers or the amount of those transfers, could be captured in the altruism terms as more altruistic individuals would be more likely to give to more groups and if that is the case the altruism measures would shift toward zero or become insignificant. Table 2.7a controls for the presence of transfers to other recipients;

[30] The coefficient is positive and significant for all model specifications except model 2, OLS with dollar amounts.
[31] An analysis on help with parents' chores and errands was also done; however, the HRS does not include information about whether siblings help with such tasks; therefore, it is not included in the text and can be found in the Technical Appendix.

thus, in the model for children (top panel), whether respondents made a transfer to their elderly parents in the same year is included. In the model for elderly parents, whether respondents made transfers to any of their children in the same year is included. The coefficients on the altruism variables are not statistically different from the original estimates in Tables 2.5a and 2.6a for both recipient groups across all model specifications. The coefficients on the variables of whether transfers were made to other recipient groups are not significant in any models for transfer behavior toward children or parents.

Simply controlling for whether respondents make transfers to other recipient groups may not be the accurate measure to use to determine whether the altruism variables are capturing any overall transfer behavior. That is, knowing whether respondents transfer to other recipient groups may not alter results if the other groups are receiving less than the recipient group in question, which is not apparent simply by controlling if a transfer was made. Therefore in Table 2.7b the dollar amount transferred to other recipient groups is substituted into the model. In the top panel, for transfer behavior to children, controlling for the dollar amount transferred to parents does not change the sign or significance level of the altruism measures. The bottom panel examining transfer behavior to elderly parents when controlling for the amount transferred to respondents' children also shows that the altruism measures are unaffected. In all of the results in tables 2.7a and 2.7b we see that controlling for transfers to another recipient group is no more informative than the original model specification.

The second set of analysis uses an alternate specification of altruism to test the relationship with transfer behavior. Referring back to earlier analysis with the ordered probits, there was little evidence that observable characteristics of the respondents and recipients predict stated levels of altruism. In this analysis an alternate measure was created. Using the results from the ordered probit a measure of "residual altruism" was created by subtracting the stated level of altruism from the predicted level of altruism ($A_i - \hat{A}_i = residual\_altruism_i$). The reason to using this alternate measure of altruism to an attempt to get a better idea of what the respondents' level of altruism is net of the donor's and recipients characteristics that may drive how individuals answered the hypothetical transfer questions. This also

captures underlying altruistic preferences that cannot be captured by observable characteristics as was attempted in the ordered probit models in Table 2.3. A positive "residual" is interpreted as a respondent being more altruistic than his/her observable characteristics would predict them to be. Table 2.8 shows the results using this alternate measure of altruism. For transfers to children the residual altruism measure predicts positive transfer behavior across all models; however, for transfers to parents this measure does not have any predictive power.[32]

The final sensitivity analysis conducted was a longitudinal analysis on the child sample to examine how predictive the altruism measures are into the future.[33] While the Table 2.5b provides analysis for baseline characteristics predicting future (1998) transfers, the model in Table 2.9 uses the longitudinal nature of the survey and run the analysis for the years 1996-2006.[34] The models were rerun including only the altruism measures and again interacting altruism and duration. In the first set of models, the altruism measures are only significant for the medium altruism level. When the interaction terms between duration and altruism are introduced into the model, the altruism measures are no longer predictive of transfer behavior although the interaction terms themselves are significant well into 2006. This indicates that those children from families with higher levels of altruism are more likely to receive financial help from respondents than those children from families that have low levels of initial altruism.

Conclusion

An examination of the "*Attitudes toward inter-familial transfers*" Module administered in 1996 in the HRS as a proxy for stated transfer preferences, interpreted in this paper as altruism, has yielded interesting results about the relationship between altruistic preferences and the transfer behavior of older adults. The contributions of including stated altruism into the traditional intergenerational transfers model

[32] Logistic results are not available for the child sample as the model did not converge.
[33] The analysis was only done on the child sample because there is no contemporaneous relationship with the altruism measures and transfer behavior; therefore, no longitudinal relationship is expected. In addition, the lack of sample size of elderly parents in subsequent years for respondents in the *Interfamily Transfers* module does not allow for longitudinal analysis to be done.
[34] Standard errors are clustered on the family level.

allows for the inclusion of preferences to predict interfamily transfer behavior. It also indicates that such measures should be included into future surveys on intergenerational transfers to account for differences in which recipients receive transfers as donor preferences matter. One concern would be that this measure does not adequately capture donor's willingness to transfer in the same manner that contingent valuation used in economic analysis for examining willingness to pay for public goods. Contingent valuation has gotten much attention and has spelled out procedures in order to attempt to illicit consumer's true willingness to pay for goods (Arrow et al, 1993), the hypothetical transfer questions attempt to use some of these methods to get at individual's underlying preferences to transfer income, but more work should be done to examine whether these measures could be improve. In this paper the altruism measures constructed from these hypothetical transfer questions are shown to provide additional explanatory power in predicting revealed intergenerational transfer behavior. Furthermore, the analysis for transfer behavior related to help with personal care for elderly parents reveals that the altruism measures have no predictive power, which is indicative of the questions capturing preferences for financial transfers in particular, as the questions aim to do.

The descriptive assessment of the survey questions reveals that altruistic preferences are consistent within individuals. Respondents' answers to the hypothetical transfer questions show that they have stable transfer preferences across recipient groups. The multivariate analysis revealed that respondents with higher levels of altruism are associated with higher probabilities of transfers and larger transfers to their adult children and parents. Altruism appears to have an increasing gradient with regard to transfer behavior toward children (i.e. medium level altruism was statistically significant but lower in magnitude than high level altruism in transfers to children). On the other hand, altruistic preferences related to respondent transfer behavior toward elderly parents indicate that altruism predicts transfers but does not provide a similar gradient. All of the results in the baseline models were robust to several alternative model specifications and thus suggest that the attempt to capture altruistic preferences within

survey data can add information to the examination of financial transfer behavior across various recipient groups.

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Tables and Figures

Table 2.1a: Cross Tabulation of Altruism Measures by Recipient Group, All respondents with living parents and children (Frequencies & Cell Percentages)

		Level of Altruism Towards Parent			
		Low	Medium	High	Total
Level of Altruism Towards Child	Low	16	38	39	92
		1.79	4.25	4.25	10.29
	Medium	4	104	85	193
		0.45	11.63	9.51	21.59
	High	11	34	564	609
		1.23	3.80	63.09	68.12
	Total	31	176	687	*N=894*
		3.47	19.69	76.85	

Table 2.1b: Cross Tabulation of Altruism Measures by Recipient Group, Respondents with and without siblings (Frequencies & Cell Percentages)

Panel A: Respondents with No Siblings		Level of Altruism Towards Parent			
		Low	Medium	High	Total
Level of Altruism Towards Child	Low	1	0	0	0
		0.00	0.00	0.00	0.00
	Medium	1	8	4	13
		3.13	25.00	12.50	40.63
	High	0	0	19	19
		0.00	0.00	59.38	59.38
	Total	1	8	23	*N=32*
		3.13	25.00	71.88	

Panel B: Respondents with Siblings		Level of Altruism Towards Parent			
		Low	Medium	High	Total
Level of Altruism Towards Child	Low	16	36	38	90
		1.93	4.35	4.59	10.67
	Medium	3	96	81	180
		0.35	11.14	9.40	20.88
	High	11	34	545	590
		1.28	3.94	63.23	68.45
	Total	30	168	664	*N=862*
		3.48	19.49	77.03	

Table 2.1c: Cross Tabulation of Altruism Measures by Recipient Group, Respondents with one child & multiple children (Frequencies & Cell Percentages)

Panel A: Respondents with One Child		Level of Altruism Towards Parent			
		Low	Medium	High	Total
Level of Altruism Towards Child	Low	0	2	0	2
		0.00	2.99	0.00	2.99
	Medium	1	11	9	21
		1.49	16.42	13.43	31.34
	High	2	2	40	44
		2.99	1.99	59.70	65.67
	Total	3	15	49	*N=67*
		4.48	22.39	73.13	
Panel B: Respondents with Multiple Children		Level of Altruism Towards Parent			
		Low	Medium	High	Total
Level of Altruism Towards Child	Low	16	36	38	90
		1.93	4.35	4.59	10.88
	Medium	3	93	76	172
		0.36	11.25	9.19	20.80
	High	9	32	524	565
		1.09	3.87	63.36	68.32
	Total	28	161	638	*N=827*
		3.39	19.47	77.15	

Table 2.2. Descriptive Statistics of Altruism Measures by Recipient Group

	Transfer Behavior Conditional on Altruism to Child			
Level of Altruism Towards Child	Percent Giving Transfers to at Least One Child 1996	Average Amount Transferred 1996	Percent Giving Transfers to at Least One Child 1998	Average Amount Transferred 1998
Low [n = 86]	24.4%	$1,327	25.6%	$919
Medium [n = 176]	34.1%	$1,231	30.1%	$2,093
High [n = 582]	30.6%	$1,548	27.1%	$1,454
Level of Altruism Towards Parent	Percent Giving Transfers to at Least One Parent 1996	Average Amount Transferred 1996		
Low [n = 20]	5.0%	$350		
Medium [n = 112]	17.9%	$3,129		
High [n = 368]	9.5%	$4,900		

Table 2.3: Determinants for Altruism: Ordered Probit Models

	Altruism toward Children			Altruism toward Parents	
Respondent's Characteristics			*Respondent's Characteristics*		
Age - 51 to 60 years old (*omitted*)			Age - 51 to 60 years old (*omitted*)		
--Less than 51 years old	0.0650	0.116	--Less than 51 years old	0.204	0.147
	(0.120)	(0.126)		(0.172)	(0.180)
--Greater than 60 years old	0.062	0.066	--Greater than 60 years old	0.065	0.050
	(0.054)	(0.059)		(0.125)	(0.132)
Race - White (*omitted*)			Race - White (*omitted*)		
--Black	0.267***	0.270***	--Black	0.019	0.055
	(0.087)	(0.090)		(0.186)	(0.198)
--Other	-0.066	-0.034	--Other	0.218	-0.019
	(0.146)	(0.150)		(0.276)	(0.286)
Highest Grade Completed	-0.042***	-0.043***	Highest Grade Completed	0.013	0.015
	(0.011)	(0.012)		(0.022)	(0.024)
Assets - 1st quartile (*omitted*)			Assets - 1st quartile (*omitted*)		
--2nd quartile	-0.182*	-0.203**	--2nd quartile	-0.386**	-0.310*
	(0.093)	(0.095)		(0.172)	(0.176)
--3rd quartile	-0.177*	-0.208**	--3rd quartile	-0.063	0.0116
	(0.096)	(0.097)		(0.178)	(0.182)
--4th quartile	-0.289***	-0.370***	--4th quartile	-0.272	-0.186
	(0.096)	(0.098)		(0.170)	(0.175)
Income - 1st quartile (*omitted*)			Income - 1st quartile (*omitted*)		
--2nd quartile	0.090	0.116	--2nd quartile	0.178	0.223
	(0.088)	(0.090)		(0.172)	(0.176)
--3rd quartile	-0.156*	-0.183*	--3rd quartile	0.215	0.199
	(0.094)	(0.096)		(0.186)	(0.190)
--4th quartile	-0.140	-0.140	--4th quartile	0.132	0.243
	(0.095)	(0.097)		(0.179)	(0.184)
Marital status - Single: Never Married or Cohabiting (*omitted*)			Marital status - Single: Never Married or Cohabiting (*omitted*)		
--Married	-0.032	-0.042	--Married	-0.444	-0.482
	(0.150)	(0.153)		(0.294)	(0.302)
--Divorced	-0.302*	-0.307*	--Divorced	-0.340	-0.227
	(0.166)	(0.170)		(0.358)	(0.372)
--Widowed	-0.057	-0.080	--Widowed	-0.662*	-0.686*
	(0.176)	(0.179)		(0.375)	(0.390)
Head or Spouse Unemployed	-0.059	-0.029	Head or Spouse Unemployed	0.080	0.129
	(0.059)	(0.059)		(0.108)	(0.111)
Head/Spouse in poor/fair health	-0.141**	-0.143**	Head/Spouse in poor/fair health	-0.182	-0.271**
	(0.060)	(0.061)		(0.122)	(0.126)

Number of living parents	-0.064**	-0.064**	Number of living parents	-0.011	-0.044
	(0.030)	(0.030)		(0.065)	(0.075)
Number of children	0.018	0.029**	Number of children	0.094***	0.096***
	(0.012)	(0.013)		(0.030)	(0.031)
Child's Characteristics			*Parent's Characteristics*		
Age		-0.012**	Age		-0.0004
		(0.006)			(0.008)
Male		-0.033	Male		-0.009
		(0.053)			(0.122)
Own their home		0.134**	Own their home		0.185
		(0.063)			(0.116)
Currently Married		-0.120*	Currently Married		-0.053
		(0.068)			(0.128)
Lives within 10 miles		0.236***	Lives within 10 miles		0.314***
		(0.054)			(0.105)
Completed Schooling - High school graduate *(omitted*)			Completed Schooling - High school graduate *(omitted*)		
--Less than high school		-0.024	--Less than high school		0.0153
		(0.095)			(0.115)
--More than high school		0.073	--More than high school		-0.109
		(0.060)			(0.162)
Financial situation relative to respondent - First Quartile (omitted)			Financial situation relative to respondent - Same (omitted)		
--2nd quartile		0.207**	--Better		0.271**
		(0.095)			(0.128)
--3rd quartile		0.217**	--Worse		0.271**
		(0.089)			(0.134)
--4th quartile		0.175**	Number of living children		0.0338
		(0.083)			(0.023)
Working full time		0.186**	Respondent's In-Law		0.135
		(0.074)			(0.109)
Working part time		0.0311			
		(0.109)			
Has at least one child		0.0804			
		(0.063)			
Constant - Low Altruism	-2.158***	-2.162***	Constant - Low Altruism	-1.650***	-1.175
	(0.223)	(0.308)		(0.442)	(0.850)
Constant - Medium Altruism	-1.362***	-1.348***	Constant - Medium Altruism	-0.581	-0.0621
	(0.221)	(0.307)		(0.439)	(0.850)
Observations	2649	2649	Observations	747	747
Pseudo R-squared	0.028	0.044	Pseudo R-squared	0.028	0.056

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The models also include variables identifying missing values for dichotomous variables and mean-filled continuous variables.

Table 2.4: Respondent Level Characteristics of Transfers to Adult Children and Parents, by Number Living Away from Home

Panel A - Financial Transfers to Children

	Nonresident Children 25 or Older						
	1	2	3	4	5	6	Total
Number of respondents	117	265	176	126	75	85	844
--Proportion giving to children in 1996	0.21	0.21	0.24	0.10	0.03	0.07	0.17
--Proportion giving to children in 1998	0.20	0.18	0.14	0.13	0.13	0.07	0.15
Of those families giving to at least one child							
--Mean amount to each child in 1996	4963	3351	2945	4092	2775	2031	3514
--Mean amount to each child in 1998	8199	3905	2733	2317	4227	1617	4179

Panel B - Financial Transfers to Parents

	Noncoresident Parents- Couples				
	1	2	3	4	Total
Number of respondents	284	173	32	6	495
--Proportion giving to parents in 1996	0.09	0.08	0.09	0.00	0.09
Of those families giving to at least one parent					
--Mean amount to each parent in 1996	4014	2113	750	--	3316

Table 2.5a: Logit, OLS, and Tobit Effect Analysis of Financial Transfers to Children in 1996

	Logit		OLS		Tobit		OLS	
	Received Transfer		Amount of Transfer		Amount of Transfer		Log of Transfer	
Altruism Measure - Low Level Altruism (omitted)								
High Level Altruism		0.423		325.9**		1712*		0.809**
		(0.263)		(133.144)		(978.851)		(0.358)
Medium Level Altruism		0.391		142.3		1308		0.713*
		(0.298)		(147.696)		(1080.058)		(0.425)
Child's Characteristics								
Age	-0.096***	-0.095***	-41.28***	-40.40***	-367.5***	-360.1***	-0.139***	-0.138***
	(0.017)	(0.017)	(10.857)	(10.773)	(74.300)	(73.306)	(0.024)	(0.024)
Male	-0.131	-0.123	98.06	101.0	-88.56	-82.94	-0.164	-0.152
	(0.139)	(0.138)	(91.994)	(92.133)	(517.098)	(512.177)	(0.217)	(0.216)
Own their home	-0.516***	-0.525***	-103.9	-115.4	-1755***	-1822***	-0.812***	-0.828***
	(0.159)	(0.158)	(85.367)	(84.805)	(580.115)	(578.635)	(0.262)	(0.260)
Currently married	-0.238	-0.227	-134.1	-124.0	-1201*	-1129*	-0.305	-0.285
	(0.174)	(0.173)	(108.198)	(108.385)	(662.947)	(658.221)	(0.274)	(0.273)
Lives within 10 miles	0.301**	0.285**	124.8	105.1	1191**	1110**	0.482**	0.442**
	(0.136)	(0.136)	(90.834)	(90.115)	(523.596)	(515.835)	(0.225)	(0.223)
Completed Schooling - High school graduate *(omitted)*								
--Less than high school	-0.128	-0.124	-111.0	-109.9	-864.8	-865.8	-0.201	-0.207
	(0.306)	(0.304)	(99.488)	(98.375)	(1059.657)	(1042.867)	(0.391)	(0.388)
--More than high school	0.017	0.014	-77.27	-83.30	-118.4	-104.3	0.058	0.051
	(0.160)	(0.159)	(97.992)	(97.918)	(585.840)	(580.272)	(0.248)	(0.247)
Income - 1st quartile (omitted)								
--2nd quartile	-0.141	-0.156	-60.14	-77.18	-229.5	-303.6	-0.242	-0.263
	(0.222)	(0.222)	(155.826)	(155.589)	(808.897)	(807.690)	(0.439)	(0.438)
--3rd quartile	-0.191	-0.219	-145.4	-165.6	-492.1	-595.6	-0.499	-0.545
	(0.202)	(0.203)	(128.352)	(128.378)	(756.959)	(758.861)	(0.365)	(0.366)

--4th quartile	-0.607***	-0.626***	-128.5	-143.5	-1577*	-1646**	-1.085***	-1.115***
	(0.218)	(0.218)	(153.964)	(151.870)	(812.901)	(806.324)	(0.350)	(0.349)
Working full time	0.116	0.108	-36.05	-51.27	-109.9	-149.6	0.152	0.127
	(0.197)	(0.197)	(116.238)	(117.115)	(706.437)	(704.661)	(0.305)	(0.305)
Working part time	0.544*	0.542*	234.3	233.4	1942*	1913*	0.908*	0.898*
	(0.282)	(0.283)	(221.759)	(220.670)	(1058.522)	(1058.044)	(0.521)	(0.520)
Has at least one child	0.580***	0.571***	37.29	30.33	1824***	1757***	0.670***	0.653***
	(0.165)	(0.164)	(121.286)	(121.821)	(610.101)	(607.068)	(0.246)	(0.246)
Respondent's Characteristics								
Age -51 to 60 years old (omitted)								
--Less than 51 years old	-0.122	-0.119	-47.62	-54.58	-588.4	-573.3	-0.214	-0.205
	(0.333)	(0.333)	(228.657)	(235.474)	(1226.716)	(1240.209)	(0.571)	(0.573)
--Greater than 60 years old	0.203	0.199	73.39	68.30	806.5	780.2	0.216	0.215
	(0.175)	(0.175)	(112.683)	(111.792)	(696.489)	(692.001)	(0.254)	(0.254)
Race - White *(omitted)*								
--Black	-0.662**	-0.697**	-256.0***	-277.9***	-2835***	-2925***	-0.845**	-0.891***
	(0.309)	(0.314)	(82.573)	(83.315)	(1025.601)	(1040.388)	(0.333)	(0.337)
--Other	-0.697	-0.718	177.2	179.1	-1919	-1984	-0.612	-0.611
	(0.521)	(0.522)	(406.666)	(409.903)	(2050.263)	(2053.185)	(0.579)	(0.580)
Highest Grade Completed	0.040	0.043	25.36	28.76	159.3	172.9	0.063	0.067
	(0.038)	(0.038)	(20.317)	(19.846)	(135.439)	(135.096)	(0.056)	(0.055)
Assets - 1st quartile (*omitted*)								
--2nd quartile	0.290	0.302	-27.00	-12.77	570.2	653.4	0.245	0.282
	(0.318)	(0.316)	(97.636)	(97.384)	(1059.952)	(1052.168)	(0.377)	(0.377)
--3rd quartile	0.714**	0.716**	52.60	67.49	2020*	2041*	0.908**	0.930**
	(0.312)	(0.309)	(132.497)	(131.700)	(1065.454)	(1054.676)	(0.408)	(0.407)
--4th quartile	0.477	0.496	210.5*	241.0**	1701	1795	0.654	0.711
	(0.340)	(0.336)	(116.611)	(115.983)	(1106.291)	(1091.148)	(0.434)	(0.432)

Income - 1st quartile (*omitted*)								
--2nd quartile	0.188	0.175	80.81	72.71	1087	1029	0.076	0.057
	(0.292)	(0.290)	(98.281)	(97.606)	(1002.024)	(991.374)	(0.351)	(0.349)
--3rd quartile	0.249	0.265	85.64	102.5	1250	1327	0.179	0.219
	(0.311)	(0.309)	(133.960)	(133.739)	(1087.703)	(1078.873)	(0.424)	(0.422)
--4th quartile	0.552*	0.560*	344.4**	357.6**	2629**	2673**	0.801*	0.840**
	(0.299)	(0.296)	(138.629)	(139.939)	(1081.981)	(1072.637)	(0.414)	(0.413)
Head or Spouse Unemployed	0.087	0.090	313.4**	316.2**	966.8	971.8	0.249	0.265
	(0.174)	(0.174)	(131.400)	(132.233)	(665.398)	(663.809)	(0.289)	(0.289)
Head/Spouse in poor/fair health	0.041	0.044	-219.4**	-207.2**	-422.5	-382.4	0.031	0.035
	(0.190)	(0.190)	(85.496)	(85.157)	(660.102)	(658.785)	(0.278)	(0.277)
Marital status - Single: Never married/Cohabiting *(omitted)*								
--Married	0.607	0.600	239.5**	242.6**	2207	2064	0.887	0.877
	(0.520)	(0.530)	(119.766)	(118.111)	(1687.066)	(1730.668)	(0.653)	(0.667)
--Divorced	0.817	0.844	392.7**	419.4***	3093*	3081*	1.326*	1.381*
	(0.553)	(0.564)	(156.062)	(154.895)	(1816.311)	(1857.787)	(0.710)	(0.725)
--Widowed	0.684	0.695	377.6**	385.8**	2917	2823	1.162	1.178
	(0.591)	(0.601)	(176.157)	(173.839)	(2013.608)	(2046.734)	(0.748)	(0.761)
Number of living parents	0.015	0.0210	-54.87	-48.54	-109.1	-81.52	0.010	0.026
	(0.087)	(0.087)	(62.633)	(61.732)	(331.559)	(328.488)	(0.145)	(0.145)
Number of children	-0.265***	-0.263***	-106.3***	-108.4***	-1015***	-1007***	-0.351***	-0.354***
	(0.048)	(0.048)	(26.419)	(26.506)	(207.033)	(204.381)	(0.060)	(0.060)
Constant	0.698	0.253	1650***	1329***	1833	83.14	-0.669	-1.466
	(0.962)	(1.010)	(446.915)	(417.826)	(3253.629)	(3376.360)	(1.346)	(1.377)
Tobit Sigma					7366***	7347***		
					(734.522)	(728.198)		
Pseudo R-squared	2624	2624	2643	2643	2643	2643	2643	2643
Observations	0.1348	0.1366	0.050	0.053	0.0318	0.0323	0.099	0.101
Mean Dependent Variable	0.135		459.752		459.752		-4.954	

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The models also includes variables identifying missing values for dichotomous variables and mean-filled continuous variables. The Logit models have 19 fewer observations due to dropped observations due to prefect prediction from the missing indicators on employment status and income.

Table 2.5b: Logit, OLS, and Tobit Effect Analysis of Financial Transfers to Children in 1998

	Logit		OLS		Tobit		OLS	
	Received Transfer		Amount of Transfer		Amount of Transfer		Log of Transfer	
Altruism Measure - Low Level Altruism (omitted)								
High Level Altruism		0.474*		336.0***		1998**		0.841**
		(0.244)		(115.151)		(903.269)		(0.344)
Medium Level Altruism		0.555**		267.9**		1809*		1.014**
		(0.274)		(128.255)		(990.682)		(0.422)
Child's Characteristics								
Age	-0.037**	-0.037**	-15.73*	-15.30	-126.7**	-121.1**	-0.063***	-0.063***
	(0.015)	(0.015)	(9.442)	(9.552)	(56.172)	(56.159)	(0.022)	(0.022)
Male	-0.104	-0.096	-39.55	-34.41	-291.2	-297.8	-0.168	-0.148
	(0.132)	(0.132)	(73.009)	(73.164)	(483.469)	(482.285)	(0.208)	(0.208)
Own their home	-0.173	-0.176	-48.94	-56.15	-545.1	-579.0	-0.295	-0.300
	(0.157)	(0.156)	(82.387)	(81.381)	(578.722)	(570.898)	(0.249)	(0.248)
Currently married	-0.260	-0.250	-210.9*	-202.5	-1247*	-1179*	-0.386	-0.369
	(0.180)	(0.181)	(125.012)	(123.960)	(707.527)	(701.373)	(0.284)	(0.284)
Lives within 10 miles	-0.089	-0.101	-54.06	-71.50	-400.2	-455.4	-0.139	-0.172
	(0.134)	(0.135)	(88.495)	(90.550)	(525.225)	(528.338)	(0.209)	(0.211)
Completed Schooling - High school graduate *(omitted)*								
--Less than high school	0.122	0.120	401.5*	403.7*	1561	1570	0.205	0.198
	(0.287)	(0.284)	(234.624)	(235.026)	(1117.970)	(1108.262)	(0.400)	(0.396)
--More than high school	-0.130	-0.133	-97.65	-100.4	-692.2	-709.1	-0.168	-0.169
	(0.162)	(0.162)	(100.636)	(101.071)	(624.546)	(626.080)	(0.249)	(0.249)
Income - 1st quartile (omitted)								
--2nd quartile	0.174	0.173	173.7	162.4	1050	977.2	0.415	0.406
	(0.213)	(0.213)	(158.174)	(156.849)	(837.400)	(829.172)	(0.411)	(0.409)
--3rd quartile	-0.016	-0.040	-131.4	-149.7	-123.4	-224.4	-0.113	-0.157
	(0.210)	(0.211)	(99.037)	(99.863)	(782.050)	(783.654)	(0.341)	(0.342)

--4th quartile	-0.095	-0.105	65.13	52.19	45.70	-33.67	-0.152	-0.172
	(0.219)	(0.219)	(129.500)	(128.394)	(813.088)	(808.102)	(0.357)	(0.354)
Working full time	-0.016	-0.019	70.74	58.60	172.0	143.9	-0.023	-0.043
	(0.186)	(0.187)	(107.158)	(104.964)	(703.019)	(700.045)	(0.305)	(0.305)
Working part time	0.071	0.069	98.07	92.58	459.3	419.4	0.084	0.067
	(0.275)	(0.272)	(205.231)	(203.840)	(1073.559)	(1061.152)	(0.475)	(0.468)
Has at least one child	0.319**	0.308*	194.2	185.6	1472**	1401**	0.447*	0.425*
	(0.158)	(0.158)	(119.066)	(118.139)	(691.107)	(682.143)	(0.244)	(0.242)
Respondent's Characteristics								
Age -51 to 60 years old (omitted)								
--Less than 51 years old	-0.124	-0.102	-30.38	-31.55	-313.1	-287.5	-0.224	-0.200
	(0.320)	(0.315)	(236.819)	(236.123)	(1241.117)	(1220.341)	(0.553)	(0.544)
--Greater than 60 years old	-0.242	-0.237	-53.24	-52.48	-832.2	-830.0	-0.337	-0.328
	(0.167)	(0.167)	(95.911)	(95.763)	(660.660)	(657.013)	(0.245)	(0.245)
Race								
--Black	0.192	0.157	-67.54	-90.77	372.0	243.7	0.208	0.152
	(0.263)	(0.268)	(119.150)	(119.948)	(934.442)	(935.957)	(0.383)	(0.386)
--Other	-0.084	-0.088	60.37	69.41	-207.6	-231.5	0.144	0.150
	(0.542)	(0.534)	(312.893)	(309.686)	(1905.425)	(1870.110)	(0.707)	(0.694)
Highest Grade Completed	0.083***	0.085***	39.13***	41.32***	356.0***	368.9***	0.128***	0.130***
	(0.032)	(0.032)	(15.107)	(14.775)	(119.706)	(119.292)	(0.049)	(0.048)
Assets - 1st quartile (*omitted*)								
--2nd quartile	0.058	0.071	-70.58	-52.44	-12.84	31.27	0.019	0.063
	(0.320)	(0.320)	(123.308)	(122.077)	(1090.691)	(1083.873)	(0.393)	(0.397)
--3rd quartile	0.219	0.217	27.42	39.14	880.8	905.0	0.239	0.248
	(0.323)	(0.323)	(150.943)	(148.389)	(1144.825)	(1134.405)	(0.415)	(0.417)
--4th quartile	0.480	0.492	217.2*	243.2**	1915*	1982*	0.753*	0.798*
	(0.334)	(0.332)	(122.930)	(120.992)	(1112.602)	(1097.407)	(0.446)	(0.449)

Income - 1st quartile (*omitted*)								
--2nd quartile	0.134	0.127	-12.44	-18.55	328.7	298.3	0.114	0.0990
	(0.315)	(0.316)	(108.894)	(108.770)	(1051.700)	(1046.659)	(0.360)	(0.360)
--3rd quartile	0.503	0.533	136.3	154.1	1774	1926*	0.620	0.661
	(0.339)	(0.338)	(140.836)	(142.037)	(1107.568)	(1107.374)	(0.459)	(0.459)
--4th quartile	0.643*	0.661*	259.0**	276.9**	2466**	2553**	0.971**	1.017**
	(0.341)	(0.340)	(130.313)	(131.919)	(1120.954)	(1116.168)	(0.460)	(0.461)
Head or Spouse Unemployed	0.121	0.127	98.64	105.2	502.5	516.9	0.243	0.263
	(0.173)	(0.172)	(105.925)	(106.071)	(647.022)	(640.730)	(0.295)	(0.295)
Head/Spouse in poor/fair health	0.397**	0.384**	67.03	70.74	1239*	1240*	0.631**	0.618**
	(0.172)	(0.172)	(92.182)	(92.881)	(650.718)	(652.791)	(0.277)	(0.277)
Marital status - Single: Never married/Cohabiting *(omitted)*								
--Married	0.808	0.793	338.6***	336.1***	3332*	3327*	1.122**	1.102**
	(0.511)	(0.507)	(129.149)	(126.787)	(1789.722)	(1771.886)	(0.558)	(0.551)
--Divorced	1.077**	1.091**	567.2**	589.8**	4501**	4618**	1.644***	1.682***
	(0.540)	(0.535)	(240.315)	(241.806)	(2011.239)	(1999.205)	(0.627)	(0.620)
--Widowed	1.185**	1.195**	512.0***	517.9***	4726**	4759**	1.727**	1.743**
	(0.596)	(0.591)	(197.573)	(195.184)	(2142.306)	(2122.051)	(0.721)	(0.711)
Number of living parents	0.0741	0.0809	-0.560	5.970	187.8	221.9	0.113	0.129
	(0.087)	(0.086)	(47.165)	(47.524)	(319.487)	(316.969)	(0.150)	(0.149)
Number of children	-0.158***	-0.155***	-91.54***	-93.19***	-685.4***	-679.8***	-0.234***	-0.235***
	(0.043)	(0.042)	(24.285)	(24.638)	(178.813)	(177.241)	(0.054)	(0.054)
Constant	-2.454***	-2.943***	290.1	-41.92	-11894***	-14034***	-5.290***	-6.113***
	(0.917)	(0.947)	(414.249)	(437.633)	(3551.310)	(3774.234)	(1.236)	(1.268)
Tobit Sigma					7480***	7457***		
					(812.315)	(808.742)		
Observations	2476	2476	2490	2490	2490	2490	2490	2490
Pseudo R-squared	0.0745	0.0774	0.039	0.041	0.0185	0.0192	0.058	0.061
Mean Dependent Variable	0.130		471.021		471.021		-5.030	

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The models also include variables identifying missing values for dichotomous variables and mean-filled continuous variables. All model covariates are for 1996, only the outcome measures are from the 1998 survey. The Logit models have 14 fewer observations due to dropped observations due to prefect prediction from the missing indicators on employment status and income.

Table 2.6a: Logit, OLS, and Tobit Effect Analysis of Financial Transfers to Parents in 1996

	Logit		OLS		Tobit		OLS	
	Received Transfer		Amount of Transfer		Amount of Transfer		Log of Transfer	
Altruism Measure - Low Level Altruism (omitted)								
High Level Altruism		13.55***		659.0		75048***		0.665*
		(0.934)		(462.044)		(1348.692)		(0.401)
Medium Level Altruism		14.01***		346.7		74446***		0.994**
		(1.099)		(271.221)		(800.503)		(0.479)
Parent's Characteristics								
Age	0.043	0.038	13.58	12.67	247.1	-1887***	0.021	0.019
	(0.034)	(0.036)	(12.922)	(12.889)	(205.299)	(231.186)	(0.017)	(0.017)
Male	1.054*	0.975	140.3	139.0	5642**	201.7***	0.216	0.191
	(0.600)	(0.601)	(145.361)	(153.761)	(2697.753)	(16.009)	(0.254)	(0.249)
Own their home	-0.649	-0.582	-25.63	-71.45	-2438	5233***	-0.469	-0.479
	(0.532)	(0.512)	(244.973)	(222.966)	(2509.788)	(667.872)	(0.344)	(0.334)
Currently married	0.541	0.563	513.5	523.0	6025	-2814**	0.238	0.226
	(0.617)	(0.640)	(508.534)	(521.086)	(5615.644)	(1309.174)	(0.342)	(0.343)
Lives within 10 miles	0.838	0.913	-41.57	-84.77	3335	6651***	0.578**	0.577**
	(0.569)	(0.570)	(322.128)	(350.510)	(2764.238)	(1244.556)	(0.286)	(0.293)
Received financial help from R's siblings	4.946***	4.888***	692.0***	689.5***	25342**	24984***	6.503***	6.445***
	(1.022)	(1.022)	(216.474)	(224.542)	(10524.969)	(787.725)	(1.021)	(1.030)
Completed Schooling - High school graduate *(omitted*)								
--Less than high school	0.651	0.732	477.1	485.1	6719	3537***	0.118	0.111
	(0.547)	(0.572)	(540.371)	(548.734)	(5253.995)	(872.948)	(0.323)	(0.327)
--More than high school	-0.542	-0.260	200.2	235.0	1742	6767***	-0.313	-0.260
	(1.236)	(1.274)	(505.876)	(508.538)	(5783.339)	(1056.352)	(0.512)	(0.515)
Financial situation relative to respondent - Same (*omitted*)								
Better	-3.284***	-3.260***	-633.6	-667.8	-20332**	3457***	-1.062***	-1.087***
	(0.938)	(0.965)	(412.983)	(434.680)	(9040.850)	(869.635)	(0.289)	(0.297)

Worse	-2.127**	-2.149**	-710.4*	-745.4*	-10712**	-20856***	-1.120***	-1.164***
	(0.937)	(0.970)	(405.947)	(424.379)	(5094.137)	(1268.457)	(0.352)	(0.364)
Respondent's In-Law	-0.080	0.004	445.1	445.0	2510	3412***	-0.117	-0.068
	(0.570)	(0.574)	(580.653)	(565.925)	(3788.202)	(1017.101)	(0.347)	(0.346)
Respondent's Characteristics								
Age - 51 to 60 years old (*omitted*)								
--Less than 51 years old	0.032	0.097	-144.7	-188.9	-217.5	-1024	0.293	0.319
	(0.628)	(0.642)	(282.609)	(321.892)	(3951.734)	(1200.179)	(0.380)	(0.378)
--Greater than 60 years old	0.229	0.269	-7.721	-12.95	3220	3683***	0.064	0.100
	(0.603)	(0.595)	(426.866)	(436.932)	(3334.113)	(790.871)	(0.392)	(0.393)
Race - White (*omitted*)								
--Black	3.025*	2.973*	146.1	112.0	9837*	9242***	0.893	0.884
	(1.558)	(1.551)	(251.788)	(246.336)	(5387.222)	(849.708)	(0.566)	(0.561)
--Other	3.713**	3.828**	325.2	323.9	16844*	18013***	1.397	1.423
	(1.702)	(1.679)	(242.655)	(252.048)	(9082.017)	(888.363)	(0.949)	(0.947)
Highest Grade Completed	0.140	0.125	53.83	53.80	504.6	475.8***	0.064	0.056
	(0.134)	(0.136)	(113.857)	(115.779)	(837.137)	(97.841)	(0.079)	(0.079)
Assets - 1st quartile (*omitted*)								
--2nd quartile	0.976	0.847	-281.0	-241.6	-1987	-2157**	0.184	0.117
	(1.327)	(1.349)	(242.503)	(201.690)	(5267.999)	(842.582)	(0.324)	(0.336)
--3rd quartile	2.003	1.945	-234.7	-247.0	4740	4346***	0.476	0.444
	(1.711)	(1.733)	(270.805)	(274.209)	(4940.984)	(768.115)	(0.416)	(0.413)
--4th quartile	1.704	1.638	-167.0	-154.2	2551	2411*	0.446	0.420
	(1.236)	(1.230)	(224.862)	(217.285)	(3925.088)	(1357.233)	(0.345)	(0.349)
Income - 1st quartile (*omitted*)								
--2nd quartile	0.657	0.620	-75.84	-118.6	2451	2500***	0.328	0.307
	(0.830)	(0.833)	(209.236)	(229.931)	(3502.932)	(680.853)	(0.460)	(0.466)
--3rd quartile	-2.461	-2.490	148.9	119.3	-3624	-3566***	-0.025	-0.030
	(2.585)	(2.678)	(207.964)	(206.215)	(7104.161)	(1045.382)	(0.470)	(0.473)

--4th quartile	1.286*	1.225*	663.6*	615.5*	10714*	10310***	0.851	0.798
	(0.733)	(0.739)	(388.198)	(364.519)	(5557.001)	(1279.093)	(0.526)	(0.532)
Head or Spouse Unemployed	0.142	0.094	599.9	585.5	3530	2826***	0.086	0.113
	(0.456)	(0.463)	(492.756)	(472.775)	(3205.492)	(1013.166)	(0.318)	(0.316)
Head/Spouse in poor/fair health	-0.032	0.005	-219.3	-182.7	-273.1	479.5	0.086	0.089
	(0.545)	(0.533)	(208.623)	(182.520)	(3165.899)	(708.763)	(0.336)	(0.334)
Marital status - Single: Never Married or Cohabiting (*omitted*)								
--Married	-0.380	-0.359	45.71	94.66	3399	3261**	-0.120	-0.123
	(1.222)	(1.188)	(121.979)	(124.420)	(5482.064)	(1366.431)	(0.593)	(0.591)
--Divorced	-2.387	-2.314	198.2	197.8	-4657	-5483***	-1.096	-1.031
	(1.717)	(1.735)	(369.628)	(353.500)	(8591.677)	(859.438)	(0.765)	(0.761)
--Widowed	-0.365	-0.556	461.5	525.3	806.7	1077	0.276	0.260
	(1.409)	(1.430)	(375.867)	(418.261)	(8006.193)	(916.176)	(0.776)	(0.785)
Number of living parents	0.313	0.309	167.7	170.7	2606	2671***	0.070	0.072
	(0.299)	(0.294)	(224.425)	(225.137)	(1953.196)	(651.957)	(0.174)	(0.175)
Number of living siblings	-0.317	-0.299	-103.9	-105.4	-1976	-11255***	-0.163**	-0.160*
	(0.201)	(0.191)	(69.797)	(71.948)	(1380.219)	(1050.831)	(0.081)	(0.082)
Number of children	0.064	0.069	-108.6	-120.7	-852.2	-944.8***	0.073	0.072
	(0.117)	(0.123)	(100.615)	(110.794)	(976.952)	(278.470)	(0.087)	(0.089)
Constant	-12.64***	-25.64***	-2001	-2400	-76406**	-145572***	-9.318***	-9.684***
	(3.995)	(4.051)	(2812.562)	(3001.072)	(37285.177)	(1348.564)	(2.099)	(2.139)
Tobit Sigma					13453***	13290***		
					(4185.000)	(514.762)		
Observations	562	562	577	577	577	577	577	577
(*Psuedo*) *R*-squared	0.4987	0.5065	0.057	0.060	0.1046	0.3104	0.307	0.310
Mean Dependent Variable	0.093		513.895		513.895		-5.577	

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The models also include variables identifying missing values for dichotomous variables and mean-filled continuous variables. The Logit models have 15 fewer observations due to dropped observations due to prefect prediction from the missing indicators on parent's age, proximity and financial situation.

Table 2.6b: Logit, OLS, and Tobit Effect Analysis of Help with Personal Care to Parents in 1996

	Logit		OLS		Tobit		OLS	
	Received Personal Care		Hours of Personal Care		Hours of Personal Care		Log Hours of Personal Care	
Altruism Measure - Low Level Altruism (omitted)								
High Level Altruism		0.522		14.71		155.1		0.171
		(0.883)		(81.975)		(541.191)		(0.913)
Medium Level Altruism		0.197		6.651		58.89		-0.0408
		(1.041)		(90.273)		(601.679)		(0.957)
Parent's Characteristics								
Age	0.001	-0.00001	0.368	0.344	17.13	16.29	0.011	0.011
	(0.035)	(0.036)	(1.688)	(1.681)	(19.893)	(19.981)	(0.019)	(0.019)
Male	-0.307	-0.285	10.31	10.53	113.8	117.0	-0.091	-0.084
	(0.394)	(0.401)	(20.086)	(20.102)	(231.621)	(232.790)	(0.293)	(0.295)
Own their home	-0.192	-0.242	53.37	52.65	267.7	255.3	0.120	0.103
	(0.570)	(0.573)	(33.098)	(34.002)	(314.931)	(319.696)	(0.366)	(0.367)
Currently married	0.685	0.717	31.85	32.19	281.9	286.9	0.184	0.187
	(0.682)	(0.714)	(31.317)	(30.890)	(335.833)	(338.575)	(0.361)	(0.358)
Lives within 10 miles	1.605***	1.559***	46.27*	45.21*	830.2***	815.3***	0.984***	0.961***
	(0.458)	(0.465)	(26.065)	(24.763)	(230.630)	(235.637)	(0.305)	(0.308)
Received financial help from R's siblings	3.962***	3.997***	192.7***	193.1***	2125***	2129***	3.591***	3.590***
	(0.555)	(0.558)	(53.535)	(52.710)	(360.837)	(370.524)	(0.625)	(0.617)
Completed Schooling - High school graduate *(omitted*)								
--Less than high school	0.081	0.108	22.67	22.81	71.00	78.93	-0.090	-0.084
	(0.523)	(0.520)	(24.869)	(24.429)	(317.922)	(313.359)	(0.292)	(0.293)
--More than high school	0.149	0.150	0.145	0.717	211.9	215.1	0.266	0.266
	(0.753)	(0.768)	(25.540)	(28.103)	(384.988)	(390.856)	(0.443)	(0.455)
Financial situation relative to respondent - Same (*omitted*)								

Better	-0.198	-0.208	-36.21	-37.04	-272.7	-273.9	-0.208	-0.219
	(0.447)	(0.451)	(36.867)	(38.523)	(323.356)	(326.065)	(0.350)	(0.365)
Worse	-0.736	-0.774	-44.73	-45.55	-341.3	-354.0	-0.283	-0.288
	(0.541)	(0.547)	(37.091)	(38.879)	(332.664)	(336.445)	(0.394)	(0.405)
Respondent's In-Law	-0.199	-0.236	11.23	11.13	-146.0	-152.9	-0.335	-0.347
	(0.503)	(0.505)	(30.215)	(33.745)	(312.821)	(312.225)	(0.296)	(0.312)
Respondent's Characteristics								
Age - 51 to 60 years old (*omitted*)								
--Less than 51 years old	0.032	-0.022	-9.912	-10.69	-180.0	-186.6	-0.091	-0.113
	(0.786)	(0.824)	(20.294)	(21.159)	(449.646)	(456.150)	(0.323)	(0.336)
--Greater than 60 years old	0.400	0.420	4.994	5.334	208.9	218.3	-0.011	-0.014
	(0.478)	(0.496)	(41.768)	(43.303)	(343.930)	(347.140)	(0.366)	(0.378)
Race - White (*omitted*)								
--Black	0.630	0.639	-13.50	-14.17	-26.36	-22.64	0.066	0.062
	(0.635)	(0.648)	(46.950)	(46.610)	(364.323)	(361.856)	(0.662)	(0.662)
--Other	--	--	-45.85	-46.47	-8645	-8636	-0.908*	-0.915*
			(34.494)	(34.789)	(0.000)	(0.000)	(0.487)	(0.486)
Highest Grade Completed	0.058	0.054	0.369	0.309	31.14	30.86	0.008	0.009
	(0.088)	(0.087)	(4.045)	(4.413)	(53.276)	(53.751)	(0.061)	(0.062)
Assets - 1st quartile (*omitted*)								
--2nd quartile	0.669	0.717	25.56	26.68	226.5	234.1	0.502	0.533
	(0.713)	(0.706)	(39.006)	(40.265)	(443.718)	(443.817)	(0.452)	(0.453)
--3rd quartile	1.479**	1.521**	72.19	72.32	708.2	709.9	0.962*	0.967*
	(0.716)	(0.742)	(48.099)	(47.747)	(451.705)	(451.968)	(0.522)	(0.523)
--4th quartile	-0.254	-0.206	21.20	22.02	-291.6	-285.1	0.152	0.170
	(0.767)	(0.773)	(53.261)	(53.870)	(486.429)	(486.073)	(0.525)	(0.524)
Income - 1st quartile (*omitted*)								
--2nd quartile	-1.971***	-1.969***	-84.54	-85.60	-1194***	-1192***	-1.279**	-1.295**
	(0.659)	(0.685)	(54.144)	(55.541)	(385.349)	(383.012)	(0.559)	(0.567)

--3rd quartile	-1.628*	-1.597*	-96.98**	-97.70*	-915.1**	-902.7**	-1.210**	-1.222*
	(0.836)	(0.834)	(49.129)	(50.920)	(454.486)	(436.599)	(0.613)	(0.626)
--4th quartile	-1.098	-1.166	-92.60*	-93.71*	-839.0**	-856.8**	-0.871	-0.883
	(0.721)	(0.746)	(54.485)	(56.824)	(405.865)	(412.744)	(0.674)	(0.691)
Head or Spouse Unemployed	0.589	0.575	35.81	35.20	464.1	463.6*	0.466	0.451
	(0.452)	(0.466)	(24.090)	(24.849)	(284.641)	(278.471)	(0.287)	(0.287)
Head/Spouse in poor/fair health	-0.520	-0.540	0.251	0.931	-302.2	-307.4	-0.296	-0.286
	(0.506)	(0.498)	(38.152)	(37.280)	(338.478)	(323.621)	(0.427)	(0.422)
Marital status - Single: Never Married or Cohabiting (*omitted*)								
--Married	0.469	0.505	-6.565	-5.366	182.5	193.7	0.046	0.070
	(0.830)	(0.835)	(58.505)	(58.614)	(498.468)	(501.186)	(0.667)	(0.667)
--Divorced	0.477	0.462	14.13	14.21	288.9	287.4	-0.005	-0.016
	(1.338)	(1.318)	(77.074)	(78.352)	(742.325)	(739.064)	(0.861)	(0.864)
--Widowed	1.949*	1.989*	76.99	77.65	752.2	750.8	0.928	0.947
	(1.068)	(1.101)	(147.726)	(147.913)	(749.509)	(747.070)	(1.467)	(1.471)
Number of living parents	0.017	0.012	-10.09	-9.762	-136.6	-136.4	-0.058	-0.051
	(0.238)	(0.240)	(15.652)	(15.972)	(188.855)	(191.653)	(0.179)	(0.181)
Number of living siblings	-0.190*	-0.189	-5.883	-5.928	-71.48	-70.88	-0.066	-0.067
	(0.111)	(0.115)	(5.799)	(5.820)	(67.715)	(68.064)	(0.068)	(0.069)
Number of children	-0.166	-0.194	-9.334	-9.699	-121.9	-128.5	-0.063	-0.069
	(0.142)	(0.152)	(8.007)	(7.547)	(83.227)	(83.395)	(0.082)	(0.081)
Constant	-4.223	-4.415	8.359	-0.161	-4326**	-4360**	-6.890***	-6.996***
	(3.779)	(3.746)	(188.271)	(193.594)	(2197.624)	(2181.407)	(2.246)	(2.290)
Tobit Sigma					1345***	1344***		
					(238.791)	(240.721)		
Observations	575	575	589	589	589	589	589	589
(*Psuedo*) *R*-squared	0.4382	0.4402	0.113	0.113	0.1114	0.1115	0.222	0.223
Mean Dependent Variable	0.086		60.206		60.206		-5.989	

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The models also include variables identifying missing values for dichotomous variables and mean-filled continuous variables. The Logit models have 14 fewer observations due to dropped observations due to prefect prediction from the other race variable and the missing indicators on parent's age, proximity, and financial situation.

Table 2.7a: Logit, OLS, and Tobit Effect Analysis of Financial Transfers to Recipients
(Controlling for whether other transfers were made by respondent.)

		Logit Received Transfer	OLS Amount of Transfer	Tobit Amount of Transfer	OLS Log of Transfer
Children	*Altruism Measure*				
	High Level Altruism	0.429	323.5**	1705*	0.809**
		(0.262)	(131.167)	(971.420)	(0.356)
	Medium Level Altruism	0.397	140.8	1302	0.713*
		(0.297)	(147.845)	(1076.448)	(0.424)
	Transfer made to R's Parent	0.0721	-50.88	-70.47	-0.000607
		(0.244)	(177.854)	(899.863)	(0.420)
	Tobit Sigma			7347***	
				(728.351)	
	Observations	2624	2643	2643	2643
	(Pseudo) R-squared	0.1367	0.053	0.0323	0.101
Parents	*Altruism Measure*				
	High Level Altruism	14.09***	602.1	74985***	0.690*
		(0.880)	(413.837)	(1342.080)	(0.409)
	Medium Level Altruism	14.42***	323.9	74392***	1.004**
		(1.110)	(259.098)	(789.586)	(0.486)
	Transfer made to R's Parent	0.791	-370.8	-90.81	0.165
		(0.668)	(330.840)	(869.618)	(0.288)
	Received financial help from R's siblings	5.057***	704.4***	24975***	6.439***
		(1.159)	(235.843)	(789.547)	(1.030)
	Tobit Sigma			13286***	
				(512.793)	
	Observations	562	577	577	577
	(Pseudo) R-squared	0.514	0.063	0.107	0.311

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The models also include all covariates listed in Tables 2.5a-c, as well as variables identifying missing values for dichotomous variables and mean-filled continuous variables. The Logit models for children have 19 fewer observations due to dropped observations from collinearity with the missing indicators on employment status and income. . The Logit models for parents have 14 fewer observations due to dropped observations due to prefect prediction from the other race variable and the missing indicators on parent's age, proximity, and financial situation.

Table 2.7b: Logit, OLS, and Tobit Effect Analysis of Financial Transfers to Recipients
(Controlling for the total amount of other transfers made to other recipients by respondent.)

		Logit Received Transfer	OLS Amount of Transfer	Tobit Amount of Transfer	OLS Log of Transfer
Children	*Altruism Measure*				
	High Level Altruism	0.422	326.6**	1701*	0.811**
		(0.264)	(133.768)	(977.890)	(0.358)
	Medium Level Altruism	0.387	141.7	1283	0.711*
		(0.298)	(147.645)	(1078.761)	(0.425)
	Amount of transfer to R's parent	-0.00001	-0.004	-0.045	-0.00001
		(0.000)	(0.006)	(0.046)	(0.000)
	Tobit Sigma			7345***	
				(727.670)	
	Observations	2624	2643	2643	2643
	(Pseudo) R-squared	0.1368	0.053	0.0323	0.101
		Logit Received Transfer	OLS Amount of Transfer	Tobit Amount of Transfer	OLS Log of Transfer
Parents	*Altruism Measure*				
	High Level Altruism	13.56***	650.5	74967***	0.673*
		(0.936)	(452.451)	(1349.642)	(0.404)
	Medium Level Altruism	13.96***	351.1	74427***	0.990**
		(1.120)	(267.808)	(813.048)	(0.480)
	Amount of transfer to R's parent	0.00003	-0.017	-0.025	0.00002
		(0.000)	(0.018)	(0.036)	(0.000)
	Received financial help from R's siblings	4.975***	692.4***	24964***	6.443***
		(1.085)	(228.089)	(788.787)	(1.031)
	Tobit Sigma			13284***	
				(514.028)	
	Observations	562	577	577	577
	(Pseudo) R-squared	0.509	0.061	0.107	0.311

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The models also include all covariates listed in Tables 2.5a-c, as well as variables identifying missing values for dichotomous variables and mean-filled continuous variables. The Logit models for children have 19 fewer observations due to dropped observations from collinearity with the missing indicators on employment status and income. The Logit models for parents have 14 fewer observations due to dropped observations due to prefect prediction from the other race variable and the missing indicators on parent's age, proximity, and financial situation.

Table 2.8: Logit, OLS, and Tobit Effect Analysis of Financial Transfers to Children and Parents (Using "Residual Altruism" Measure)

			OLS Amount of Transfer	Tobit Amount of Transfer	OLS Log of Transfer
Children	Altruism Residual		168.7***	717.5*	0.319*
			(63.085)	(424.313)	(0.166)
	Tobit Sigma			7345***	
				(728.130)	
	Observations		2643	2643	2643
	(Pseudo) R-squared		0.053	0.0322	0.101
		Logit Received Transfer	OLS Amount of Transfer	Tobit Amount of Transfer	OLS Log of Transfer
Parents	Altruism Residual	-0.004	320.8	2914	-0.003
		(0.367)	(301.583)	(2811.004)	(0.225)
	Received financial help from R's siblings	4.947***	691.0***	25070**	6.503***
		(1.016)	(216.171)	(10232.740)	(1.021)
	Tobit Sigma			13315***	
				(4065.073)	
	Observations	562	577	577	577
	(Pseudo) R-squared	0.4987	0.060	0.1055	0.307

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The models also include all covariates listed in Tables 2.5a-c, as well as variables identifying missing values for dichotomous variables and mean-filled continuous variables. Logistic results are not available for children as the model does not converge.

Table 2.9: OLS Analysis of Financial Transfers to Children
(Using panel data from 1996 to 2006; all covariates contemporaneous)

	Logit		OLS		Tobit		OLS	
	Received Transfer		Amount of Transfer (in 1996 $s)		Amount of Transfer (in 1996 $s)		Log of Transfer (in 1996 $s)	
High Level Altruism	0.141	-0.215	87.29	76.42	994.0	-1180	0.291	-0.280
	(0.150)	(0.160)	(261.543)	(243.427)	(1215.293)	(1238.335)	(0.280)	(0.336)
Medium Level Altruism	0.348**	-0.182	165.3	-221.1	2270*	-1590	0.695**	-0.318
	(0.162)	(0.152)	(277.774)	(239.232)	(1281.248)	(1194.070)	(0.315)	(0.324)
High Altruism * Year 2		0.366		-275.9		1432		0.605
		(0.223)		(398.402)		(1743.133)		(0.367)
Medium Altruism * Year 2		0.508*		-46.51		2554		0.893**
		(0.267)		(420.308)		(2040.059)		(0.448)
High Altruism * Year 3		0.176		-9.574		1024		0.257
		(0.215)		(230.746)		(1478.474)		(0.359)
Medium Altruism * Year 3		0.429*		564.3*		3811**		0.769*
		(0.250)		(327.141)		(1855.336)		(0.432)
High Altruism * Year 4		-0.564***		-805.9**		-4688***		-1.089***
		(0.177)		(335.581)		(1460.424)		(0.312)
Medium Altruism * Year 4		-0.350		-376.6		-2993*		-0.620*
		(0.219)		(352.985)		(1702.099)		(0.376)
High Altruism * Year 5		1.399***		689.1*		8608***		3.241***
		(0.181)		(382.246)		(1419.470)		(0.437)
Medium Altruism * Year 5		1.780***		1643***		11696***		4.612***
		(0.251)		(589.749)		(1794.472)		(0.697)
High Altruism * Year 6		0.432***		602.1**		3838***		0.712***
		(0.146)		(278.345)		(1351.946)		(0.226)
Medium Altruism * Year 6		0.339		646.5**		3265**		0.655*
		(0.217)		(258.553)		(1635.281)		(0.350)

Tobit Sigma					14391***	14102***		
					(1628.130)	(1614.778)		
Observations	14459	14459	14524	14524	14524	14524	14524	14524
R-squared	0.087	0.137	0.032	0.041	0.019	0.027	0.079	0.130

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The models also include all covariates listed in Tables 2.5-c and 2.6a-c, as well as variables identifying missing values for dichotomous variables and mean-filled continuous variables. The number of observations in the logit model differs from the OLS and Tobit models due to the perfect prediction of the dichotomous outcome with the household income and employment status missing indicators.

FOR BETTER OR WORSE: RELATIONSHIP STATUS AND BODY MASS INDEX[1]

Abstract

Recent increases in the incidence of obesity and declines in marriage have prompted policymakers to implement policies to mitigate these trends. This paper examines the link between these two outcomes. There are four hypotheses (selection, protection, social obligation and marriage market) that might explain the relationship between marital status transitions and changes in Body Mass Index (BMI). The selection hypothesis suggests that those with a lower BMI are more likely to be selected into marriage. The protection hypothesis states that married adults will have better physical health as a result of the increased social support and reduced incidence of risky behavior among married individuals. The social obligation hypothesis states that those in relationships may eat more regular meals and/or richer and denser foods due to social obligations which may arise because of marriage. Finally, the marriage market hypothesis indicates that when adults are no longer in the marriage market they may not maintain a healthy BMI because doing so is costly and they are in a stable union—or on the other hand, adults may enhance their prospects in the marriage market by losing weight. Taking advantage of longitudinal data and complete marriage histories in the National Longitudinal Survey of Youth 1979, we estimate individual fixed effects models to examine associations between the change in log BMI and the incidence of overweight and obesity, and changes in relationship status controlling for the effects of aging and other respondent characteristics. We find no support for the marriage protection hypothesis. Rather we find evidence supporting the social obligation and marriage market hypotheses—BMI increases for both men and women during marriage and in the course of a cohabiting relationship. Separate analyses by race and ethnicity reveal substantial differences in the response of BMI to relationship status across these groups.

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Introduction

Marriage has become an increasingly important topic of social science research. It has been associated with positive changes in labor market productivity and compensation. In particular, married men are found to earn more than unmarried men, even controlling for education, age, occupation and industry, and person-specific fixed effects to control for selection into marriage. This marriage-wage premium is a phenomenon observed not only in the U.S. (recent empirical studies using U.S. data include Averett et al., 2006; Light, 2004; Stratton and Leslie, 2002; Chun and Lee, 2001; Hersch and Stratton, 2000) but also in other countries (see Richardson, 2000; Gupta et al., 2005) There is also a burgeoning literature that links marital status to health outcomes and longevity (see Wilson and Oswald, 2005; Wood et al., 2007 for recent reviews of this literature). Different researchers focus on various measures of health, ranging from self-reported health to mortality rates. In addition there is evidence that after marriage individuals (men in particular) reduce risky behaviors associated with health such as smoking (Duncan et al., 2006). Generally, these studies suggest the existence of a marriage-health premium.

In this paper, we estimate the association between relationship status and one important indicator of health—the Body Mass Index (BMI), and particularly unhealthy levels of the BMI such as overweight and obesity. Recent decades have seen significant changes in the prevalence of obesity and overweight nationally and internationally.[2] In the United States the prevalence of obesity for adults 20–74 years of age has increased from 15 percent in the late 1970s to 32.2 percent in 2003–2004 (Flegal et al., 2002; Ogden et al., 2006). From 2000 to 2005 alone, the prevalence of obesity among adults in the U.S. rose 24 percent (Strum, 2007). Obesity is linked to chronic illnesses including diabetes, hypertension, asthma, heart disease, and cancer and is estimated to affect more people than smoking, heavy drinking or poverty (Sturm, 2002; Sturm and Wells, 2001).

[2] A BMI (defined as weight in kilograms divided by height in meters squared) between 18.5 and 25 is considered healthy weight, a BMI under 18.5 is considered underweight and a BMI between 25 and 29 is considered overweight. A BMI 30 and over is considered obese and a BMI 40 and over extremely (or morbidly) obese, roughly 100 pounds overweight (Strum, 2007).

In this research we add to the existing literature on marital status and health by explicitly considering cohabitation as a separate relationship status. Most previous work on the health effects of marriage has treated cohabiting individuals as if they were single. The evidence regarding whether cohabitation confers the same benefits of marriage is mixed. There exist a number of studies that establish that the financial and health benefits of relationship status are somewhat unique to marriage (e.g. Waite and Gallagher, 2000). This may be because in marriage, which in the U.S. is a more stable relationship than cohabitation, individuals are more likely to invest by specializing. However, other research suggests that the type of relationship does not matter (Lillard and Panis, 1996).

We use data from the 1979 cohort of the National Longitudinal Survey of Youth (NLSY79), a longer panel data set than used in earlier work, to sort out the association between relationship status and BMI. Although our results do not distinguish the route through which relationship status affects BMI, they provide important evidence about a link between relationship status and obesity. We might expect systematic associations between marriage and BMI for four reasons. Marriage may confer protective effects, individuals may alter their BMI as they move in and out of the marriage market, partnered individuals may engage in social eating behaviors and activities or because individuals who marry are a select group, inherently different from those who do not marry. We expand on these explanations in the next section.

The theoretical link between marriage and health

There are several competing, but not mutually exclusive theories that have been offered to explain the well-documented positive correlation between marriage and various measures of health status and mortality. The marriage selection hypothesis suggests that the healthy are selected into marriage because they make better marriage partners. According to this argument, an observed correlation between marital status and health is not causal—i.e. not a function of marriage per se but rather a function of the process by which marriage partners are selected; such a process favors the healthy. This observation is consistent with Becker's (1981) marriage model where comparative advantage is important if there are to

be gains realized from marriage. This is also consistent with the positive assortative mating hypothesis where health status is a criterion—healthy people will marry other healthy people. It also suggests that healthier people may have an easier time finding a partner and maintaining a relationship (Lillard and Panis, 1996). Theory suggests a clear direction for the selection effect—those who are healthy (i.e. thinner) are most likely to be selected into marriage. Because approximately 90 percent of Americans eventually marry, obesity does not appear to prevent marriage but it may influence marital timing and mate quality. For example, Averett and Korenman (1996) found that obese women were less likely to marry and when they did marry they married spouses with lower earnings.

Another explanation linking marital status to health outcomes is that marriage confers health benefits by providing protection—this is termed the marriage protection hypothesis in the literature (e.g. Waldron et al., 1996). Under this hypothesis, married people are healthier because they have a spouse who can monitor their health behaviors, who can care for them when they are ill and who will likely discourage them from engaging in risky behaviors. They also, by virtue of economies of scale and specialization in labor market and home production activities, have access to more material resources on a per capita basis than they would if they were single. In this scenario marriage provides social support and financial resources that themselves promote health by providing access to better nutrition and health care. In contrast to the selection hypothesis, the marriage protection hypothesis suggests that married people are healthier precisely because they are married; i.e. being married is the cause of better health. In this case, we would expect to see that married people have BMIs in the recommended range rather than in the overweight or underweight ranges.

As Lillard and Panis (1996) note, however, the existence of the protective effect introduces the possibility of adverse selection: those in poor health have an incentive to marry. In other words, those who are most likely to benefit from marriage in terms of better health are most inclined to marry and least likely to exit the marriage; i.e. they are most likely to ‘purchase’’ the marriage protective effect. There are also theories that emphasize that positive assortative mating will lead to better health because partners

with similar traits share values and beliefs that may facilitate a supportive relationship (Stutzer and Frey, 2003).[3]

In addition to the selection and protection hypotheses, which generally hold for most measures of health, there is a third route through which BMI in particular might be related to marital status. In American society (as in many other developed nations) obese persons, especially women, are stigmatized (Sobal, 1999). Individuals who are not as socially desirable are less likely to have an opportunity to attract a potential mate (Jo, 2004). Carmalt et al. (2007) using BMI and other physical and behavioral covariates find that both heavier men and women are less likely to be matched with a physically attractive partner, though a desirable personality, attractiveness and better grooming increase the likelihood of being matched with such a partner. This is especially relevant for women because physical attractiveness has traditionally played an important role in attracting a mate. Because maintaining low weight is costly, once a relationship has been established, vigilance in the monitoring of one's weight may relax. This 'marriage market' hypothesis suggests that married individuals, who are no longer concerned about attracting a mate may allow their BMI to rise. Similarly, individuals may lower their BMI in the event of a divorce. Theoretical models of marriage and divorce posit that individuals compare their utility in marriage to their utility in the single state (Becker, 1981). Utility in marriage includes the characteristics of one's spouse. Because the utility-maximizing conditions for entering marriage are the same as the conditions for remaining married, the validity of this marriage market hypothesis in explaining a link between marriage and BMI relies on the assumption that there are some transactions costs associated with exiting marriage (i.e. divorce costs are non-trivial). Under this scenario, partners will tolerate some amount of weight gain before they see their own benefits from the union fall enough to make divorce the preferred option.

[3] There are, however, some studies that cast doubt on the protection hypothesis and the possibility that marriage would lead to healthier BMI. Goldman and Smith (2002), investigating adherence to self-treatment health regimens for HIV and insulin-dependent diabetes, also found that men who went from married to single were significantly less likely to adhere to their health regimen suggesting that wives provide a protective role in their husbands, with the presence of a wife being more beneficial for more educated men. However, they did not find that married men provided the same protection for their wives. Furthermore, as Duncan et al. (2006) find, marriage reduces the incidence of smoking and smoking cessation is strongly correlated with weight gain (Jo, 2004; Sobal and Rauschenbach, 2003).

Another explanation offered for a positive correlation between marriage and BMI is that married couples may face spousal role obligations that often encourage them to eat – perhaps more than they might as single individuals because they may eat more regular meals or eat out more as a married couple and thus ingest more calories (Sobal and Rauschenbach, 2003; Jo, 2004). Recent evidence indicates that this may hold for social networks in general (Christakis and Fowler, 2007).

Naturally, these explanations for the relationship between marriage and health are not mutually exclusive. One can easily imagine that while marriage per se might reduce risky behavior, the selection hypothesis suggests that those who engage in risky behaviors might not be selected into marriage and that at least part of the observed relationship between marriage and risky behavior is due to selection. Thus, in order to understand the relationship between relationship status and BMI, careful empirical investigation is warranted.

Cohabitation may also impact partners' health, though perhaps to a lesser extent than marriage. Cohabiters have some security in the presence of a partner but also have a lower cost of union dissolution and therefore may feel that they are still in the ''marriage market''. Thus, cohabiting partners may feel greater pressure to maintain a lower BMI. They may also be less likely to provide the protective effect if it is particularly time consuming. Divorced individuals may integrate themselves back into the marriage market and thus we might expect weight loss.

Our discussion of the possible routes through which relationship status might result in changes in BMI highlights the fact that theory is ambiguous as to the effect of relationship status on BMI. Our analysis allows us to empirically evaluate the relative strengths of these competing effects although given data limitations we cannot evaluate each one independently. For example, the NLSY has no information on exercise or physical activity and only limited information on food choices.

We expect that the relationship between marital status and BMI may be different for men and women and we estimate our models separately for these two groups. Physical attractiveness has been shown to be a more important factor for women in the marriage market than for men (Averett and

Korenman, 1996; Conely and Glauber, 2005). In addition, there is some evidence that women are more likely to take care of men rather than vice versa (Goldman and Smith, 2002). For these reasons, we hypothesize that the protective effect of marriage may dominate for men, and the marriage market effect may be strongest for women. In the next section we review the extant literature on this topic followed by a discussion of our method and data.

Previous empirical research on the link between marriage and health

A consistent finding in previous cross-sectional studies is that married people enjoy better health and live longer than their unmarried counterparts. Only relatively recently have researchers tried to disentangle the selection and protection effects of marriage by using longitudinal data. A recent review by Wilson and Oswald (2005) provides an excellent summary of this literature and a more comprehensive review than is included here. Interestingly, Wilson and Oswald note, that although economists have been contributing to the marriage wage premium literature for years, they have had relatively less to say about other benefits of marriage, including health, despite the fact that there are potential cost savings if marriage per se is the cause of better health. Wood et al. (2007) provide a comprehensive review of the marriage-health literature.

Researchers have used a variety of methods to control for the selection of the healthy into marriage: prospective models, difference models and simultaneous equation models. In an example of the latter, Lillard and Panis (1996) use data from the Panel Study of Income Dynamics to jointly estimate the determinants of marital status, health and mortality. Using a self reported measure of health status they find evidence of positive selection into marriage based on health but also some evidence for adverse selection—i.e. that unhealthy men are more likely to marry. They also find some support for the protection effect hypothesis resulting from marriage.

Other researchers find support for both the selection and protection effects of marriage by exploiting the timing of events available from longitudinal data to estimate prospective models. Controlling for pre-marriage behaviors, Duncan et al. (2006) find that both marriage and cohabitation

reduce the incidence of some substance use and that the protective effect of marriage is greater than that of cohabitation. Similarly Waldron et al. (1996) find a strong protective effect of marriage on later health outcomes among women even after controlling for initial health status. In their work, the association between marriage and health was found to be much weaker for women who were employed full time.

Similar to the analysis that we conduct, a number of earlier studies relied on individual fixed effects or difference models to net out the selection effect of marriage. Wu and Hart (2002) estimate the effects of marital and non-marital union transitions within a 2-year period on three measures of health—a self-reported health indicator, a measure of depression and a generic health status index. They found that after netting out selection by estimating a difference model and controlling for protection effects by including measures of social networks and social contacts, staying married or cohabiting resulted, counterintuitively, in poorer physical and mental health compared to those who remained single. In contrast, Stutzer and Frey (2004) estimated fixed effects models using 17 years of data from the German socio-economic panel and found a protective effect of marriage on happiness. Similarly, Blanchflower and Oswald (2004) in their study of happiness in the U.S. and Britain estimate the value of a lasting marriage at around $100,000 per year on average (compared to being widowed or separated).

The marriage and health literature identifies the selection of the healthy into marriage, but also finds some support for a protection effect of marriage, in that marriage, and to a lesser extent cohabitation, increases longevity, reduces risky behaviors, and makes people healthier. Though marriage is shown to positively affect the health of both men and women, there is some evidence that men benefit more than women.

Less attention has been paid to the relationship between marital status and BMI, although several researchers have found that there is a negative selection effect into marriage associated with BMI. Specifically, the obese are less likely to be married. For example, Averett and Korenman (1994) and Conely and Glauber (2005) both report that obese women fare far worse in the marriage market than their peers in the recommended BMI range.

A considerable amount of research shows that the BMIs of spouses are highly correlated (see Jeffery and Rick, 2002 and the citations within). Furthermore, a recent paper by Jeffery and Rick (2002) examined the longitudinal associations between body mass index and marriage-related factors. They found that those who married during their study gained weight while those who ended a marriage lost weight. They did not find any evidence that obesity reduced the likelihood of getting married (though the authors noted that their sample consisted of relatively older adults and they observed very few new marriages).

Several papers by medical and nutrition researchers and sociologists examine the link between marital status and weight in a longitudinal framework. These papers used data from the 1980s and the early 1990s (and hence often did not control for cohabitation). Generally these studies employed data from only two points in time and so could not provide estimates for a long marital history. These papers provide mixed evidence regarding the association between marriage and weight (for a review of these papers see Sobal et al., 2003). To our knowledge only two recent papers employed techniques that allowed one to net out time invariant selection characteristics when estimating the association between marital status and weight changes. Sobal et al. (2003) use longitudinal data to examine the relationship between weight and marriage transitions and find that women who were unmarried at baseline and married before the follow-up survey had greater weight gain than those who were married in both time periods. In contrast, men who remained divorced/separated and men who became widowed lost more weight than men married at both baseline and follow-up. They interpret their findings as indicative that changes in social roles, such as entering or leaving marriage, influence physical characteristics such as body weight. One drawback of their method is that they only observe their sample at two points in time 10 years apart, introducing the possibility of missing multiple intervening marriage transitions.

Jo (2004) uses NLSY data to estimate a bivariate probit model of the link between marriage and the probability of being obese. The bivariate probit typically relies on the identification of valid instruments. Jo, however, relies on an alternative identification strategy that is achieved by constraining

the value of the correlation coefficient between the unobservables that determine obesity and the unobservables that determine the probability of marriage. He reports that ‘‘[t]hese findings support and even confirm the operation of a marital causation model among men. . .’’ (Jo, 2004, p. 57). He notes also that for women, the results do not support the possibility of a causal relationship between marriage and obesity.

Finally, recent research documents that married individuals living in countries with high divorce rates have lower BMI’s than married people living in societies with lower risk of divorce. This suggests that people are more likely to invest in their outer appearance when the potential of returning to the marriage market is high (Lundborg et al., 2006).

Data and Econometric Model

To examine the link between relationship status and BMI we use data from the 1979 cohort of the National Longitudinal Survey of Work Experience of Youth (NLSY79). These data are a nationally representative sample, that includes a weighted oversample of Hispanics, African-Americans and low-income whites. The survey respondents, over 12,000 young men and women, were between the ages of 14 and 22 in 1979. The advantage of the NLSY79 data is that respondents were surveyed annually from 1979 to 1994 and biannually thereafter. Respondents provided information on their transitions from school to employment, marriage and fertility histories, family structure, and detailed information on income and labor market variables, as well as periodic reports of height and weight. We begin our analysis with data from the 1981 survey because this is the first year height and weight data were recorded.

We extract a sample of individuals over the age of 18 that consists of 10,423 respondents who had complete and chronological marital histories based on marriage and divorce dates. Our sample is divided into sub-samples by formal relationship status: never married, married and divorced. To examine the impact of informal relationships, for those who are never married or divorced we also identify the

presence of a cohabiting partner. We define a cohabitor as an unmarried individual who reported the presence of a partner other than a spouse in the household record.

We follow an empirical approach that is standard in the literature on marriage and health which aims to disentangle selection from potential protection and marriage market effects (see, for example, Wilson and Oswald, 2005; Sobal et al., 2003; Wu and Hart, 2002). Our interest lies in netting out the selection effect to determine if any association between the type of relationship and BMI remains. Thus, we estimate individual-level fixed-effects models. Our econometric model is:

$$(BMI_{it}) = \alpha + \beta' R_{it} + \gamma X_{it} + \delta_i + \varepsilon_{it} \quad (1)$$

where the dependent variable is the natural log of the predicted BMI of individual *i* at survey *t*.[4,5] It should be noted that there are limitations of BMI as an accurate measure of fatness. As described by Cawley and Burkhauser (2008), high BMI may be associated with either excess fat or highly developed muscle mass. Though we cannot distinguish between the two, BMI is the only measure available in the NLSY79. The independent variables of interests are R_{it}, a vector of dichotomous variables indicating the individual's relationship status at time *t*. Relationship status variables are classified into one of five categories: (1) never married and not cohabiting; (2) unmarried and currently cohabiting; (3) currently married; (4) divorced and not cohabiting; or (5) divorced and currently cohabiting. The omitted category in our analysis is Never Married and Not Cohabiting. The vector *X* includes other potentially important sociodemographic determinants of BMI such as education, region of residence, and various fertility measures. Because of the effect of pregnancy on BMI for women,[6] we include an indicator of a current pregnancy, the presence of any children, the number of children, and the birth of a child within the past

[4] The distribution of the Body Mass Index is positively skewed, thus to minimize the impact of positive outliers we estimate models of logged BMI. We reestimate all of our models using linear BMI and obtain similar, though less precise results. Eleven individuals whose weight was outside the ''measurable range'' of 50–400 pounds, as used by the NLSY79, were dropped.

[5] Due to the potential reporting error in self-reported height and weight data we use the coefficients estimated from the NHANESIII data by Cawley and Burkhauser (2008) to predict a measurement error corrected height and weight of respondents. While this does not correct for all potential measurement error, the goodness of fit for their models by race and sex have an R-squared of 0.91–0.95.

[6] We also include these measures to control for any potential ''sympathy weight'' gain during a spouse's/partner's pregnancy.

year. Because of the positive correlation between BMI and age, and because an individual is necessarily older when divorced than during their marriage, it is important to control for age. We include both age and age-squared to allow for nonlinearities in the relationship between BMI and age. Finally, our models include δ_i, a vector of individual-level fixed-effects. As explained above, the inclusion of these fixed-effects allows us to estimate β' parameters that are unbiased by any time invariant individual characteristics correlated with marital status. As noted by Antonovics and Town (2004) there are limitations of fixed effects models. However, given that we lack credible instrumental variables for relationship status and because we know that OLS models do not allow us to untangle selection from protection and marriage market effects; fixed effects models are our preferred empirical method.

To estimate individual fixed effects models, we arrange our data in a person-year format. Each respondent contributes one observation in every year in which he or she reports weight data to allow the calculation of their BMI. Height data were collected in 1981, 1982, and finally in 1985when respondents are between the ages of 20 and 28.[7] For the years after 1985, we use height measured in 1985.[8] Weight data were collected in those same 3 years, and then in eleven of the 14 survey years after 1985.

Table 3.1a presents the unadjusted sample means for all women in the longitudinal sample (5180women contributing 56,708 person years) and separately by marital status. The average woman in our sample has a BMI that is just over the upper bound of the ‘‘recommended’’ range (over 25 is considered overweight or obese). BMIs are highest for single cohabiting and divorced women. We see that the BMI of never-married women is about the same as that of married women. Table 3.1b reports the means for our sample of men (5243men contributing 54,867 person years). Divorced men who cohabit and married men have the highest BMIs. As shown in Table 3.1, the vector *X* includes demographic and socioeconomic covariates, all of which are time varying except for dichotomous variables identifying race and ethnicity and whether the respondent lived with both parents at age 14.

[7] Height and weight information was also gathered in 1983, but only for ever-pregnant females. We do not use data from this year.
[8] Given that the denominator of the BMI equation is constant from 1985 forward, change in BMI is thus a result of weight change.

Results

Given the potentially important role of selection in marriage decisions, we begin our empirical analysis by estimating a model of logged BMI measured in 1981 on whether an individual ever marries using as our sample all individuals who reported having never been married in 1981—the first year of our panel. The first column of Table 3.2 indicates that women who are single in 1981 and who subsequently marry have a 1981 BMI 6.2 percent lower than those who do not ever marry. This finding is indicative of selection into marriage for women with lower BMIs.[9] For men (in column 2), those who ever marry have a 1981 BMI 1.3 percent higher than those who remain single indicating selection into marriage of slightly heavier men. The second panel of Table 3.2, estimated on the sample of those who have ever been married at some point in the survey, examines the effect of BMI at the time of marriage on the probability of eventually divorcing. We find no evidence that weight plays a significant role in selecting into divorce. These results highlight the importance of accounting for selection into marriage in the subsequent analyses.

To further examine the issue of selection into marriage, we examine a group of individuals who are never married at age 18 and identify their circumstances at age 35.[10] Tables 3.3a and 3.3b report average BMIs at ages 18 and 35 by relationship categories reported at age 35 for women and men, respectively. This exercise confirms that both women and men gain weight and experience an increased incidence of overweight and obesity as they age. The weight gain with age is more evident for women than for men. For instance, on average, 18-year-old women in our sample have a BMI of 22.8. In all subsequent relationship categories, average BMI at age 35 ranges from 27.1 to 29.9. There are also

[9] 1981 is the first year BMI is available. This percent change estimate is calculated on the mean height of all women in the sample, 64.3 in. or about 50400.
Similarly, for men mean height is 69.7 in. or about 501000.

[10] Although we try to select an observation for each individual at age 18, some respondents are not observed (nor is BMI measured) at age 18. We select an observation at age 18, 19, or 20 to increase sample sizes for this analysis. Similarly, we attempt to select an observation at age 35, but in some cases must use include data for an individual in a year when they were 36 or 37. Thus, sample sizes for this exercise are necessarily smaller than those reported in Table 2 because we use a three year age window rather than the seven year window used in Table 2.

distinct patterns across relationship categories. Never married women, both those who are cohabiting and those who live alone, have the highest BMIs. Married and divorced women have BMIs nearly two points lower. A comparison of average BMI at age 35 to the average BMI at age 18 provides additional Confirmation of a selection effect of lighter women into marriage. Women who are married at age 35 have the lowest initial BMIs (22.6) compared to initial BMIs nearly 2 points higher for never married and single cohabiting women. It appears that thinner women are selected into marriage and although they gain weight slightly more rapidly than their unmarried counterparts, they nevertheless are far less likely to be obese at age 35 than are women who remain single.

Table 3.3b provides the same information for men in our sample. Men experience a similar weight gain between age 18 and age 35, but there is less evidence of a selection effect into marriage for men as compared to women. For both men and women, there is evidence that relationship status is also associated with personal and background characteristics. Specifically, married men and women have the highest levels of education. Racial differences across relationship categories are also evident. Black and Hispanic men and women are least likely to be married and black men and women are overrepresented among never married and cohabiting groups.

Because individuals in different relationship categories differ, not just in their body weight, but in their personal characteristics, we proceed with a multivariate examination of the determinants of BMI levels. Tables 3.4a (females) and 3.4b (males) present the OLS and fixed effects (FE) estimates of logged BMI on relationship status controlling for a limited set of sociodemographic covariates and then extend the model to include additional explanatory variables. The OLS models in column 1 of Table 3.4a are in keeping with what we know from other studies. African-American and Hispanic women have higher BMIs than comparable white women. OLS results also reveal that BMI increases at a decreasing rate with age and is higher for women with less education. Women living in an urban area also experience lower BMIs.

The OLS models also demonstrate that BMI levels vary with respect to a woman's marital and cohabitation status. Specifically, women who are identified as ever having been in a relationship experience lower BMI levels than women in our sample who have never married and who are not currently cohabiting. This reduction in BMI is most pronounced for currently divorced women whether they are cohabiting (a BMI that is nearly six percent lower than that of comparable single women) or living alone (a BMI that is almost five percent lower).

The OLS results provide an interesting descriptive picture of the association between BMI and marital status but do not disentangle selection effects from possible causal explanations. The OLS estimates rely on both variation in marital status across women in the sample and variation in marital status for each individual woman over time. These OLS estimates may be biased if there are any fixed characteristics of the individual that are associated with both BMI and marital status. For instance, if women with a genetic predisposition for low body weight are more likely to marry, then the OLS estimates of the effect of marriage on BMI would be biased downward. To address this concern, we estimate individual-level fixed effects models that eliminate person-specific time-invariant factors. The fixed effects results for women are reported in column 2 of Table 3.4a.

The coefficients on the time-varying personal characteristics such as age, education and residential location are similar to those in the OLS models but are typically smaller in magnitude and not all reach conventional levels of statistical significance. Note that time invariant characteristics such as race, ethnicity, and parents' marital status during adolescence drop out of the fixed effects model.

The most striking differences between the OLS models and the fixed effects models occur in the coefficients on the marital status and cohabitation variables. The effect of being unmarried and cohabiting and being married switch from their negative estimate in the OLS models to positive and significant estimates in the fixed effects models. The negative OLS estimates, which capture the variation in BMI across individuals, suggest that women with lower BMIs are more likely to be married or cohabiting. The fixed effects estimates, on the other hand, indicate that after marriage or cohabitation a woman's weight is

higher than it was when she was unmarried. In contrast, divorce leads to BMI values that are significantly lower than when that woman was single, cohabiting, or married.

Individual-level fixed effects models control for time-invariant heterogeneity, but do not address the potential problem of reverse causality. That is, it is possible that changes in BMI over time cause changes in marital status. The fixed effects models net out an underlying genetic tendency for a high BMI, but if for example, a woman's BMI affects her marriage prospects, then a recent weight loss may increase the probability that she moves into marriage and thus also be associated with a lower BMI immediately after marriage. Ideally, we would like to conduct an experiment with a sample of identical individuals (with regard to BMI and other characteristics), randomly assign some of them to marriage, and compare changes in BMI across the married and unmarried groups. Of course, this is implausible. However, we can control for initial BMI in each time period. In results not shown here but available from the authors upon request, we added in the lagged value of (the natural log of) the women's BMI as a control variable using the same specification as shown in column 1 of Table 3.4a. The inclusion of lagged BMI values confirms the persistence of body weight from year to year. We find that 46 percent of one's current BMI is determined by BMI in the previous year. The addition of lagged BMI to our models alters the coefficients on the marital status variables only slightly. Marriage and cohabitation, both for never-married and divorced women, are still associated with an increase in BMI, and divorce is still associated with a decrease in BMI (although somewhat smaller and not statistically significant).[11]

Our results suggest that being in a partnered relationship is associated with a higher BMI for women than when they are single or divorced and not cohabiting. There are a number of routes through which the presence of a partner could alter BMI. The first is that there is additional family income in a two-adult household. Although greater income is typically associated with healthier BMI levels (Williams and Umberson, 2004), we modify our models to consider the income effect of partnership. Furthermore, the presence of a partner may alter work behaviors which, in turn, may be associated with changes in BMI

[11] We do not include the lagged BMI in our FE models because including a lagged dependent variable in a FE regression violates the strict exogeneity assumption.

levels (Averett and Korenman, 1996). Finally, there is an obvious link between BMI and fertility for women. We thus modify our base model to control for total family income, labor force status including unemployment, withdrawal from the labor force, and school enrollment. These models also control for health limitations that prevent the respondent from working, an indicator of a current pregnancy, a recent birth, and the presence and number of children. It could be argued that these variables are endogenous but we include them as they are possible routes through which relationship status may affect body weight. Estimates from these extended models are shown in columns 3 and 4 of Table 3.4a.

Although some of these additional variables are significantly related to BMI levels for women, their inclusion in the models does not substantially alter the effect of marital status on BMI. Examining the results from our preferred specification of the model in column 4 (fixed effects with the extended set of covariates) we find that, compared to employed women, women who are not in the labor force have higher BMIs. Since married women are less likely to work than unmarried women, a change in employment status could explain weight gain among married women. Similarly, pregnancy, more likely among married and partnered women, is associated with higher BMI. In contrast, the higher levels of family income that are experienced by partnered women result in reduced BMI. Net of all of these effects, married and cohabiting women are still found to experience higher BMIs than do single or divorced women. Clearly, netting out selection reveals a very different pattern than seen in our OLS results. These findings are inconsistent with the idea that marriage confers a protective effect for women by lowering their BMI.

As shown in Table 3.4b, we find a different pattern of results by relationship status in the OLS models for men. Married men, compared to single never-married men, have a BMI which is 2.8 percent higher while the BMI of divorced men who are currently cohabiting is 2 percent higher than that of single never-married men. However, men who are divorced and not cohabiting have significantly lower BMIs than their never-married counterparts. Furthermore, men who are divorced and cohabiting have BMIs that are 0.7 percent lower than those of single never-married men. While significant, these effects are

practically rather small. The same relationships with respect to age, education, race and ethnicity hold for men as they did for women.

For men, estimates from models that purge time-invariant selection effects via the inclusion of individual-level fixed effects and that control for work, health and fertility variables (column 4) illustrate small but significant increases in BMI during marriage and cohabitation for men. Specifically, BMI levels are 1.5, 1.0 and 1.5 percent higher for men who are married, single and cohabiting, and divorced and cohabiting respectively. Becoming divorced continues to be associated with a lower BMI but the magnitude falls from a modest 0.6 percent decline in the OLS model to a small and insignificant 0.1 percent BMI decline in the fixed effects model.[12] Clearly, for men, being in a relationship with a partner, whether formalized through marriage or not is associated with an increase in BMI although the increases are rather modest.

Until now, we have examined the effect of relationship status on a continuous measure of BMI. However, small changes in BMI for individuals within the normal range are not expected to have serious health consequences. On the other hand, if the changes in BMI cause individuals to cross into the unhealthy range of the BMI, the health consequences may be much more serious. Thus, we examine whether the weight increases associated with marriage or cohabitation move individuals from a level considered 'underweight' to the recommended weight range, or from the recommended weight range to levels considered overweight or obese.[13] The marginal probabilities reported in Table 3.5 are from linear probability models estimated with the extended set of covariates, and individual-level fixed effects (i.e. the same specification in column 4 of Tables 3.4a and 3.4b). These results suggest that the largest changes in BMI that were suggested in both panels of Table 3.4 may have important health consequences. For instance, marriage does not result in a reduction in the incidence of underweight among women, but is associated with a 3.9 percentage point increase in the likelihood that a woman is above the overweight

[12] F-Tests indicate that statistically the effect of marriage and being a divorced cohabiter are the same but the effect of being married is statistically different from being divorced or cohabiting and never married.
[13] In keeping with the medical literature, we define underweight as a BMI less than 18.5. A BMI over 25 is considered overweight, and a BMI in excess of 30 is considered obese.

threshold and a 1.4 percentage point increase in the probability that she is obese. The weight loss associated with divorce, on the other hand, reduces the probability of a women being classified as overweight or obese. Interestingly, women who cohabit do not experience a weight gain large enough to push them into the unhealthy levels. This may reflect the fact that in the U.S. cohabitation is often a more temporary relationship and thus women who cohabit may view themselves as still in the marriage market and hence keep their weight in the recommended BMI range (Litchter et al., 2006). Though the magnitude of BMI increases associated with the presence of a partner were smaller for men, there are significant increases in overweight and obesity for married and cohabiting men that are even larger than those for women These results clearly suggest that any protective health effects of marriage and cohabitation do not occur through healthy weight management.

The models estimated in Tables 3.4 and 3.5 assume that the effect of relationship status is constant in all years. That is, these estimates assume a single average relationship status effect regardless of the duration of time spent in each status. To facilitate our understanding of the relationship between marital status and BMI over time, we map out BMI trajectories for women and men before and after relationship status transitions. Fig. 3.1 illustrates BMI changes for men and women in the 2 years before marriage and in the 3 years following marriage relative to the individual's BMI at the time of marriage. This figure is constructed from fixed effects models that control for age and all of the sociodemographic variables included in the expanded models in Table 3.4. These models are the same as the specifications in column 4 of Tables 3.4a and 3.4b with the addition of dichotomous indicators of the time before and after a relationship transition.[14] Fig. 3.1 clearly demonstrates that both men and women gain weight after marriage. Women begin at lower BMIs in the year before marriage (relative to their BMI at marriage), and then gain weight after marriage occurs. The initial drop in BMI for women may result from the desire to lose weight prior to her wedding. The trajectory for men shows a similar pattern of weight gain, but it is smaller and less precisely estimated.

[14] The full regression results are available from the authors upon request.

In similar fashion to Fig. 3.1, Figs. 3.2–3.4 illustrate the BMI trajectories for men and women prior to and subsequent to single cohabitation, divorce, and divorce cohabitation. BMI patterns for never-married men and women who enter cohabiting relationships (Fig. 3.2) indicate some weight gain after cohabitation but this gain is smaller in magnitude than that occurring after marriage, suggesting that the lower cost of exiting a cohabiting relationship or lower levels of commitment may lead cohabitors to more carefully monitor their BMIs. Fig. 3.3 indicates an irregular pattern of BMI changes for divorced and cohabiting men and women that are not significantly different from the initial cohabitation year.

Fig. 3.4 illustrates the extent to which divorce negates marriage-related weight gain. The BMI for both men and women rises up until the time of divorce and then declines. Initially, women's BMIs drop by nearly 1.2 percent and men's drop by 0.7 percent in the year or two following divorce. BMIs for divorced women reach their low point 2 years after divorce, but for both men and women the post divorce weight loss is short lived. Though the observed decreases in BMI during the years in which an individual is divorced are consistent with the marriage market hypothesis, yet another factor could be at work. The process of divorce, both the emotional upheaval, property settlements, and the physical move to two separate households are likely to affect one's emotional well-being. Physical responses to anxiety and depression often include weight changes. The fact that BMI's are found to be lower than in the single state may be explained by the emotional stress of divorce (Sobal et al., 2003; Hobson et al., 1998). This avenue of causality is supported by our findings that the decreases in BMI upon divorce are most sharply observed in the years immediately following divorce.

Our comparison of the OLS and the fixed effects results reveal that for women there is significant selection into marriage. Women with lower BMIs are most likely to marry as evidenced by the negative coefficients on marriage in the OLS models and the complete elimination of a negative effect of marriage in the fixed effects model. This is consistent with the findings in Table 3.2 that women who will eventually marry have lower initial BMIs. Fixed effects models, which remove time invariant heterogeneity reveal that for women there is a positive effect of marriage on BMI though the coefficient is

not particularly large. These effects, however, have the potential to lead to serious health consequences because they move women from the recommended weight range into the overweight and obese categories. Whether this is a marriage market effect or caused by changes in eating and activity patterns in a relationship cannot be disentangled with our data.

For men, after netting out selection we find that married men and divorced cohabiting men are only slightly heavier. Men in any relationship are more likely to cross over into unhealthy weight categories. We conclude our analysis with an examination of whether the relationship between marital status and BMI differs across racial and ethnic groups.

Marital status and body weight by race and ethnicity

Marriage and cohabitation rates vary considerably by race. Data from the 1995 round of the National Survey of Family Growth, for example, reveal that 47.4 percent of Hispanics were currently married compared to 54.3 percent of whites and 25.2 percent of blacks. Hispanics are slightly more likely to cohabit (8.2 percent) when compared to whites (6.9 percent) and blacks (7.0 percent) (Bramlett and Mosher, 2002). For this reason, we examine the patterns of weight changes and marital status separately for non-Hispanic blacks, non-Hispanic whites and Hispanics. The results of this exercise are reported in Tables 3.6a, 3.6b and 3.6c.

The pattern for white women is similar to that of all women. This is perhaps expected since white women make up the majority of our sample. The fixed effects results indicate that married white women are heavier than single never-married white women while divorced white women have lower BMIs than their single, never-married counterparts. The increase in BMI for white women during marriage is associated with an increase in the proportion of women classified as overweight and obese. These findings are consistent with a withdrawal from the marriage market or that the unobserved responsibilities associated with marriage such as increased caloric intake due to more frequent or regular meals have resulted in weight gain.

We observe declines in BMI and reductions in the likelihood of overweight for white women after divorce that are consistent with the notion that in the absence of a partnered arrangement she is keeping her marriage market options open. In Table 3.6b we see that married black women have higher BMIs than single, never-married black women. Never-married cohabiting black women also experience (a somewhat smaller) increase in BMI, but only marriage moves black women out of the healthy BMI range into the overweight category.[15] For Hispanic women (Table 3.6c) we see that married and divorced women (whether cohabiting or not) have higher BMIs and a higher incidence of overweight and in some cases obesity, than their single never-married counterparts.

Men in all racial and ethnic groups tend to be heavier in marriage than when they were single, and in many cases these increases manifest themselves in increases in the likelihood of unhealthy BMI levels. Specifically, married black men and white men increasingly find themselves in all three unhealthy weight categories (underweight, overweight and obese) compared to similar never-married men. Hispanic men are less likely to be underweight but are five percentage points more likely to be overweight after marriage. Cohabiting is associated with weight gain only for white and Hispanic men. White and Hispanic men experience weight declines after divorce, but only Hispanic men transition out of the overweight and obese categories in the aftermath of divorce.

Conclusion

Our research examines the effect of relationship status on BMI and on important measures of health such as the likelihood of being underweight, overweight and obese. We use data from the National Longitudinal Survey of Youth 1979 cohort to examine the impact of changes in formal (marriage and divorce) and informal (cohabitation) relationships between 1981 and 2004. The panel nature of the data allows us to look at changes over time while differencing out individual time invariant heterogeneity.

[15] It should be noted that the OLS results for black women (not shown, but available from the authors on request) suggest no evidence of selection into marriage for thinner black women. This finding may reflect different cultural norms for attractiveness (Thompson et al., 1996).

Our results support the hypothesis that thinner women are more likely to be selected into romantic relationships. OLS models consistently show that women in any relationship status are thinner than their never-married counterparts. This supports the argument that thinness among women is valued in the marriage market. However, fixed effects models reveal that once selection is netted out by the use of person-specific fixed effects, women are generally heavier when married than they were during their never-married years. Weight gain after marriage may occur in part because spouses eat more often with others due to shared meals and social obligations and perhaps participate less frequently in individual activities such as sports and exercise (Sobal et al., 2003). Another potential explanation is that married individuals are less likely to smoke (Duncan et al., 2006) and smoking cessation is associated with weight gain. Never-married cohabiting women are also heavier than their never-married non-cohabiting counterparts. These findings are consistent with the fact that partnered women are not participating in the marriage market and may not monitor their weight as carefully as when they are single. The fact that these effects are smaller for cohabiting women than for married women is consistent with the idea that cohabiting unions are not perceived to be as stable or permanent as marriage. We see no evidence of the protective effects of being in a relationship operating through healthier weight management for women.

We consistently find, as have others, that married men are more likely to be heavier than their single, never-married counterparts in the cross-section. Our results for married males hold in the FE specification as well though the effect is about half the size of the OLS estimate. This result holds across all three of our race/ethnic groups.

For both men and women the increase in BMI associated with marriage (and associated with cohabitation for men) translates into increases in the likelihood that an individual has a BMI in the overweight or obese categories. Our findings suggest that although others have found marriage to be beneficial to health in other dimensions, marriage, and to a much lesser extent cohabitation, may exact a price on one's health in the form of increased BMI. These changes in BMI can have important

implications for health as they increase the probability of unhealthy weight, although the precise behaviors that lead to these changes in BMI cannot not identified in this study.

Finally, our results suggest that the dissolution of a marriage is associated with reductions in BMI and the incidence of overweight and obesity among women. These health benefits associated with divorce, however, are short-lived. Women return to their pre-divorce level of BMI within two years of their divorce.

By estimating individual-level fixed effects models with longitudinal data that provide information on relationship histories over a 24-year period, we are able to net out time invariant factors that lead to selection into marriage, divorce and cohabitation. Our estimates suggest that changes in relationship status lead to predictable and significant changes in BMI that can have important health consequences. What remains is to more precisely identify the route through which these changes occur. Another fruitful avenue for future research would be to use data that contains other measures of fatness to see if the results hold for these data.

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Tables and Figures

Table 3.1a. Sample statistics – means and standard deviations for women

	Full sample	Never married	Single cohabiting	Married	Divorced	Divorced cohabiting
Predicted BMI	26.056	25.987	26.074	25.954	26.653	25.858
	(6.310)	(6.777)	(6.540)	(5.905)	(6.659)	(5.900)
Underweight	0.02	0.024	0.02	0.016	0.022	0.026
Overweight	0.465	0.438	0.45	0.472	0.506	0.468
Obese	0.216	0.22	0.224	0.207	0.244	0.185
Single, never married	0.306	1	0	0	0	0
Single cohabiting	0.039	0	1	0	0	0
Married	0.503	0	0	1	0	0
Divorced	0.128	0	0	0	1	0
Divorce cohabiting	0.024	0	0	0	0	1
Any children	0.649	0.345	0.535	0.79	0.825	0.806
Number of children at interview	1.379	0.674	1.111	1.679	1.872	1.882
	(1.338)	(1.176)	(1.386)	(1.239)	(1.363)	(1.388)
Pregnant	0.043	0.023	0.049	0.06	0.02	0.043
Child less than 12 months old	0.155	0.081	0.165	0.218	0.086	0.118
White	0.551	0.423	0.489	0.652	0.459	0.657
Black	0.293	0.45	0.338	0.177	0.379	0.175
Hispanic	0.156	0.126	0.172	0.171	0.162	0.168
Highest grade completed	12.887	12.963	12.45	13.037	12.412	12.01
	(2.315)	(2.222)	(2.205)	(2.404)	(2.149)	(1.970)
Age	30.211	26.84	28.333	31.581	33.009	32.633
	(6.996)	(6.764)	(6.118)	(6.574)	(6.378)	(5.929)
Age over 35	0.278	0.151	0.161	0.326	0.41	0.361
Lived in 2 parent HH at 14	0.681	0.638	0.579	0.733	0.622	0.632
Urban	0.796	0.842	0.837	0.761	0.818	0.758
Northeast	0.179	0.211	0.239	0.168	0.137	0.14
Midwest	0.237	0.23	0.225	0.242	0.228	0.258
South	0.398	0.406	0.301	0.39	0.446	0.367

Table 3.1a Continued	Full sample	Never married	Single cohabiting	Married	Divorced	Divorced cohabiting
West	0.186	0.153	0.236	0.2	0.189	0.236
Employed	0.686	0.667	0.648	0.694	0.712	0.695
Unemployed	0.067	0.1	0.088	0.044	0.073	0.06
In school	0.029	0.067	0.018	0.011	0.018	0.01
Not in labor force	0.217	0.165	0.245	0.251	0.195	0.234
Employment missing	0.001	0.001	0.001	0.001	0.001	0.001
Total net family income	38247.62	26304.52	16041.88	51271.23	25548.13	20895.6
	(64440.840)	(40001.800)	(27203.240)	(80097.070)	(39770.270)	(33426.440)
Total net family income missing	0.168	0.212	0.064	0.156	0.156	0.077
Health limitation	0.079	0.072	0.089	0.071	0.117	0.118
Health limitation missing	0.015	0.016	0.023	0.015	0.014	0.015
Sample size	56708	17363	2199	28545	7240	1361
Proportion of sample	1.000	0.306	0.039	0.503	0.128	0.024

Table 3.1b. Sample statistics – means and standard deviations for men

	Full sample	Never married	Single cohabiting	Married	Divorced	Divorced cohabiting
Predicted BMI	26.201	25.071	25.758	27.158	26.491	27.239
	(4.812)	(4.606)	(4.633)	(4.799)	(4.755)	(4.848)
Underweight	0.007	0.012	0.006	0.003	0.003	0.003
Overweight	0.535	0.407	0.484	0.642	0.573	0.644
Obese	0.177	0.124	0.155	0.224	0.181	0.22
Single, never married	0.397	1	0	0	0	0
Single cohabiting	0.051	0	1	0	0	0
Married	0.442	0	0	1	0	0
Divorced	0.088	0	0	0	1	0
Divorce cohabiting	0.022	0	0	0	0	1
Any children	0.531	0.19	0.565	0.773	0.758	0.82
Number of children at interview	1.088	0.333	1.159	1.611	1.616	1.953
	(1.309)	(0.838)	(1.426)	(1.281)	(1.366)	(1.553)
Pregnant	0.041	0.015	0.057	0.067	0.016	0.043
Child less than 12 months old	0.14	0.046	0.193	0.231	0.074	0.152
White	0.549	0.484	0.373	0.639	0.495	0.544
Black	0.292	0.375	0.458	0.19	0.337	0.279
Hispanic	0.159	0.142	0.169	0.17	0.168	0.177
Highest grade completed	12.662	12.565	11.982	12.976	12.172	11.633
	(2.399)	(2.265)	(2.120)	(2.562)	(2.122)	(1.897)
Age	30.26	26.807	29.746	32.558	33.76	33.623
	(6.985)	(6.535)	(5.904)	(6.309)	(6.127)	(5.837)
Age over 35	0.281	0.141	0.207	0.374	0.45	0.421
Lived in 2 parent HH at 14	0.682	0.649	0.568	0.741	0.635	0.556
Urban	0.8	0.836	0.865	0.759	0.805	0.799
Northeast	0.182	0.215	0.226	0.159	0.13	0.158
Midwest	0.245	0.238	0.219	0.261	0.214	0.236
South	0.374	0.362	0.318	0.376	0.448	0.393
West	0.199	0.185	0.238	0.205	0.208	0.213

Table 3.1b Continued	Full sample	Never married	Single cohabiting	Married	Divorced	Divorced cohabiting
Employed	0.816	0.706	0.817	0.918	0.788	0.838
Unemployed	0.077	0.121	0.091	0.036	0.08	0.065
In school	0.026	0.056	0.009	0.006	0.007	0.003
Not in labor force	0.08	0.116	0.083	0.039	0.123	0.093
Employment missing	0.001	0.001	0	0.001	0.001	0.002
Total net family income	40764.57	30555.49	21652.46	54193.8	33587.02	28578.24
	(67411.380)	(54515.030)	(36959.780)	(80384.850)	(52047.050)	(49709.160)
Total net family income missing	0.188	0.266	0.105	0.123	0.232	0.089
Health limitation	0.059	0.066	0.062	0.045	0.089	0.086
Health limitation missing	0.008	0.012	0.005	0.004	0.007	0.004
Sample size	54867	21788	2808	24234	4837	1200
Proportion of sample	1.000	0.397	0.051	0.442	0.088	0.022

Table 3.2. OLS model of the determinants of initial log BMI

	Women	Men		Women	Men
Ever married	-0.0618***	0.0125**	Ever divorced	0.0023	-0.0076
	(0.008)	(0.006)		(0.010)	(0.008)
Unemployed	0.00027	0.00054	Unemployed	0.0141	0.0066
	(0.011)	(0.007)		(0.014)	(0.014)
In school	-0.0019	-0.0147*	In school	-0.0081	-0.0383
	(0.009)	(0.008)		(0.027)	(0.029)
Not in labor force	0.0051	-0.0031	Not in labor force	0.0248**	-0.0287
	(0.013)	(0.011)		(0.011)	(0.019)
Total net family income/1000	-0.0003	0.0003*	Total net family income/1000	-0.0001**	0.000
	(0.000)	(0.000)		(0.000)	(0.000)
Health limitation	0.0121	-0.0198	Health limitation	0.0477***	-0.0051
	(0.017)	(0.014)		(0.015)	(0.018)
Any children	0.0335	-0.0098	Any children	-0.010	0.0061
	(0.021)	(0.023)		(0.015)	(0.013)
Number of children at interview	-0.0219*	0.0006	Number of children at interview	-0.0048	-0.0016
	(0.013)	(0.015)		(0.006)	(0.005)
Pregnant	0.0033	0.0067	Pregnant	0.0522**	0.0048
	(0.025)	(0.024)		(0.021)	(0.016)
Child less than 12 months old	-0.0162	0.0015	Child less than 12 months old	-0.0174	-0.0007
	(0.018)	(0.021)		(0.017)	(0.014)
Black	0.0325***	-0.0175***	Black	0.0898***	0.0241***
	(0.009)	(0.007)		(0.010)	(0.009)
Hispanic	0.0230**	0.0298***	Hispanic	0.0537***	0.0495***
	(0.011)	(0.008)		(0.012)	(0.010)
Highest grade completed	-0.0071***	0.00118	Highest grade completed	-0.0093***	-0.0028*
	(0.002)	(0.002)		(0.002)	(0.002)
Age	0.0722	0.105***	Age	0.0170**	0.0279***
	(0.049)	(0.037)		(0.008)	(0.006)
Age squared	-0.0016	-0.00234**	Age squared	-0.0001	-0.0003***
	(0.001)	(0.001)		(0.000)	(0.000)
Lived in 2 parent HH at 14	-0.0018	0.00414	Lived in 2 parent HH at 14	-0.0021	0.0138*
	(0.008)	(0.006)		(0.009)	(0.007)
Age over 35	–	–	Age over 35	-0.0113	0.0399**
	–	–		(0.024)	(0.018)
Urban	-0.0124	-0.0175***	Urban	-0.0041	0.000
	(0.009)	(0.007)		(0.010)	(0.008)
Northeast	-0.0137	0.0119	Northeast	0.0068	0.0258**
	(0.011)	(0.008)		(0.013)	(0.011)
Midwest	0.0012	0.0170**	Midwest	0.0034	0.0237**
	(0.011)	(0.008)		(0.012)	(0.010)
South	-0.0084	0.00769	South	0.0098	0.0092
	(0.010)	(0.008)		(0.011)	(0.009)

Table 3.2 Continued	Women	Men		Women	Men
Constant	2.458***	1.964***	Constant	2.883***	2.735***
	(0.496)	(0.381)		(0.100)	(0.085)
Sample size	2524	2968	Sample size	2202	2056
R-squared	0.061	0.037	R-squared	0.17	0.138

Note: ***p < 0.01; **p < 0.05; *p < 0.10. Standard errors in parentheses. In columns 1 and 2 the dependent variable is BMI in 1981, the first year that height and weight measurements are available, and the sample consists of all respondents who reported never having been married in 1981. The dependent variable in columns 3 and 4 is BMI in the first year in which the respondent reports being married, and the sample consists of all respondents who ever married. The models also control for dummy variables indicating whether employment, total net family income and health limitations were missing.

Table 3.3a. Initial characteristics at age 18 and subsequent characteristics at age 35 by relationship status for women

	18 year olds never married at baseline	Never married at age 35	Single cohabiting at age 35	Married at age 35	Divorced at age 35	Divorced cohabiting at age 35
Predicted BMI	–	29.87	29.911	27.113	27.772	27.878
(measured at age 35)		(7.634)	(7.826)	(6.384)	(6.854)	(7.009)
Predicted initial BMI	22.813	24.313	24.631	22.64	23.101	23.897
(measured in 1981)	(4.061)	(5.092)	(5.202)	(3.670)	(4.455)	(4.579)
Underweight	0.044	0.008	0	0.009	0.016	0.009
Overweight and obese	0.219	0.695	0.713	0.553	0.592	0.604
Obese	0.062	0.422	0.436	0.264	0.313	0.283
White	0.526	0.281	0.309	0.631	0.4	0.566
Black	0.329	0.595	0.457	0.186	0.43	0.236
Hispanic	0.145	0.124	0.234	0.182	0.17	0.198
Highest grade completed	11.755	13.2	12.564	13.404	12.629	12.406
	(1.278)	(2.501)	(2.128)	(2.489)	(2.097)	(2.142)
Any children	0.13	0.536	0.723	0.882	0.859	0.84
Number of children at interview	0.161	1.253	1.787	2.039	2.091	2.198
	(0.457)	(1.567)	(1.632)	(1.202)	(1.428)	(1.564)
Lived in 2 parent HH at 14	0.662	0.589	0.564	0.741	0.61	0.66
Employed	0.529	0.705	0.596	0.736	0.767	0.774
Unemployed	0.146	0.079	0.106	0.032	0.061	0.075
In school	0.221	0.012	0	0.008	0.014	0.009
Not in labor force	0.104	0.203	0.287	0.224	0.156	0.142
Total net family income	24072.6	30568.08	20976.77	66530.87	28151.55	28311.5
	(15798.85)	(25379.54)	(19120.54)	(107217.30)	(28699.80)	(28028.09)
Health limitations	0.037	0.136	0.149	0.084	0.14	0.132
Sample size	2292	645	94	2034	623	106

Table 3.3b. Initial characteristics at age 18 and subsequent characteristics at age 35 by relationship status for men

	18 year olds never married at baseline	Never married at age 35	Single cohabiting at age 35	Married at age 35	Divorced at age 35	Divorced cohabiting at age 35
Predicted BMI	–	27.444	27.163	28.039	27.234	27.509
(measured at age 35)		(5.430)	(4.914)	(4.856)	(4.646)	(4.260)
Predicted initial BMI	22.976	23.419	22.72	23.623	23.386	23.523
(measured in 1981)	(3.328)	(3.908)	(2.808)	(3.491)	(3.301)	(3.146)
Underweight	0.028	0.009	0.000	0.002	0.002	0.000
Overweight and obese	0.205	0.625	0.632	0.733	0.648	0.703
Obese	0.043	0.276	0.206	0.271	0.225	0.228
White	0.548	0.373	0.232	0.62	0.443	0.594
Black	0.302	0.479	0.594	0.206	0.374	0.248
Hispanic	0.15	0.149	0.174	0.174	0.184	0.158
Highest grade completed	11.375	12.811	11.923	13.288	12.322	11.911
	(1.448)	(2.353)	(1.822)	(2.560)	(2.048)	(2.025)
Any children	0.054	0.338	0.755	0.856	0.788	0.832
Number of children at interview	0.062	0.686	1.826	1.903	1.788	2.059
	(0.280)	(1.241)	(1.691)	(1.244)	(1.447)	(1.605)
Lived in 2 parent HH at 14	0.658	0.596	0.568	0.749	0.616	0.644
Employed	0.56	0.718	0.768	0.934	0.78	0.812
Unemployed	0.189	0.083	0.103	0.021	0.071	0.089
In school	0.18	0.009	0	0.001	0.006	0
Not in labor force	0.071	0.19	0.129	0.044	0.143	0.089
Total net family income	25158.01	30990.28	28714.74	66109.99	34811.57	33694.14
	(16372.75)	(24948.94)	(24367.10)	(98918.51)	(52675.44)	(26187.77)
Health limitations	0.035	0.132	0.110	0.046	0.11	0.069
Sample size	2631	794	155	1942	463	101

Table 3.4a. Determinants of log predicted body mass index: OLS and fixed effects models for women

	Base model		Extended model	
	OLS	FE	OLS	FE
Single cohabiting	-0.013***	0.009***	-0.018***	0.006**
	(0.005)	(0.003)	(0.005)	(0.003)
Married	-0.028***	0.019***	-0.025***	0.017***
	(0.002)	(0.002)	(0.002)	(0.002)
Divorced	-0.047***	-0.005**	-0.047***	-0.007***
	(0.003)	(0.002)	(0.003)	(0.002)
Divorced cohabiting	-0.057***	0.002	-0.059***	0.0001
	(0.006)	(0.003)	(0.006)	(0.003)
Unemployed			-0.007**	-0.007***
			(0.004)	(0.002)
In school			-0.017***	0.003
			(0.005)	(0.003)
Not in labor force			0.001	0.004***
			(0.002)	(0.001)
Total net family income/1000			-0.0001***	-0.00002***
			(0.000)	(0.000)
Health limitation			0.051***	0.023***
			(0.003)	(0.002)
Any children			-0.008***	-0.003*
			(0.003)	(0.002)
Number of children at interview			-0.0002	-0.001
			(0.001)	(0.001)
Pregnant			0.026***	0.026***
			(0.005)	(0.002)
Child less than 12 months old			0.001	0.001
			(0.003)	(0.001)
Black	0.100***		0.100***	
	(0.002)		(0.002)	
Hispanic	0.064***		0.065***	
	(0.003)		(0.003)	
Lived in 2 parent HH at 14	0.006***		0.007***	
	(0.002)		(0.002)	
Highest grade completed	-0.011***	-0.002***	-0.011***	-0.002***
	(0.000)	(0.001)	(0.000)	(0.001)
Age	0.026***	0.005***	0.025***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)
Age squared	-0.0003***	-0.0001***	-0.0003***	-0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)
Age over 35	0.001	0.003	0.003	0.003
	(0.004)	(0.002)	(0.004)	(0.002)

Table 3.4a Continued	Base model		Extended model	
Urban	-0.019***	0.0005	-0.018***	0.0005
	(0.002)	(0.001)	(0.002)	(0.001)
Northeast	0.003	0.010**	0.004	0.010**
	(0.003)	(0.005)	(0.003)	(0.005)
Midwest	0.010***	0.013***	0.010***	0.013***
	(0.003)	(0.004)	(0.003)	(0.004)
South	0.012***	0.002	0.012***	0.002
	(0.003)	(0.004)	(0.003)	(0.004)
Constant	2.851***	3.094***	2.859***	3.085***
	(0.026)	(0.029)	(0.026)	(0.029)
Sample size	56708	56708	56708	56708
R-Squared	0.170	0.848	0.178	0.849
F-Stat. single cohabit = married	10.39***	14.83***	2.277	15.04***
F-Stat. divorced = married	51.13***	226.70***	69.62***	207.10***
F-Stat. divorce cohabit = married	26.67***	31.85***	37.98***	31.49***

Note: ***p < 0.01; **p < 0.05; *p < 0.10. Standard errors in parentheses. The models also control for dummy variables indicating whether employment, total net family income and health limitations were missing, as well as year dummy variables.

Table 3.4b. Determinants of log predicted body mass index: OLS and fixed effects models for men

	Base model		Extended model	
	OLS	FE	OLS	FE
Single cohabiting	-0.005*	0.009***	-0.007**	0.010***
	(0.003)	(0.002)	(0.003)	(0.002)
Married	0.028***	0.013***	0.029***	0.015***
	(0.002)	(0.001)	(0.002)	(0.001)
Divorced	-0.007***	-0.003	-0.006**	-0.001
	(0.003)	(0.002)	(0.003)	(0.002)
Divorced cohabiting	0.020***	0.014***	0.019***	0.015***
	(0.005)	(0.003)	(0.005)	(0.003)
Unemployed			-0.005**	-0.001
			(0.003)	(0.001)
In school			-0.005	0.007***
			(0.004)	(0.002)
Not in labor force			-0.010***	0.003**
			(0.003)	(0.002)
Total net family income/1000			-0.00001	-0.00001
			(0.000)	(0.000)
Health limitation			-0.003	-0.005***
			(0.003)	(0.002)
Any children			-0.018***	-0.007***
			(0.002)	(0.002)
Number of children at interview			0.006***	0.003***
			(0.001)	(0.001)
Pregnant			0.003	0.002
			(0.004)	(0.002)
Child less than 12 months old			-0.002	-0.003**
			(0.002)	(0.001)
Black	0.006***		0.008***	
	(0.002)		(0.002)	
Hispanic	0.053***		0.0534***	
	(0.002)		(0.002)	
Lived in 2 parent HH at 14	0.002		0.002	
	(0.002)		(0.002)	
Highest grade completed	-0.001***	-0.003***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Age	0.017***	0.017***	0.018***	0.017***
	(0.001)	(0.001)	(0.001)	(0.001)
Age squared	-0.0002***	-0.0003***	-0.0002***	-0.0003***
	(0.000)	(0.000)	(0.000)	(0.000)
Age over 35	-0.0004	-0.003*	-0.001	-0.003*
	(0.003)	(0.002)	(0.003)	(0.002)

	Base model		Extended model	
Urban	-0.010***	0.003**	-0.010***	0.003**
	(0.002)	(0.001)	(0.002)	(0.001)
Northeast	0.020***	0.006*	0.021***	0.006
	(0.002)	(0.004)	(0.002)	(0.004)
Midwest	0.017***	0.010***	0.017***	0.010***
	(0.002)	(0.003)	(0.002)	(0.003)
South	0.009***	0.014***	0.009***	0.014***
	(0.002)	(0.003)	(0.002)	(0.003)
Constant	2.878***	2.926***	2.885***	2.920***
	(0.021)	(0.023)	(0.021)	(0.023)
Sample size	54867	54867	54867	54867
R-Squared	0.163	0.849	0.165	0.849
F-Stat. single cohabit = married	111.60***	5.534**	121.10***	8.203***
F-Stat. divorced = married	200.10***	117.20***	185.10***	124.10***
F-Stat. divorced cohabit = married	3.205*	0.018	4.82**	0.01

Note: ***p < 0.01; **p < 0.05; *p < 0.10. Standard errors in parentheses. The models also control for dummy variables indicating whether employment, total net family income and health limitations were missing, as well as year dummy variables.

Table 3.5. Selected determinants of being underweight, overweight or obese

	Women			Men		
	Underweight	Overweight and obese	Obese	Underweight	Overweight and obese	Obese
Single cohabiting	-0.002	0.0004	0.003	-0.001	0.028***	0.014**
	(0.003)	(0.009)	(0.007)	(0.002)	(0.008)	(0.006)
Married	-0.002	0.039***	0.014***	0.004***	0.061***	0.033***
	(0.002)	(0.006)	(0.005)	(0.001)	(0.006)	(0.005)
Divorced	0.004	-0.013*	-0.022***	0.004**	0.013	0.002
	(0.003)	(0.008)	(0.006)	(0.002)	(0.008)	(0.006)
Divorced cohabiting	0.005	0.001	-0.024**	0.004	0.045***	0.034***
	(0.004)	(0.012)	(0.010)	(0.003)	(0.012)	(0.010)
Sample size	56708	56708	56708	54867	54867	54867
R-Squared	0.421	0.66	0.648	0.362	0.657	0.629
F-Stat. S. cohabit = married	0.00572	18.03***	2.019	8.661***	16.35***	7.916***
F-Stat. divorced = married	8.342***	89.60***	61.17***	0.367	54.55***	34.60***
F-Stat. D. cohabit = married	3.992**	13.97***	19.80***	0.100	2.138	0.0127

Note: ***p < 0.01; **p < 0.05; *p < 0.10. Standard errors in parentheses. Models are fixed effects with the same set of covariates as column 4 of Tables 3.4a and 3.4b.

Table 3.6a. Selected determinants of log body mass index and dichotomous weight outcomes for whites

	White Women				White Men			
OLS	Log pred. BMI	Underweight	Overweight and obese	Obese	Log pred. BMI	Underweight	Overweight and obese	Obese
Single cohabiting	-0.035***	0.001	-0.064***	-0.053***	-0.021***	-0.004	-0.031**	-0.047***
	(0.006)	(0.005)	(0.015)	(0.011)	(0.005)	(0.002)	(0.016)	(0.012)
Married	-0.045***	-0.002	-0.080***	-0.073***	0.027***	-0.001	0.097***	0.025***
	(0.003)	(0.003)	(0.008)	(0.006)	(0.003)	(0.001)	(0.008)	(0.006)
Divorced	-0.072***	0.014***	-0.145***	-0.097***	-0.018***	-0.001	-0.027**	-0.056***
	(0.005)	(0.004)	(0.011)	(0.008)\	(0.004)	(0.002)	(0.012)	(0.009)
Divorced cohabiting	-0.088***	0.009*	-0.169***	-0.153***	0.004	-0.002	0.025	-0.029*
	(0.007)	(0.006)	(0.017)	(0.013)	(0.006)	(0.003)	(0.020)	(0.015)
Observations	31248	31248	31248	31248	30123	30123	30123	30123
R-Squared	0.113	0.013	0.089	0.071	0.149	0.010	0.123	0.063
F-Stat. S. cohabit = married	2.695	0.306	1.126	3.323*	92.28***	1.05	68.43***	38.35***
F-Stat. divorced = married	51.63***	26.83***	52.16***	12.88***	179.40***	0.0309	136.60***	103.80***
F-Stat. D. cohabit = married	42.57***	4.428**	31.09***	45.08***	14.21***	0.22	14.22***	14.18***
Fixed effects								
Single cohabiting	0.004	-0.004	-0.007	-0.0002	0.005**	0.00005	0.036***	0.005
	(0.003)	(0.005)	(0.012)	(0.009)	(0.002)	(0.002)	(0.012)	(0.009)
Married	0.013***	-0.002	0.026***	0.014**	0.011***	0.002	0.058***	0.024***
	(0.002)	(0.003)	(0.008)	(0.006)	(0.002)	(0.002)	(0.008)	(0.006)
Divorced	-0.020***	0.011***	-0.047***	-0.024***	-0.009***	0.003	-0.0004	-0.012
	(0.003)	(0.004)	(0.010)	(0.008)	(0.002)	(0.002)	(0.011)	(0.008)
Divorced cohabiting	-0.015***	0.010*	-0.038***	-0.028***	0.006*	0.004	0.024	0.013
	(0.004)	(0.006)	(0.014)	(0.011)	(0.003)	(0.003)	(0.016)	(0.012)
Observations	31248	31248	31248	31248	30123	30123	30123	30123
R-Squared	0.844	0.444	0.659	0.638	0.861	0.342	0.670	0.634
F-Stat. S. cohabit = married	6.942***	0.239	7.093***	2.411	4.739**	0.931	3.165*	4.047**
F-Stat. divorced = married	231.00***	19.08***	95.28***	44.85***	116.20***	0.159	43.89***	27.90***
F-Stat. D. cohabit = married	61.10***	5.926**	27.57***	21.04***	2.565	0.242	5.549**	0.817

Note: ***p < 0.01; **p < 0.05; *p < 0.10. Standard errors in parentheses. Models are fixed effects with the same set of covariates as column 4 of Tables 3.4a and 3.4b.

Table 3.6b. Selected determinants of log body mass index and dichotomous weight outcomes for blacks

	Black Women				Black Men			
OLS	Log pred. BMI	Underweight	Overweight and obese	Obese	Log pred. BMI	Underweight	Overweight and obese	Obese
Single cohabiting	-0.016*	-0.006	-0.046***	-0.031*	-0.0005	0.001	-0.006	0.006
	(0.008)	(0.005)	(0.018)	(0.017)	(0.005)	(0.003)	(0.014)	(0.012)
Married	-0.001	-0.005*	0.019**	-0.010	0.028***	-0.006***	0.085***	0.051***
	(0.004)	(0.002)	(0.009)	(0.009)	(0.004)	(0.002)	(0.010)	(0.008)
Divorced	-0.032***	0.001	-0.047***	-0.063***	0.012**	-0.009***	0.027**	0.014
	(0.005)	(0.003)	(0.011)	(0.011)	(0.005)	(0.003)	(0.013)	(0.011)
Divorced cohabiting	-0.018	0.012	-0.011	-0.051*	0.039***	-0.006	0.119***	0.046**
	(0.014)	(0.008)	(0.030)	(0.029)	(0.009)	(0.006)	(0.026)	(0.021)
Observations	16599	16599	16599	16599	16024	16024	16024	16024
R-Squared	0.163	0.011	0.132	0.109	0.190	0.016	0.169	0.091
F-Stat. S. cohabit = married	3.163*	0.0428	12.64***	1.419	27.60***	5.200**	37.52***	14.36***
F-Stat. divorced = married	34.62***	3.375*	35.66***	24.67***	11.22***	1.281	18.66***	11.84***
F-Stat. D. cohabit = married	1.364	4.095**	0.958	1.93	1.575	0.00252	1.78	0.0596
Fixed effects								
Single cohabiting	0.006	-0.002	0.002	-0.0001	0.011***	0.001	0.018	0.020**
	(0.005)	(0.005)	(0.015)	(0.014)	(0.003)	(0.003)	(0.012)	(0.010)
Married	0.019***	0.005	0.056***	0.015	0.023***	0.006**	0.076***	0.058***
	(0.003)	(0.003)	(0.011)	(0.010)	(0.003)	(0.003)	(0.011)	(0.009)
Divorced	-0.002	0.001	0.01	-0.031**	0.006	0.004	0.025*	0.031***
	(0.004)	(0.004)	(0.013)	(0.012)	(0.004)	(0.004)	(0.015)	(0.012)
Divorced cohabiting	0.012	0.005	0.027	-0.018	0.021***	0.005	0.077***	0.056***
	(0.008)	(0.009)	(0.026)	(0.025)	(0.006)	(0.006)	(0.023)	(0.019)
Observations	16599	16599	16599	16599	16024	16024	16024	16024
R-Squared	0.847	0.372	0.633	0.647	0.833	0.405	0.640	0.607
F-Stat. S. cohabit = married	6.510**	1.79	11.03***	0.996	12.88***	1.887	17.81***	11.10***
F-Stat. divorced = married	40.79***	1.866	20.10***	22.63***	32.67***	0.437	18.05***	7.566***
F-Stat. D. cohabit = married	0.768	0.0000147	1.447	2.051	0.088	0.026	0.0005	0.008

Note: ***p < 0.01; **p < 0.05; *p < 0.10. Standard errors in parentheses. Models are fixed effects with the same set of covariates as column 4 of Table 3.4a and 3.4b.

Table 3.6c. Selected determinants of log body mass index and dichotomous weight outcomes for Hispanics

	Hispanic women				Hispanic men			
OLS	Log pred. BMI	Underweight	Overweight and obese	Obese	Log pred. BMI	Underweight	Overweight and obese	Obese
Single cohabiting	0.0002	-0.002	-0.014	0.018	0.002	-0.003	-0.015	-0.009
	(0.011)	(0.007)	(0.027)	(0.024)	(0.009)	(0.004)	(0.023)	(0.021)
Married	-0.029***	-0.003	-0.046***	-0.069***	0.027***	0.004*	0.073***	0.027**
	(0.006)	(0.004)	(0.015)	(0.013)	(0.005)	(0.002)	(0.015)	(0.014)
Divorced	-0.056***	-0.003	-0.107***	-0.137***	-0.024***	0.003	-0.011	-0.089***
	(0.008)	(0.005)	(0.019)	(0.017)	(0.007)	(0.003)	(0.020)	(0.018)
Divorced cohabiting	-0.053***	-0.007	-0.073**	-0.146***	0.004	0.002	0.047	-0.036
	(0.014)	(0.009)	(0.034)	(0.030)	(0.012)	(0.006)	(0.034)	(0.031)
Observations	8861	8861	8861	8861	8720	8720	8720	8720
R-Squared	0.152	0.020	0.116	0.091	0.174	0.014	0.145	0.095
F-Stat. S. cohabit = married	7.456***	0.0263	1.471	14.66***	9.098***	4.225**	15.77***	3.145*
F-Stat. divorced = married	16.42***	0.0135	15.21***	24.06***	62.89***	0.233	22.58***	51.62***
F-Stat. D. cohabit = married	3.191*	0.146	0.717	7.381***	3.751*	0.197	0.684	4.660**
Fixed effects								
Single cohabiting	0.007	0.006	0.002	-0.000154	0.015***	-0.008*	0.024	0.022
	(0.006)	(0.007)	(0.023)	(0.020)	(0.005)	(0.004)	(0.020)	(0.017)
Married	0.023***	-0.019***	0.044***	-0.002	0.018***	0.009***	0.042***	0.032**
	(0.005)	(0.005)	(0.016)	(0.014)	(0.004)	(0.003)	(0.016)	(0.014)
Divorced	0.002	-0.018***	0.013	-0.054***	0.007	0.004	0.021	-0.003
	(0.006)	(0.006)	(0.020)	(0.018)	(0.005)	(0.005)	(0.021)	(0.019)
Divorced cohabiting	0.032***	-0.019**	0.095***	-0.029	0.032***	0.00004	0.053*	0.070***
	(0.008)	(0.009)	(0.030)	(0.026)	(0.007)	(0.007)	'(0.030)	(0.027)
Observations	8861	8861	8861	8861	8720	8720	8720	8720
R-Squared	0.841	0.391	0.63	0.63	0.849	0.305	0.635	0.645
F-Stat. S. cohabit = married	5.037**	10.85***	2.904*	0.0082	0.192	13.54***	0.711	0.226
F-Stat. divorced = married	27.81***	0.039	5.046**	18.78***	7.469***	1.925	1.748	5.933**
F-Stat. divorced cohabited	1.675	0.00000553	4.139**	1.543	5.252**	2.574	0.161	2.798*

Note: ***p < 0.01; **p < 0.05; *p < 0.10. Standard errors in parentheses. Models are fixed effects with the same set of covariates as column 4 of Table 3.4a and 3.4b.

Figure 3.1. BMI trajectory for married respondents.

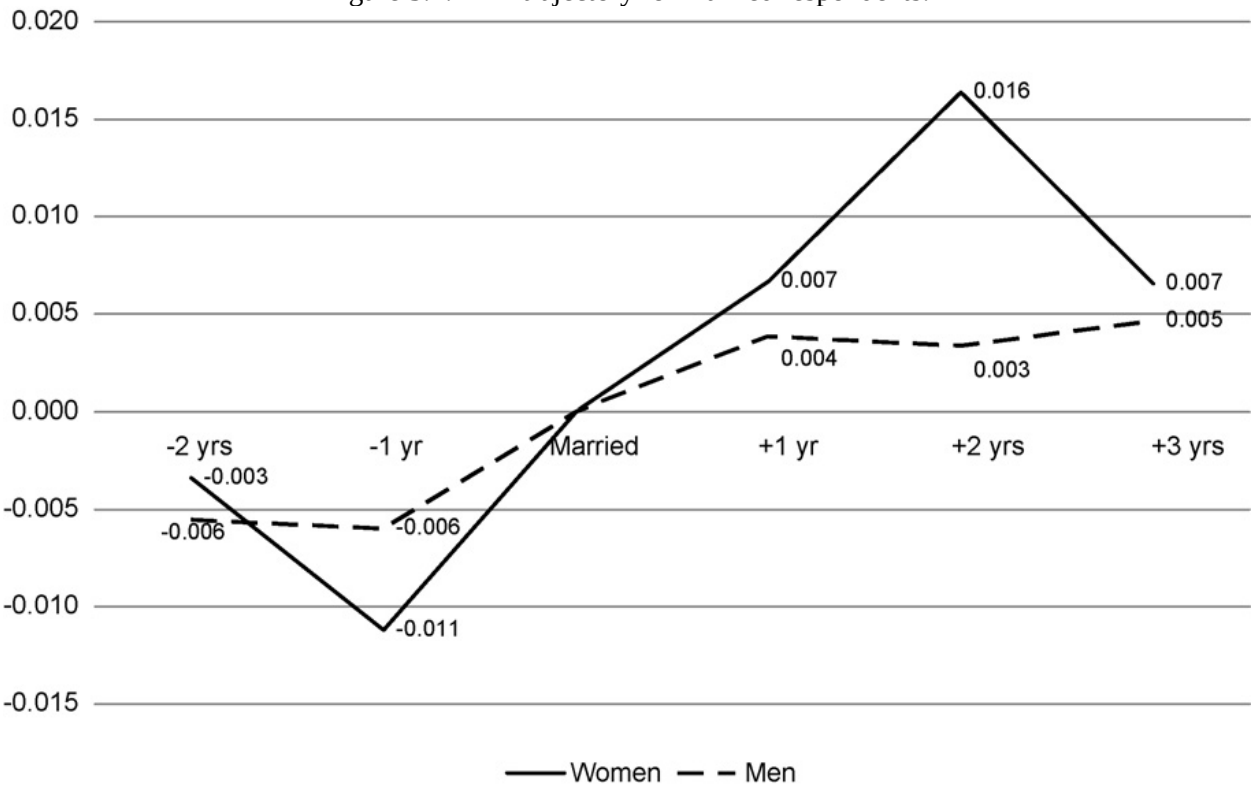


Figure 3.2. BMI trajectory for single cohabiting respondents.

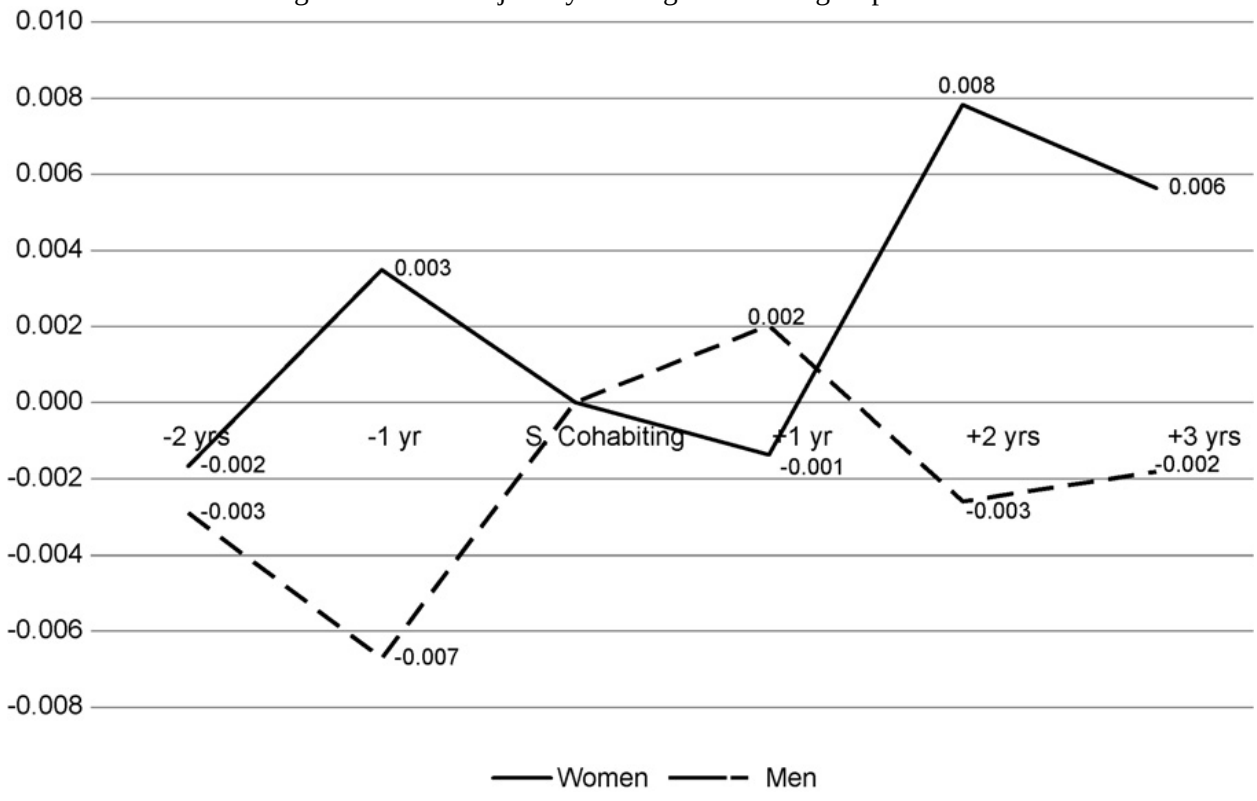


Figure 3.3. BMI trajectory for divorced cohabiting respondents.

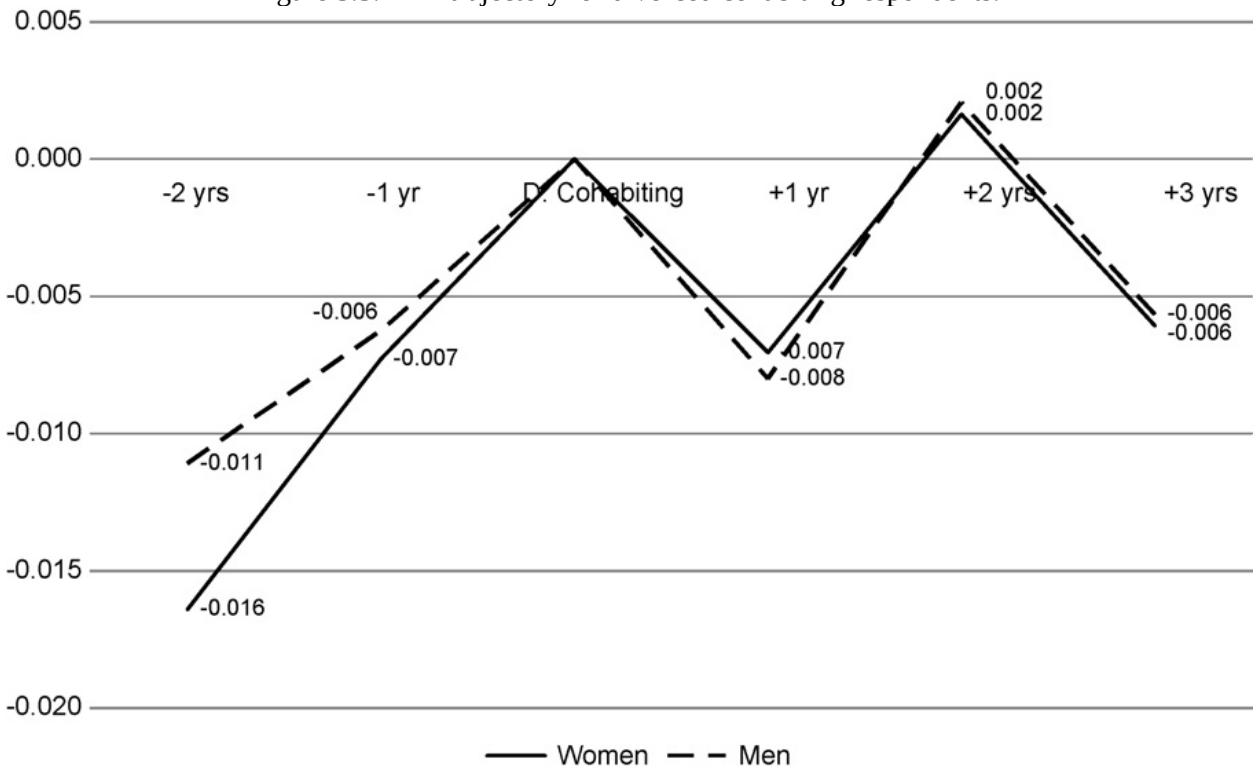
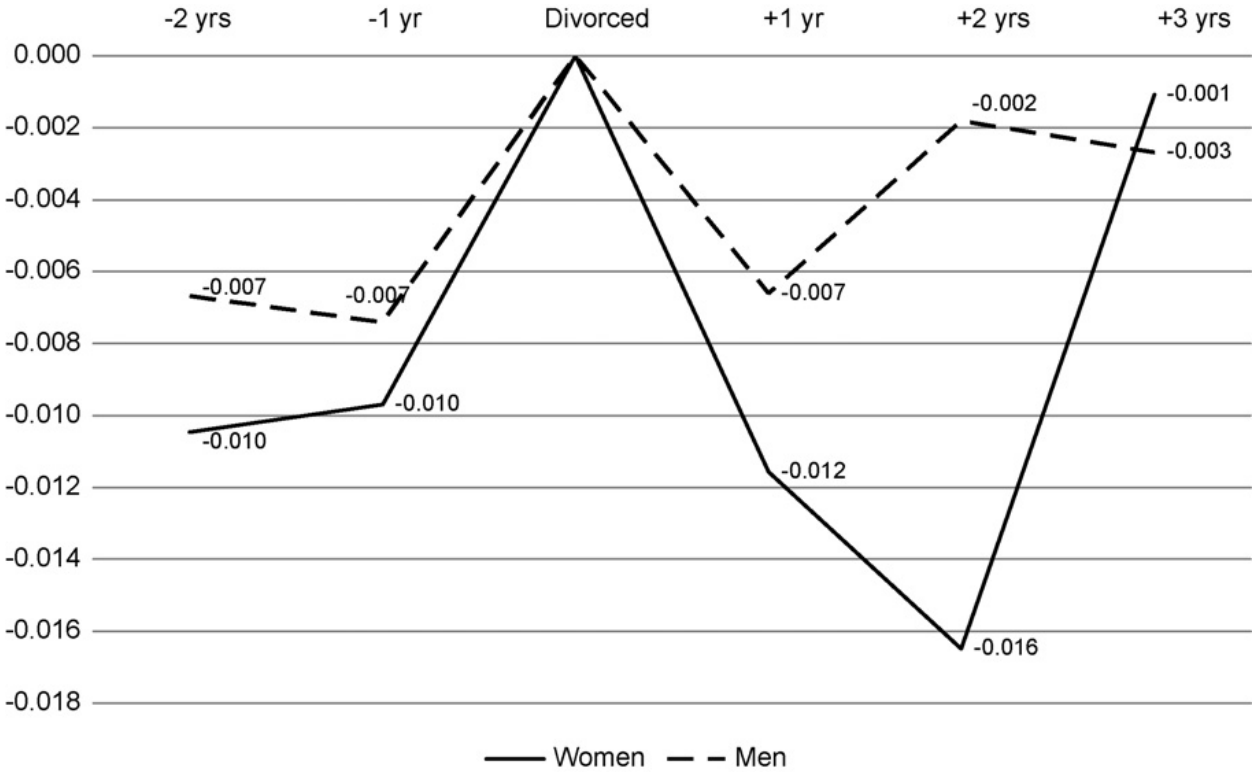


Figure 3.4. BMI trajectory for divorced respondents.



APPENDIX

Technical Appendix A1 - The Effect of Parent and Adult-Child Contact on Elderly Cognitive Functioning

This appendix is to serve as a supplemental document to the analysis in "The Effect of Parent and Adult-Child Contact on Elderly Cognitive Functioning." The purpose of this appendix is to provide additional information to the original article that was omitted for space and relevance issues. Any additional information that is not included in this document or the original article is available from the author up request.

SUMMARY STATISTICS

Appendix Table A1.1a: Summary Statistics for Missing Indicators in Analysis Sample

	Nonresident Sample		Nonresident Women		Resident Sample		No Children	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Dependent Variable								
Cognitive Recall Missing	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Contact Variables								
Contact Information Missing/Incomplete	0.17	0.37	0.17	0.38	0.21	0.41	0	0
Demographic Characteristics								
Race	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00
Marital Status	0.00	0.03	0.00	0.03	0.00	0.03	0.00	0.03
Years of Education	0.00	0.04	0.00	0.05	0.00	0.04	0.01	0.10
Work Status	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Income	0.00	0.05	0.00	0.05	0.01	0.10	0.01	0.09
Wealth	0.04	0.19	0.04	0.20	0.08	0.27	0.08	0.27
Baseline Health Characteristics								
CES-D score	0.00	0.02	0.00	0.02	0.00	0.04	0.00	0.00
Number of Chronic Illnesses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Activities of Daily Living Problems	0.00	0.03	0.00	0.03	0.00	0.04	0.00	0.02
Other Functional Limitations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IADL Problems	0.00	0.03	0.00	0.03	0.00	0.04	0.00	0.02
Fine Motor Skill Problems	0.00	0.03	0.00	0.03	0.00	0.04	0.00	0.02
Other Characteristics								
Live with Children	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix Table A1.1a Continued	Nonresident Sample		Nonresident Women		Resident Sample		No Children	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Live in Assisted Living Environment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Children Live within 10 Miles	0.03	0.18	0.03	0.18	0.05	0.22	1.00	0.00
Foreign Born	0.00	0.02	0.00	0.01	0.00	0.02	0.00	0.00
Sample Size	45888		27699		7308		2921	

Note: All means are weighted. Initial Sample consists on all observations for respondents who were surveyed between 1998 and 2008, excluding 2006.

Appendix Table A1.1b: Summary Statistics for Initial Samples and Final Nonresident Sample for Men.

	Starting Sample		Starting Sample Nonresident		Starting Sample Resident		Nonresident Men	
Variables	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Dependent Variable								
Cognitive Recall Score	9.15	4.45	9.20	4.38	8.99	4.67	9.51	3.39
Cognitive Recall Missing	0.09	0.28	0.08	0.27	0.11	0.31	0.00	0.00
Contact Variables								
Days of Contact - Total Child Contact Days	374.98	342.91	367.89	333.74	419.79	393.05	350.18	288.32
Ln(Days of Contact)	4.84	2.82	4.74	2.97	5.46	1.45	5.30	1.54
Contact Information Missing/Incomplete	0.16	0.37	0.16	0.37	0.15	0.36	0.16	0.37
Instrument								
Number of Female Children	1.40	1.23	1.32	1.18	1.68	1.37	1.37	1.11
Control Variables								
Female	0.56	0.5	0.56	0.50	0.57	0.50	0.00	0.00
Black	0.09	0.28	0.07	0.26	0.14	0.34	0.06	0.23
Hispanic	0.06	0.24	0.04	0.21	0.13	0.33	0.04	0.19
Race Missing	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.03
Baseline Characteristics								
Age	67.73	9.99	68.57	9.76	64.83	10.25	68.28	9.15
Years of Education	12.34	3.23	12.47	3.10	11.92	3.56	12.89	3.07
Years of Education Missing	0.00	0.06	0.00	0.06	0.00	0.06	0.00	0.04
Work Status	0.47	0.50	0.45	0.50	0.55	0.50	0.54	0.50
Work Status Missing	0.03	0.17	0.03	0.17	0.03	0.16	0.00	0.00
Log Income	9.40	2.03	9.55	2.01	9.19	1.11	10.01	1.07
Income Missing	0.08	0.28	0.03	0.18	0.03	0.18	0.00	0.06
Log Wealth	10.11	3.47	10.40	3.37	10.23	1.78	11.05	2.50

Appendix Table A1.1b Continued	Starting Sample		Starting Sample Nonresident		Starting Sample Resident		Nonresident Men	
Variables	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Wealth Missing	0.03	0.18	0.07	0.26	0.11	0.31	0.03	0.18
Never Married	0.02	0.15	0.03	0.17	0.01	0.11	0.00	0.05
Partnered	0.02	0.14	0.02	0.15	0.01	0.10	0.03	0.16
Married	0.62	0.49	0.63	0.48	0.60	0.49	0.77	0.42
Divorced	0.12	0.33	0.12	0.32	0.13	0.33	0.12	0.32
Widowed	0.21	0.41	0.20	0.40	0.25	0.44	0.09	0.28
Marital Status Missing	0.00	0.03	0.00	0.03	0.00	0.03	0.00	0.03
Health Conditions at Baseline								
CES-D score	1.34	1.83	1.30	1.79	1.50	1.94	1.14	1.64
CES-D score Missing	0.09	0.29	0.09	0.28	0.10	0.30	0.00	0.00
Number of Chronic Illnesses	1.42	1.23	1.43	1.22	1.41	1.27	1.44	1.18
Number of Chronic Illnesses Missing	0.03	0.17	0.03	0.17	0.03	0.16	0.00	0.00
Activities of Daily Living Problems	0.26	0.85	0.25	0.82	0.31	0.95	0.18	0.67
ADLProblems Missing	0.03	0.17	0.03	0.17	0.03	0.16	0.00	0.00
Other Functional Limitations	2.69	3.12	2.66	3.09	2.80	3.22	1.73	2.32
OFL Missing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Instrumental Activities of Daily Living Problems	0.25	0.74	0.23	0.70	0.31	0.87	0.12	0.50
IADL Problems Missing	0.03	0.17	0.03	0.17	0.03	0.16	0.00	0.00
Fine Motor Skill Problems	0.14	0.43	0.13	0.43	0.15	0.46	0.11	0.38
Fine Motor Skill Problems Missing	0.03	0.17	0.03	0.17	0.03	0.16	0.00	0.00
Other Characteristics								
Proxy Respondent	0.08	0.26	0.07	0.25	0.10	0.30	0.00	0.00
Live with Children	0.22	0.42	0.00	0.00	1.00	0.00	0.00	0.00
Live with Children Missing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Live in Assisted Living Environment	0.02	0.15	0.03	0.16	0.00	0.07	0.02	0.15
Live in Assisted Living Environment Missing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Children Live within 10 Miles	0.59	0.49	0.60	0.49	0.59	0.49	0.56	0.50
Children Live within 10 Miles Missing	0.12	0.32	0.10	0.30	0.18	0.38	0.04	0.19
Foreign Born	0.09	0.28	0.07	0.25	0.14	0.35	0.06	0.23

Appendix Table A1.1b Continued	Starting Sample		Starting Sample Nonresident		Starting Sample Resident		Nonresident Men	
Variables	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Foreign Born Missing	0.00	0.03	0.00	0.03	0.00	0.03	0.00	0.03
Sample Size	80647		63640		17007		18189	

Note: All means are weighted.

Appendix Table A1.2: Descriptive Statistics of All Variables by Cognitive Score Response Status

	Cognitive Scores Available		Cognitive Scores Unavailable	
Variables	Mean	Std. Dev.	Mean	Std. Dev.
Dependent Variable				
Cognitive Recall Score	10.01	3.60	0.00	0.00
Cognitive Recall Missing	0.00	0.00	1.00	0.00
Contact Variables				
Days of Contact - Total Child Contact Days	356.14	306.15	405.92	324.17
Ln(Days of Contact)	4.80	2.83	5.07	2.61
Contact Information Missing/Incomplete	0.15	0.36	0.17	0.37
Instrument				
Number of Female Children	1.36	1.19	1.50	1.27
Control Variables				
Female	0.59	0.49	0.35	0.48
Black	0.08	0.27	0.11	0.32
Hispanic	0.05	0.22	0.09	0.28
Race Missing	0.00	0.02	0.00	0.02
Baseline Characteristics				
Age	68.09	9.65	70.39	10.95
Years of Education	12.51	3.04	10.83	3.86
Years of Education Missing	0.00	0.05	0.01	0.09
Work Status	0.46	0.50	0.37	0.48
Work Status Missing	0.02	0.15	0.07	0.26
Log Income	9.53	1.90	8.79	2.80
Income Missing	0.03	0.17	0.08	0.27
Log Wealth	10.37	3.30	9.27	4.20
Wealth Missing	0.07	0.26	0.15	0.35
Never Married	0.03	0.16	0.02	0.13
Partnered	0.02	0.15	0.02	0.12
Married	0.61	0.49	0.72	0.45
Divorced	0.13	0.33	0.05	0.21
Widowed	0.21	0.41	0.20	0.40
Marital Status Missing	0.00	0.03	0.00	0.01
Health Conditions at Baseline				
CES-D score	1.36	1.81	0.77	1.59

Appendix Table A1.2 Continued	Cognitive Scores Available		Cognitive Scores Unavailable	
Variables	Mean	Std. Dev.	Mean	Std. Dev.
CES-D score Missing	0.04	0.20	0.59	0.49
Number of Chronic Illnesses	1.42	1.21	1.53	1.31
Number of Chronic Illnesses Missing	0.02	0.15	0.07	0.26
Activities of Daily Living Problems	0.22	0.76	0.47	1.23
ADL Problems Missing	0.03	0.16	0.08	0.27
Other Functional Limitations	2.57	3.00	3.71	3.79
OFLs Missing	0.00	0.00	0.00	0.00
Instrumental Activities of Daily Living Problems	0.20	0.60	0.62	1.35
IADL Problems Missing	0.03	0.16	0.08	0.27
Fine Motor Skill Problems	0.12	0.40	0.24	0.62
Fine Motor Skill Problems Missing	0.03	0.16	0.08	0.27
Other Characteristics				
Proxy Respondent	0.00	0.06	0.83	0.38
Live with Children Missing	0.00	0.00	0.00	0.00
Live with Children	0.13	0.33	0.18	0.39
Live in Assisted Living Environment	0.02	0.15	0.02	0.14
Live in Assisted Living Environment Missing	0.00	0.00	0.00	0.00
Children Live within 10 Miles	0.59	0.49	0.67	0.47
Children Live within 10 Miles Missing	0.09	0.29	0.07	0.25
Foreign Born	0.07	0.25	0.11	0.32
Foreign Born Missing	0.00	0.02	0.00	0.05
Sample Size	61955		7227	

Note: All means are weighted.

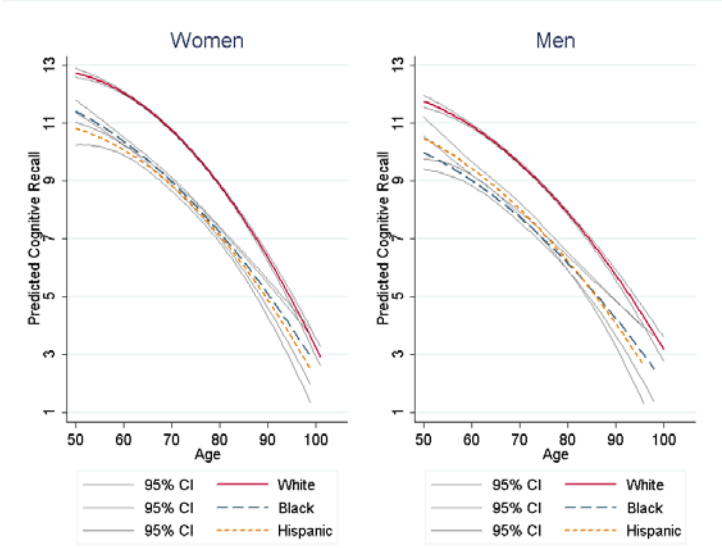
DATA VALIDITY

The following section describes the relationship between cognition and various demographic characteristics that were not include in the description of the cognition variable in the paper, *Data: Health and Retirement Study – Variables – Cognitive Measure.* The additional trajectories examined were those by race and ethnicity, education, marital status, employment status and the presence of vascular disease. Recall, the fitted model for the plotted trajectories is based on a fully interacted quadratic ordinary least squares model.[1]

[1] $C_i = \alpha_0 + \alpha_1 age_i + \alpha_2 age_i^2 + \alpha_3 X_i + \alpha_4 X_i * age_i + \alpha_5 X_i * age_i^2 + \varepsilon_i$, where X_i is the characteristic of interest

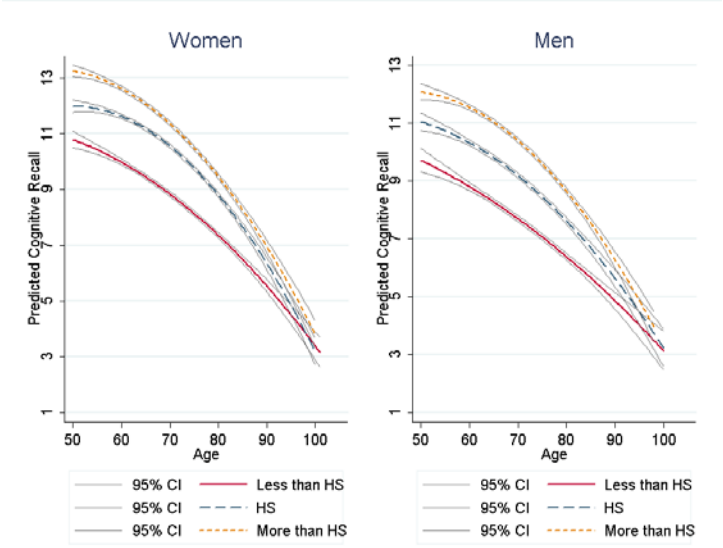
Appendix Figure 1 shows the trajectories by race and ethnicity. The cognitive scores are about one and a half words higher, and statistically different, for white respondents than they are for black or Hispanic respondents. This is consistent with Callahan et al (1996) who find that, by race, African Americans are more likely than Caucasians to develop dementia but note that this is primarily due to factors such as education.

Appendix Figure A1.1: Cognitive Trajectories by Race/Ethnicity - Quadratic OLS Models



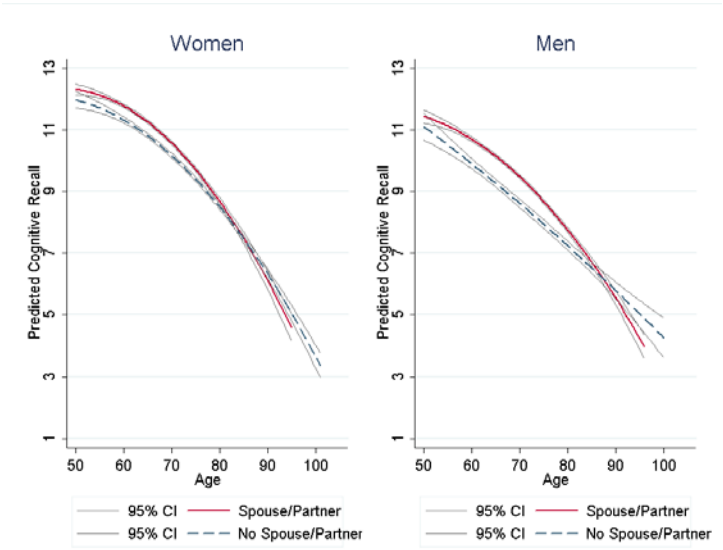
A factor that has been shown to have a causal effect on cognitive scores is education (Glymour et al, 2008). Appendix Figure 2 shows the cognitive trajectories by education level (less than high school, high school educated, and more than high school). Respondents with more than a high school education recall about two more words than those with less than a high school education initially; however, recall scores converge as respondents age. This evidence is supported by Kukull et al. (2002), who found that people with less than 12 years of formal education had a 15 percent greater risk of developing dementia than people with 12 to 15 years of education and a 35 percent greater risk than people with more than 15 years of education.

Appendix Figure A1.2: Cognitive Trajectories by Education - Quadratic OLS Models



By marital status, Appendix Figure 3, there is little visual evidence to suggest that women who do or do not have spouses or partners differ in cognitive functioning. Married and partnered men however have slightly higher cognitive scores than those who are not. The literature has found mixed results on the relationship between marriage and cognitive functioning.[2]

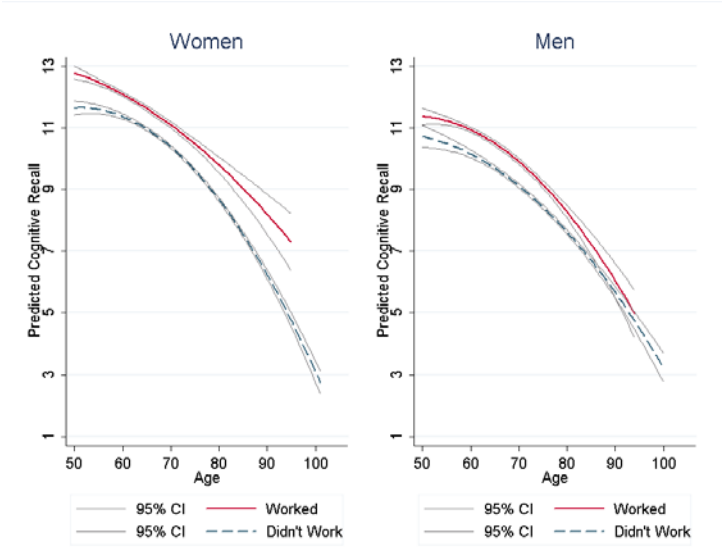
Appendix Figure A1.3: Cognitive Trajectories by Marital Status - Quadratic OLS Models



[2] Helmer et al., 1999; Hakansson et al., 2009.

A causal link has also been established between earlier retirement and cognitive functioning using retirement policies across countries (Rohwedder and Willis, 2010). Examining cognitive functioning trajectories by employment status, Appendix Figure 4, those individuals who work have slightly better cognitive scores than those who did not work. In particular, women who are not working have an increased rate of decline than those who are working.

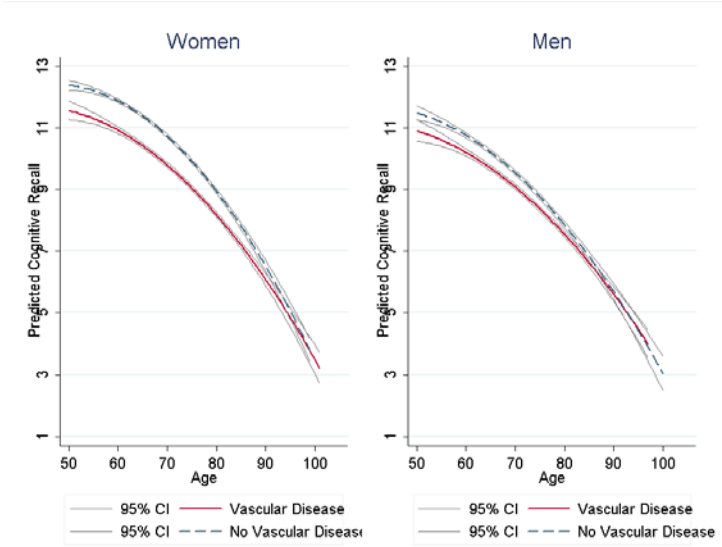
Appendix Figure A1.4: Cognitive Trajectories by Baseline Employment Status - Quadratic OLS Models



Noting that individuals with dementia tend to have other comorbid conditions for which they are treated (Bynum, 2004), Appendix Figure 5 shows the trajectories for individuals by vascular disease status.[3] Vascular conditions can lower physical mobility and therefore increase the risk for cognitive decline as hypothesized by the vascular hypothesis (Fratiglioni et al, 2004). Consistent with this hypothesis, both men and women with vascular disease have lower cognitive recall scores than those who do not.

[3] Vascular disease is defined by the presence of diabetes, stroke, or heart problems.

Appendix Figure A1.5: Cognitive Trajectories by Vascular Disease Status - Quadratic OLS Models



ATTRITION

The following discussion focuses on the issue of attrition. As mentioned in the paper, most attrition, two-thirds, is a result of death; however, about a quarter of attrition is due to nonrandom non-response. Attrition was dealt with in two different ways, the first was with the creation of inverse probability weights and the second was using balance sample of those respondents who never attrit from the study; however, neither method produced results that were statistically different than the unweighted OLS results presented in the paper. The first set of attrition analyses focuses on the inverse probability weights. Appendix Table 3 shows probit model estimates for attrition based on the observable baseline characteristics, including baseline cognitive recall. Of the twenty-six variables in the model, twenty are significant predictors for attrition and account for twelve percent of the nonrandom attrition. Lower levels of baseline cognition and more baseline health conditions increase the probability of attrition. Older respondents, men, blacks, less educated, unmarried, and those have lower levels of baseline wealth and income are all more likely to attrit from the survey. In addition, more time from the initial survey also increases the probability of attrition. These results indicate that the analysis should control for the nonrandom attrition, especially as the dependent variable is a significant predictor. Inverse probability

weights based on the probit results are used in the following analysis in order to give more weight those who are less likely to attrit than to those who remain in the survey throughout the sample period. The attrition weights range from 1.03 to 43.36 with a mean of 3.79.

Appendix Table A1.3: Probit Estimates of Attrition Based on Observable Characteristics

	β-Coefficient		Std. Error
Baseline Characteristics			
Cognitive Recall Scores	-0.028	***	(0.004)
Contact Days with Children	0.0001		(0.000)
Number of Children	-0.015	*	(0.008)
Age	0.027	***	(0.002)
Years of Education	-0.008	*	(0.005)
Female	-0.191	***	(0.026)
Black	0.089	**	(0.042)
Hispanic	0.087		(0.058)
Never Married	0.081		(0.086)
Partnered	0.346	***	(0.084)
Divorced	0.143	***	(0.041)
Widowed	0.103	***	(0.035)
Worked	0.042		(0.029)
Log Income	-0.024	*	(0.013)
Log Wealth	-0.026	***	(0.005)
Health Conditions at Baseline			
CES-D score	0.023	***	(0.007)
Number of Chronic Illnesses	0.065	***	(0.011)
Activities of Daily Living Problems	0.023		(0.024)
Other Functional Limitations	0.029	***	(0.006)
Instrumental Activities of Daily Living Problems	0.023		(0.023)
Fine Motor Skill Problems	-0.044		(0.040)
Year Indicators			
2000	-0.169	***	(0.006)
2002	-0.351	***	(0.008)
2004	-0.514	***	(0.010)
2008	-0.921	***	(0.016)
Constant	-0.998	***	(0.177)
Observations	48809		
Psuedo R-Squared	0.121		

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered on the individual.

Appendix Table 4a shows the regression results for the OLS, Quantile and 2SLS regressions using the inverse probability weights calculated above based on Model 2 in the paper. The OLS results in

Column 1 show a positive association between contact and cognition, which is not statistically significant itself, but is not statistically different from the OLS coefficient present in Table 2 of the paper, 0.042. The results for the two-stage least squares model exhibit the same pattern in the point estimates and are not statistically different than the results presented in Table 4. The Hausman test statistic is smaller and insignificant. Given the concerns already expressed about the limitations of the contact measure and possible local average treatment effects, these results do not change the conclusions of the paper and thus were not included within its body.[4]

Appendix Table A1.4a: OLS and 2SLS Estimates of the Relationship between Contact with Children and Cognitive Recall Scores for Women, Attrition Models with Inverse Probability Weights

	OLS	**2SLS**	
	Model 2		Observations
	(1)	(7)	
	0.021	-0.386	27699
Ln(Total Days of Contact)	(0.028)	(0.272)	
R-Squared	0.237		
1st Stage F-Statistic		41.94	
Hausman Test Statistic		2.02	
Hausman Test p-value		0.16	

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered on the individual. Covariates include: age, race, years of education, number of children, marital status, baseline work status, (log) income and (log) wealth, baseline health variables, and whether any demographic characteristics or baseline health conditions are missing. See Table 2 for full models covariates.

The second method used to handle attrition bias is by restricting the data to a balance sample of respondents who do not attrit from the survey. This resulted in a loss of over nine-thousand observations. The results, in Appendix Table 4b, show point estimates that are larger than those in the corresponding tables in the paper, Tables 2 and 3, for the OLS and quantile regressions. These larger coefficients are not statistically different than the original estimates; however, the increased magnitude resulting from restricting the data to those individuals who may remain in the survey due to higher cognitive function highlights the existence of selection being the driving force in association between contact frequency and cognition and not a causal relationship. The quantile regression results further reinforce this by revealing

[4] Quantile regression results are not included in this analysis because quantile regressions cannot be weighted in Stata.

statistically significant results for those respondents with cognition in the 75th percentile. The 2SLS results are, again, not statistically different from the original results in Table 4. Attrition bias is a valid concern for researchers and should be taken into account, however, the results presented in this section demonstrate that in this particular analysis attrition does not significantly affect the results and therefore is not included in the main analysis of the paper.

Appendix Table A1.4b: OLS, Quantile and 2SLS Estimates of the Relationship between Contact with Children and Cognitive Recall Scores for Women, Attrition Models with Balanced Sample

	OLS	**Quantile Regression**					**2SLS**	
	Model 2	0.1	0.25	0.5	0.75	0.9		Obs.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Ln(Total Days of Contact)	0.049*	0.023	0.009	0.028	0.096***	0.054	-0.371	18297
	(0.028)	(0.034)	(0.029)	(0.026)	(0.030)	(0.037)	(0.283)	
R-Squared	0.224							
1st Stage F-Statistic							18189	
Hausman Test Statistic							0.89	
Hausman Test p-value							0.345	

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered on the individual. Covariates include: age, race, years of education, number of children, marital status, baseline work status, (log) income and (log) wealth, baseline health variables, and whether any demographic characteristics or baseline health conditions are missing. See Table 2 for full models covariates.

ALTERNATE FUNCTIONAL FORMS OF COGNITVE RECALL SCORES

The main analysis of the paper presents results using the functional form of log transformed days of contact, as well as total days of contact and days of contact squared (see Table 2). The following table shows alternate specifications of contact that were also examined. The first results in Appendix Table A1.5 divide days of contact into quintiles of the sample distribution of contact days; this is the most nonlinear specification. While the gradient of coefficients is not monotonically increasing, it does show a positive pattern of more contact being associated with higher cognitive recall as compared to those whose contact with their children is in the lowest quintile of the distribution. Models 4 and 5, examine the linear and log-transformed measures for days of contact, respectively, but include an additional term to control for those individuals had 365 or more days of contact with their children, thus seeing their children daily.

Here again the positive relationship between contact is present; however, in both cases having daily contact from their children is negatively associated with cognition. This is supports reverse causality of contact, parents receiving more frequent contact from their children due to their declining health. These functional forms were not used due to the less intuitive interpretation of the results and the need to have additional instruments for the 2SLS estimation.

Appendix Table A1.5: OLS Estimates of the Relationship between Contact with Children and Alternate Functional Forms of Cognitive Measures for Women

	Model 3		Model 4		Model 5
Quintile 2 (88-207 days)	0.120	Total Days of Contact	0.0003**	Ln(Days of Contact)	0.062**
	(0.081)		(0.0001)		(0.027)
Quintile 3 (208-390 days)	0.263***	365 Days of Contact	-0.097	365 Days of Contact	-0.069
	(0.082)		(0.072)		(0.062)
Quintile 4 (391-623 days)	0.141*				
	(0.085)				
Quintile 5 (624-1460 days)	0.234***				
	(0.091)				
Observations	27699		27699		27699
R-squared	0.272		0.272		0.272

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered on the individual. Covariates include: age, race, years of education, number of children, marital status, baseline work status, (log) income and (log) wealth, baseline health variables, and whether any demographic characteristics or baseline health conditions are missing. See Table 2 for full models covariates.

ALTERNATE SPECIFICATIONS OF COGNITION

This paper utilizes cognitive recall scores of the participants in the HRS, which requires them to recall word lists of ten nouns immediately after it is read and again roughly five minutes later. To see how the results compare to other measures of cognition the main model, in Table 2, was reestimated using alternate specifications of cognition. The first specification uses an alternate cognitive test available in the HRS, the Telephone Interview Cognition Survey (TICS; Breitner et al, 1995), which is similar to the more commonly known Mini-Mental State Exam (MMSE; Folstein et al, 1975).

Appendix Table A1.6: OLS Estimates of the Relationship between Contact with Children and Alternate Cognitive Measures for Women

	Cognitive Recall Score	Telephone Interview for Cognitive Status (TICS)	Some IADL Difficulty	Mild Cognitive Impairment	Dementia
Ln(Total Days of Contact)	0.042**	0.022	0.001	-0.026	0.009
	(0.021)	(0.014)	(0.004)	(0.026)	(0.011)
Observations	27699	20746	27693	923	923
R-squared	0.272	0.566	0.365	0.169	0.152

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered on the individual. Covariates include: age, race, years of education, number of children, marital status, baseline work status, (log) income and (log) wealth, baseline health variables, and whether any demographic characteristics or baseline health conditions are missing. The models exclude the IADL measure for comparability. See Table 2 for full models covariates. The data for mild cognitive impairment and dementia diagnoses come from the Aging, Demographics & Memory Study (ADAMS) of the Health and Retirement Study.

Using this measure the same positive relationship between cognition and contact is observed. While it is not statistically significant the point estimate is not statistically different from the cognitive recall score used in the main paper. The next column uses a proxy for cognition, whether or not a respondent experiences some difficulty with any instrumental activities of daily living (IADLs). The probability of having some difficulty with an IADL increases with more contact, thus suggesting that there is reverse causality inducing the amount of contact between mother and child. The last two columns use data from the Aging, Demographics & Memory Study (ADAMS) of the Health and Retirement Study.[5] These data provide clinical diagnoses of respondents of the HRS who were seventy years or older in 2000 survey wave with respondents assessed in 2001 and 2003.[6] The fourth column examines the probability of being diagnosed with MCI or a condition more severe. Consistent with previous results in this paper, more contact is associated with a lower probability of a diagnosis of MCI or dementia,

[5] For more information see Langa,K.M., Plassman, B.L., Wallace, R.B., Herzog, A.R., Heeringa, S.G., Ofstedal, M B., Burke, J.R., Fisher, G.G., Fultz, N.H., Hurd, M.D., Potter, G.G., Rodgers, W.L., Steffans, D.C., Weir, D.R., Willis, R.J. (2005). "The Aging, Demographics and Memory Study: Study Design and Methods", *Neuroepidemiology*, Vol 25, pp. 181-191 or Heeringa, S.G., Fisher, G.G., Hurd, M., Langa, K.M., Ofstedal, M.B., Plassman, B.L., Rodgers, W.L., Weir, D.R. (2009) "Aging, Demographics And Memory Study (ADAMS): Sample Design, Weighting and Analysis for ADAMS." http://hrsonline.isr.umich.edu/sitedocs/userg/ADAMSSampleWeights_Jun2009.pdf.

[6] The ADAMS was also conducted in 2006 and 2008; however, this data has at this time been applied for by the author and thus not used in this analysis.

pointing to selection of healthier individuals having more contact due to better health. In the last column the outcome examined in a diagnosis of dementia and here the positive coefficient point evidence to reverse causality, more contact being associated with a higher probability of dementia. All of these results are insignificant.

COGNITION AND RESPONDENT CHARACTERISTICS

This section discusses the association between cognition and the remaining covariates in the models in Table 1.2 (table not reprinted). The coefficients are consistent with the extant literature. Black women have recall scores almost a full word lower than whites, while Hispanic women have scores about a third of a word lower than whites. This is consistent with Callahan et al (1996) who find that, by race, African Americans are more likely than Caucasians to develop dementia but note that this is primarily due to differences in factors such as education and not race itself. Each additional year of age is associated with a increase in cognitive scores of about 0.27 words. The squared age term controls for the nonlinearity in the relationship between age and cognition and indicates there is a diminishing marginal increase with age; cognition begins to deteriorate after age 45. More years of education increase recall scores. This evidence is supported by Kukull et al. (2002), who found that people with less than 12 years of formal education had a 15 percent greater risk of developing dementia than people with 12 to 15 years of education and a 35 percent greater risk than people with more than 15 years of education. Marital status does not appear have much predictive power for cognitive recall after child contact is controlled for, although there are significant positive coefficients for divorced and widowed women. The mixed literature on marital status and cognitive functioning, without child contact, has found evidence of this result. Helmer et al. (1999) find divorced and widowed individuals have lower risk of AD. Furthermore, Kalmijn (2007) finds that support from children to divorced mothers increases after marriage. Finally, working, higher income and wealth at baseline are all significantly and positively associated with cognitive functioning. Higher incomes and wealth are correlated with higher education and working, both of which have positive effects on cognition (Rohwedder and Willis, 2010; Glymour et al, 2008).

Looking at baseline health conditions, worse health outcomes are associated with lower cognitive scores as expected given that individuals with dementia tend to have other comorbid conditions (Bynum et al, 2004). More chronic illnesses are significant negative predictors of cognitive scores. Higher CES-D scores are significant and negatively associate with cognition.[7] A meta-analysis on the relationship between depression and AD indicates that depression may increase the risk for developing AD (Ownby et al., 2006). More IADL conditions are also significant negative predictors of cognitive scores, which is to be expected as these health measures ask about problems with activities that are more cognitive in nature than ADLs and support the cognitive reserve hypothesis. Other functional limitations are negatively associated with cognition. These limitations are in tasks that require greater physical activity, thus a great number of physical limitations would suggest lower levels of physical activity and thus and increased risk for AD as suggested by the vascular hypothesis. In addition, Gure et al (2010) find that different forms of dementia have varying levels of functional limitations.

CONTACT AND MOTHER'S HEALTH STATUS

The next two sections examine the association between of contact with children and cognition by factors that my influence the amount of contact received by children. The first set of analysis focuses on health status as children are likely to increase the amount of contact that they have with their parents when their parents' health is deteriorating. The second analysis is by parent's relationship status as children's level of interaction with their parents may change when their parents transition into different relationships with their biological parents or other partners.

[7] CES-D scores could have a mediating effect on the relationship of contact with children on cognitive functioning (e.g. one may be depressed because they do not see their children or may not see their children because of depression); however, all analyses were run omitting the CES-D score and there was no significant difference in estimates.

Appendix Table A1.7: OLS Estimates of the Relationship between Contact with Children and Cognition by Measures of Health Status for Women

	Vascular Disease		Chronic Illness	
	No	Yes	No	Yes
Ln(Total Days of Contact)	0.037	0.062*	0.025	0.043*
	(0.025)	(0.036)	(0.063)	(0.022)
Observations	18569	9102	3793	23906
R-squared	0.241	0.260	0.224	0.267

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered on the individual. Covariates include: age, race, years of education, number of children, marital status, baseline work status, (log) income and (log) wealth, baseline health variables, and whether any demographic characteristics or baseline health conditions are missing. See Table 2 for full models covariates. Vascular disease is defined by problems with diabetes, stroke, or heart problems. Chronic illness is defined by having one or more of the following conditions: high blood pressure, diabetes, cancer, lung disease, heart problems, stroke, arthritis, and/or back pain.

Appendix Table A1.7 examines the association between contact and cognition for women with two types of health conditions, vascular disease and chronic illnesses. In both instances, those with vascular disease and one or more chronic illnesses have a point estimates on contact twice as large as those who do not suffer from these conditions. These patterns would suggest that individuals in poor health may benefit more from a marginal increase in the contact from their children as they may not have as many opportunities to engage in cognitive stimulation from other activities that healthy individuals would be able to partake it. The 2SLS results, not shown, do not indicate that there is a causal relationship between contact and cognition for the two groups, suggesting that they increase in contact that these two groups receive results from reverse causality.

CONTACT AND MOTHER'S MARITAL STATUS

Another key characteristic that may influence the level of contact that a parent and adult-child may have together is the parent's marital status. The next set of analysis examines the association of contact on cognition by relationship status of the mother.

The left column examines married and partnered mothers. The positive significant relationship between contact and cognition remains, and is not statistically different from the original OLS results in Table 2 of the main analysis, although it is larger in magnitude. Being partnered is associated with higher cognition than being married; however, partnered mothers have a rate of cognitive decline that is faster

than married mothers. While higher cognition maybe expected for partnered women, as they are on average two years younger than the married women, it is unclear why their rate of decline would be different. The right column shows the estimates for unmarried women. Women who never marry have a point estimate on contact half the size of estimate in Table 2 and one-third of the size of the estimate for married women in the left column; however, it is insignificant. Again, being divorced or widowed does not change cognition relative to never married, nor does the rate of change differ among different unmarried relationship statuses.

Appendix Table A1.8: OLS Estimates of the Relationship between Contact with Children and Cognition by Measures of Relationship Status for Women

	Married/Partnered		Not Married
Ln(Total Days of Contact)	0.068**	Ln(Total Days of Contact)	0.202
	(0.0298)		(0.181)
Partnered	0.965**	Divorced	1.245
	(0.484)		(1.034)
		Widowed	0.983
			(1.017)
Ln(Contact)*Partnered	-0.206**	Ln(Contact)*Divorced	-0.186
	(0.0872)		(0.188)
		Ln(Contact)*Widowed	-0.173
			(0.184)
Observations	16568	Observations	11107
R-squared	0.220	R-squared	0.287

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered on the individual. Covariates include: age, race, years of education, number of children, marital status, baseline work status, (log) income and (log) wealth, baseline health variables, and whether any demographic characteristics or baseline health conditions are missing. See Table 2 for full models covariates. For the Married/Partnered mothers married is the omitted relationship status and for Not Married mothers never married are the omitted relationship status.

RESULTS FOR MEN

This section of the appendix discusses the results for men. As described in the paper, most of the family respondents in the HRS are women, and all of them are women for married couples; therefore, the measure may not be an adequate representation for the frequency of contact between men and their children.

Appendix Table A1.9: OLS, Quantile, and 2SLS Estimates of the Relationship between Contact with Children and Cognitive Recall Scores for Men

	OLS	Quantile Regression					2SLS	
	Model 2	0.1	0.25	0.5	0.75	0.9		Obs.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Ln(Total Days of Contact)	-0.016	0.001	-0.001	-0.028	-0.043**	-0.035	-0.290	18189
	(0.022)	(0.026)	(0.021)	(0.018)	(0.022)	(0.031)	(0.400)	
R-Squared	0.283							
1st Stage F-Statistic							25.65	
Hausman Test Statistic							2.32	
Hausman Test p-value							0.13	

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered on the individual. Covariates include: age, race, years of education, number of children, marital status, baseline work status, (log) income and (log) wealth, baseline health variables, and whether any demographic characteristics or baseline health conditions are missing. See Table 2 for full models covariates.

Appendix Table A1.9 shows that under all model specifications the association between contact frequency and cognition is insignificant and negative men. There is no extant hypothesis as to why the relationship between cognition and contact frequency would have opposite effects for men and women. It is also incorrect to assume that the type of interaction men have with their children is either a result of contact only, which would result in a negative association between contact and cognition, or that men's contact with their children is less cognitively stimulating. Therefore, the counterintuitive negative association between contact and cognition for men appears to result from the frequency of contact reported by women being a poor measure of contact frequency for men.

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Technical Appendix A2 – Intergenerational Transfers and Altruism

This appendix is to serve as a supplemental document to the analysis in "Intergenerational Transfers and Altruism." The purpose of this appendix is to provide additional information to the original article that was omitted for space and relevance issues. Any additional information that is not included in this document or the original article is available from the author up request.

ATTITUDES TOWARD INTER-FAMILIAL TRANSFERS: Questions

Wording is taken from the module questionnaire. All formatting is from original document.

Available at: http://hrsonline.isr.umich.edu/modules/meta/1996/core/qnaire/online/17hr96md.pdf

HRS WAVE 3: MODULE 8 PAGE 47

BRANCHPOINT: IF THE RANDOM NUMBER ASSIGNED TO THIS CASE IS NOT 8, GO TO NEXT MODULE (M9-1).

M8-INTRO. Sometimes people give substantial financial help to relatives or friends. We would like to find out about situations where you (and your (husband/wife/partner)) might be willing to give substantial help to others. You should suppose that any help you give will not be repaid, and that the person you might help has been unlucky rather than lazy.

M8-1. Suppose that your (parents/father/mother) had only half as much income per person to live on as you do. Would you be willing to give your (parents/father/mother) 5% of your own family income per month, to help out until things changed -- which might be several years?

INAP.....BLANK ØM8-3

YES.....1

NO.....5 ØM8-3

DK.....8 ØM8-3

RF.....9 ØM8-3

M8-2. Suppose that they had three-quarters as much income per person as you, would you be willing to give 5% of your family income to help out?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

BRANCHPOINT: IF R WOULD BE WILLING TO SUBSIDIZE PARENT(S) (OR DK/RF WHETHER WOULD BE WILLING) (M8-1 NOT = 5), GO TO M8-4.

M8-3. Suppose they had one-third as much income per person as you, would you be willing to give 5% of your family income to help out?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

BRANCHPOINT: IF R IS NOT MARRIED/PARTNERED, GO TO M8-7.

M8-4. Suppose instead that you spouse's (parents/father/mother) had only half as much income per person to live on as you do. Would you be willing to give you spouse's (parents/father/mother) 5% of your own income per month, to help out until things changed--which might be several years?

INAP.....BLANK ØM8-6

YES.....1

NO.....5 ØM8-6

DK.....8 ØM8-6

RF.....9 ØM8-6

M8-5. Suppose they had three-quarters as much income per person as you, would you be willing to give 5% of your income to help out?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

BRANCHPOINT: IF R WOULD BE WILLING TO SUBSIDIZE SPOUSE'S/PARTNER'S PARENT(S) (OR DK/RF WHETHER WOULD BE WILLING) (M8-4 NOT = 5), GO TO M8-7.

M8-6. Suppose they had one-third as much income per person as you, would you be willing to give 5% of your income to help out?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

M8-7. Suppose instead that one of your children had only half as much income per person to live on as you do. Would you be willing to give your child 5% of your own income per month, to help out until things changed -- which might be several years?

INAP.....BLANK ØM8-9

YES.....1

NO.....5 ØM8-9

DK.....8 ØM8-9

RF.....9 ØM8-9

M8-8. Suppose they had three-quarters as much income per person as you, would you be willing to give 5% of your income to help out?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

BRANCHPOINT: IF R WOULD BE WILLING TO SUBSIDIZE CHILDREN (OR DK/RF WHETHER WOULD BE WILLING) (M8-7 NOT = 5), GO TO M8-10.

M8-9. Suppose they had one-third as much income per person as you, would you be willing to give 5% of your income to help out?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

BRANCHPOINT: IF R HAS NO SIBLINGS, GO TO M8-13.

M8-10. Now suppose that one of your brothers or sisters had only half as much income per person per person to live on as you do. Would you be willing to give your brother or sister 5% of your monthly income to help out until things changed-- which might be several years?

INAP.....BLANK ØM8-12

YES.....1

NO.....5 ØM8-12

DK.....8 ØM8-12

RF.....9 ØM8-12

M8-11. Suppose they had three-quarters as much income per person as you, would you be willing to give 5% of your income to help out?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

BRANCHPOINT: IF R WOULD BE WILLING TO SUBSIDIZE SIBLINGS (OR DK/RF WHETHER WOULD BE WILLING) (M8-10 NOT = 5), GO TO M8-13.

M8-12. Suppose they had one-third as much income per person as you, would you be willing to give 5% of your income to help out?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

M8-13. Now suppose that one of your friends had only one-third as much income per person to live on as you do. Would you be willing to give your friend 5% of your monthly income to help out until things changed-- which might be several years?

INAP.....BLANK ØM8-15

YES.....1

NO.....5 ØM8-15

DK.....8 ØM8-15

RF.....9 ØM8-15

M8-14. Suppose they had one-half as much income per person as you, would you be willing to give 5% of your income to help out?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

BRANCHPOINT: IF R WOULD BE WILLING TO SUBSIDIZE FRIENDS (OR DK/RF WHETHER WOULD BE WILLING) (M8-13 NOT = 5), GO TO M8-16.

M8-15. Suppose they has one-fifth as much income per person as you, would you be willing to give 5% of your income to help out?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

M8-16. Finally, suppose you became aware of a well-run charity that gave financial help to people who typically had about one-fifth of the income that you (and your (husband/wife/partner)) have. Would you be willing to give 5% of your income per month to that charity of you knew the money would go directly to benefit these people?

INAP.....BLANK ØM8-18

YES.....1

NO.....5 ØM8-18

DK.....8 ØM8-18

RF.....9 ØM8-18

M8-17. Suppose the charity gave financial help to people who typically had about one-third of the income that you (and your (husband/wife/partner)) have. Would you be willing to give 5% of your income per month to that charity if you knew the money would go directly to benefit these people?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

BRANCHPOINT: IF R WOULD BE WILLING TO CONTRIBUTE TO CHARITY HELPING LOWINCOME PEOPLE (OR DK/RF WHETHER WOULD BE WILLING) (M8-16 NOT = 5), GO TO M9-1.

M8-18. Suppose the charity gave financial help to people who typically had about one-tenth of the income that you (and your (husband/wife/partner)) have. Would you be willing to give 5% of your income per month to that charity if you knew the money would go directly to benefit these people?

INAP.....BLANK

YES.....1

NO.....5

DK.....8

RF.....9

END OF MODULE 8

DESCRIPTIVE STATISTICS

Children

The 844 households that responded to the hypothetical transfer questions about children have a total of 2,643 living noncoresident children over age twenty-five, the total age range is 25-54 years. Each of these children contributes an observation to the analytical sample; see Appendix Table A2.1a for descriptive statistics. Of the roughly 2,600 adult children, about thirteen and half percent receive transfers from HRS respondents. McGarry and Shoeni (1995) find that about fourteen and a half percent of children received transfers in 1992. Recipient children tend to be younger, unmarried, not homeowners, live closer to respondents, not have children, have lower incomes and have more years of schooling than children who do not receive transfers from respondents in 1996. A higher proportion of transfers to children with more education is counterintuitive to the model of altruism; however, this may be due to the definition of transfers used by the HRS. The transfer question in the HRS asks respondents to count all transfers, regardless of whether they are made for support, as gifts or loans. Thus, transfers for these children may be loans made for things such as buying a house, which will be repaid to the parent at some point in the future. More recipient children appear to work part time as opposed to full time, but there is no difference in the proportion not working between the recipient and non-recipient children.

Respondents who aid their children financially tend to be married, and have higher education, and incomes than those respondents who are not observed to make financial transfers to their children. Households, in which respondents transfer, are also more likely to have respondents and spouses working and in better health than those that do transfer. Families that transfer tend to have more living parents and fewer children.[1]

[1] All listed results are significant at the 10% level or better.

Appendix Table A2.1a: Characteristics of Respondents and Their Children, by Financial Transfer Status in 1996

	Didn't Receive Transfer (*N* = 2286)		Received Transfer (*N* = 357)		All Children (*N* = 2643)	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Child's Characteristics						
Age	34.774	5.161	32.313	4.811	34.442	5.183
Male	0.505	0.500	0.493	0.501	0.503	0.500
Own their home	0.590	0.492	0.476	0.500	0.575	0.494
Currently Married	0.659	0.474	0.585	0.493	0.649	0.477
Lives within 10 miles	0.365	0.482	0.437	0.497	0.375	0.484
Income	46407	29309	37350	23289	45184	28733
Completed Schooling						
--Less than high school	0.098	0.298	0.067	0.251	0.094	0.292
--High school graduate	0.410	0.492	0.384	0.487	0.407	0.491
--More than high school	0.491	0.500	0.549	0.498	0.499	0.500
Working full time	0.748	0.434	0.745	0.436	0.748	0.434
Working part time	0.071	0.257	0.101	0.302	0.075	0.264
Not working	0.146	0.353	0.146	0.353	0.146	0.353
Has at least one child	0.693	0.461	0.655	0.476	0.688	0.463
Respondent's Characteristics						
Age	59.846	5.417	58.983	4.941	59.729	5.362
Race						
--White	0.838	0.369	0.924	0.265	0.849	0.358
--Black	0.128	0.334	0.056	0.230	0.118	0.323
--Other	0.034	0.182	0.020	0.139	0.032	0.176
Highest Grade Completed	12.441	2.597	13.046	2.487	12.522	2.590
Income	52922	62041	73671	75975	55725	64475
Assets	207126	533464	242650	436124	211924	521446
Head or Spouse Unemployed	0.625	0.484	0.543	0.499	0.614	0.487
Head/Spouse in poor/fair health	0.285	0.452	0.241	0.428	0.279	0.449
Marital status						
--Married	0.772	0.420	0.821	0.384	0.778	0.415
--Divorced	0.111	0.314	0.101	0.302	0.110	0.313
--Widowed	0.085	0.279	0.056	0.230	0.081	0.273
--Other	0.032	0.176	0.022	0.148	0.031	0.172
Number of living parents	0.783	0.879	0.924	0.918	0.802	0.886
Number of children	4.588	2.149	3.569	1.848	4.450	2.139
Transfers to Parents	483	5645	428	2579	475	5335
Any Transfers to Parents	0.087	0.281	0.106	0.309	0.089	0.285

Parents

There are 686 living parents of the 495 respondent households that answered the hypothetical transfer questions about parents. Of these parents, each an observation in the analytic sample, about nine percent received financial transfers from respondents in 1996.[2] This number is slightly higher than McGarry and Schoeni (1995) who found that slightly fewer than eight percent of parents received transfers in 1992. Table A2.1b shows the characteristics of parents who did and did not receive financial transfers from respondents in 1996. Parents that received transfers from respondents tended to be older, unmarried, female, have lower education, not be homeowners, and live closer to respondents than parents who did not receive monetary transfers from respondents. The same proportion of in-law parents were in both the recipient and non-recipient groups. When comparing the financial situations of parents who did and did not receive transfers, those who received transfers tend not to have better financial situations relative to respondents as expected, but fewer of the recipient parents also had worse financial situations relative to respondents.

As with the analytical sample for children, respondents who made transfers to their parents appear to be younger and married with higher education, income and assets. In this case however, household respondents who said they made transfers to their parents were more female than male in the child sample. Also, different in this case, is that households that made transfers to elderly parents had fewer living parents and children than in the child sample, however they were still gave more to their children. Finally, those respondents that made transfers to parents also had a larger proportion of siblings who provided additional financial help for parents; over fifty percent compare about five percent of those households that did not make transfers to elderly parents.

[2] In households where the respondents' parents are still married each parent is assigned half of the transfer made by the respondent with the assumption that transfers to married parents are shared equally by the couple.

Appendix Table A2.1b: Characteristics of Respondents and Their Parents, by Financial Transfer Status in 1996

	Didn't Receive Transfer (*N* = 622)		Received Transfer (*N* = 64)		All Children (*N* = 686)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Parent's characteristics						
Age	81.019	7.177	82.734	5.472	81.179	7.050
Male	1.711	0.454	1.828	0.380	1.722	0.449
Own their home	0.725	0.447	0.547	0.502	0.708	0.455
Married	0.408	0.492	0.219	0.417	0.391	0.488
Lives within 10 miles	0.386	0.487	0.469	0.503	0.394	0.489
Completed schooling						
--Less than high school	0.542	0.499	0.547	0.502	0.542	0.499
--High school graduate	0.314	0.464	0.375	0.488	0.319	0.467
--More than high school	0.145	0.352	0.078	0.270	0.138	0.346
Financial situation relative to respondent						
--Better	0.357	0.479	0.047	0.213	0.328	0.470
--Same	0.391	0.488	0.797	0.406	0.429	0.495
--Worse	0.232	0.422	0.156	0.366	0.224	0.418
In-law	0.322	0.467	0.328	0.473	0.322	0.468
Respondent's Characteristics						
Age	57.312	5.633	56.688	4.953	57.254	5.573
Race						
--White	0.894	0.308	0.813	0.393	0.886	0.318
--Black	0.076	0.265	0.125	0.333	0.080	0.272
--Other	0.031	0.172	0.063	0.244	0.034	0.180
Highest Grade Completed	12.944	2.441	13.360	2.692	12.983	2.467
Income	64171	61469	96712	82434	67,207	64,343
Assets	227651	446154	389192	661832	242,722	472,178
Head or Spouse Unemployed	0.518	0.500	0.547	0.502	0.520	0.500
Head/Spouse in poor/fair health	0.236	0.425	0.250	0.436	0.238	0.426
Marital status						
--Married	0.852	0.355	0.875	0.333	0.854	0.353
--Divorced	0.072	0.259	0.016	0.125	0.067	0.250
--Widowed	0.040	0.197	0.047	0.213	0.041	0.198
--Other	0.035	0.185	0.063	0.244	0.038	0.191
Number of living parents	1.815	0.779	1.719	0.678	1.806	0.770
Number of children	3.441	1.795	3.203	1.664	3.418	1.784
Transfers to Children	2208	5052	6482	15020	2,607	6,740
Any Transfers to Children	0.416	0.493	0.500	0.504	0.424	0.495
Number of Siblings	2.892	2.297	3.109	2.697	2.913	2.336
Respondent's Siblings Help Financially	0.041	0.198	0.564	0.502	0.076	0.266
Respondent's Siblings Help Care	0.173	0.378	0.283	0.455	0.182	0.387

REGRESSION RESULTS FOR HELP WITH CHORES TO PARENTS

The HRS did not ask respondents if their siblings help their parents with chores, therefore the same analysis shown Table 2.5b and 2.5c could not be done. The following table, A2.4, provides the full regression results for the multivariate analysis examining the altruism measures with regard to the help respondents provide their parents with household chores. The models are otherwise the same. The results do not indicate that the altruism measures are associated with the amount of help provided with chores or the probability of help being given. A conceivable explanation for this is that respondents provide help with chores to their parents not because of altruistic motives but felt obligations, as described with exchange theory.

Appendix Table A2.2: Logit, OLS, and Tobit Effect Analysis of Help with Chores and Errands to Parents in 1996

	Logit		OLS		Tobit		OLS	
	Received Help with Chores		Hours of Help with Chores		Hours of Help with Chores		Log of Chore Hours	
Altruism Measure - Low Level Altruism (omitted)								
High Level Altruism		0.0475		39.17		-0.218		98.28
		(0.506)		(86.252)		(1.013)		(385.024)
Medium Level Altruism		0.379		17.38		0.193		150.8
		(0.548)		(119.218)		(1.131)		(467.028)
Parent's Characteristics								
Age	0.0527***	0.0524***	-0.888	-0.900	0.0804***	0.0794**	21.64*	21.30*
	(0.017)	(0.017)	(2.510)	(2.492)	(0.031)	(0.031)	(11.069)	(11.090)
Male	0.244	0.242	-8.856	-9.085	0.308	0.307	12.75	12.28
	(0.213)	(0.213)	(46.615)	(46.511)	(0.391)	(0.391)	(162.495)	(162.687)
Own their home	0.242	0.256	-109.1	-111.1	0.334	0.360	-89.49	-86.76
	(0.236)	(0.236)	(93.777)	(92.829)	(0.538)	(0.536)	(237.033)	(230.791)
Currently married	-0.560**	-0.547*	-19.24	-18.18	-1.293**	-1.295**	-415.9*	-407.7
	(0.281)	(0.282)	(76.133)	(77.462)	(0.523)	(0.522)	(245.111)	(250.982)
Lives within 10 miles	0.952***	0.977***	70.70	67.97	1.783***	1.818***	543.3***	545.8***
	(0.206)	(0.208)	(57.935)	(57.323)	(0.465)	(0.472)	(170.551)	(168.541)
Completed Schooling - High school graduate *(omitted*)								
--Less than high school	-0.124	-0.133	1.061	1.147	-0.291	-0.301	-110.8	-111.4
	(0.244)	(0.243)	(73.051)	(71.665)	(0.522)	(0.523)	(206.676)	(204.643)
--More than high school	-0.371	-0.357	-134.3*	-133.1*	-0.494	-0.491	-477.7*	-469.7*
	(0.304)	(0.305)	(72.441)	(71.947)	(0.633)	(0.634)	(266.963)	(265.504)
Financial situation relative to respondent - Same (*omitted*)								
Better	0.299	0.313	143.5	141.3	0.676	0.698	448.6*	446.6*
	(0.266)	(0.270)	(90.924)	(91.128)	(0.588)	(0.593)	(259.662)	(258.253)
Worse	0.0198	0.0194	10.82	8.101	0.338	0.348	136.6	129.9
	(0.263)	(0.264)	(40.078)	(40.055)	(0.551)	(0.558)	(183.917)	(184.118)

Respondent's In-Law	-0.252	-0.222	-42.91	-44.01	-0.348	-0.311	-167.5	-162.1
	(0.225)	(0.228)	(50.035)	(49.203)	(0.480)	(0.488)	(166.279)	(166.964)
Respondent's Characteristics								
Age - 51 to 60 years old (*omitted*)								
--Less than 51 years old	-0.412	-0.387	-99.24**	-101.1**	-0.411	-0.377	-383.9	-381.0
	(0.417)	(0.424)	(48.399)	(50.740)	(0.686)	(0.693)	(278.266)	(280.207)
--Greater than 60 years old	-0.786***	-0.747***	4.977	4.728	-1.407**	-1.385**	-391.3*	-381.6*
	(0.267)	(0.269)	(71.560)	(76.402)	(0.554)	(0.558)	(216.662)	(231.151)
Race - White (*omitted*)								
--Black	0.225	0.212	131.8	130.1	1.315	1.325	602.7*	598.6*
	(0.428)	(0.436)	(118.946)	(118.953)	(0.971)	(0.980)	(337.643)	(338.620)
--Other	0.218	0.226	13.48	13.26	0.920	0.923	100.5	110.9
	(0.528)	(0.527)	(51.556)	(51.477)	(0.970)	(0.975)	(353.228)	(358.359)
Highest Grade Completed	0.0594	0.0539	20.96*	20.73*	0.0732	0.0715	51.60	49.98
	(0.046)	(0.046)	(12.541)	(12.125)	(0.095)	(0.097)	(39.327)	(38.185)
Assets - 1st quartile (*omitted*)								
--2nd quartile	-0.215	-0.268	3.739	6.109	0.0758	0.0114	106.5	95.11
	(0.353)	(0.366)	(83.173)	(89.984)	(0.742)	(0.759)	(320.894)	(336.403)
--3rd quartile	0.231	0.221	71.66	71.27	1.392*	1.382*	463.5*	460.5*
	(0.346)	(0.352)	(61.881)	(63.555)	(0.818)	(0.827)	(266.057)	(268.733)
--4th quartile	-0.524	-0.546	38.86	41.05	-0.0883	-0.131	90.45	85.01
	(0.335)	(0.337)	(66.304)	(63.006)	(0.722)	(0.722)	(255.688)	(253.204)
Income - 1st quartile (*omitted*)								
--2nd quartile	-0.0863	-0.0942	-47.29	-49.72	0.303	0.314	-24.62	-31.30
	(0.331)	(0.335)	(59.588)	(59.540)	(0.779)	(0.788)	(237.939)	(238.581)
--3rd quartile	-0.279	-0.264	2.375	0.788	-0.278	-0.266	-75.33	-72.47
	(0.393)	(0.396)	(138.487)	(139.274)	(0.889)	(0.899)	(374.275)	(377.975)
--4th quartile	-0.347	-0.352	-63.37	-65.75	-0.407	-0.402	-225.9	-231.9
	(0.348)	(0.352)	(75.908)	(76.463)	(0.792)	(0.805)	(273.764)	(275.361)

Head or Spouse Unemployed	0.275	0.293	-5.024	-6.235	0.454	0.483	98.94	101.5
	(0.240)	(0.240)	(40.437)	(43.993)	(0.481)	(0.483)	(162.971)	(165.812)
Head/Spouse in poor/fair health	-0.166	-0.151	86.75	89.21	-0.0561	-0.0818	132.6	136.5
	(0.267)	(0.263)	(91.982)	(90.212)	(0.631)	(0.617)	(237.619)	(235.052)
Marital status - Single: Never Married or Cohabiting (*omitted*)								
--Married	0.836	0.795	-94.80	-91.33	1.672	1.627	364.0	359.7
	(0.534)	(0.535)	(229.479)	(230.276)	(1.042)	(1.043)	(601.946)	(604.421)
--Divorced	0.109	0.0975	-244.6	-243.6	-1.454	-1.434	-1077	-1078
	(0.677)	(0.671)	(257.994)	(258.513)	(1.231)	(1.239)	(892.695)	(892.819)
--Widowed	0.564	0.503	-246.9	-242.3	-1.166	-1.221	-8260	-8486
	(0.707)	(0.711)	(243.942)	(243.430)	(1.225)	(1.232)	(0.000)	(0.000)
Number of living parents	-0.203	-0.212	6.986	7.389	-0.249	-0.256	-76.30	-79.28
	(0.139)	(0.139)	(28.834)	(28.589)	(0.300)	(0.300)	(113.660)	(113.766)
Number of living siblings	-0.0434	-0.0405	-0.426	-0.539	-0.107	-0.105	-35.02	-34.47
	(0.047)	(0.047)	(11.768)	(11.765)	(0.099)	(0.098)	(38.022)	(37.841)
Number of children	-0.0318	-0.0314	-11.94	-12.72	0.0558	0.0633	-7.898	-9.193
	(0.062)	(0.062)	(17.402)	(17.642)	(0.121)	(0.122)	(54.646)	(55.848)
Constant	-6.455***	-6.472***	108.3	84.06	-13.18***	-12.98***	-3669***	-3715***
	(1.879)	(1.884)	(375.038)	(367.081)	(3.484)	(3.450)	(1258.109)	(1286.488)
Tobit Sigma							1401***	1401***
							(240.653)	(240.050)
Observations	675	675	675	675	675	675	675	675
(*Psuedo*) *R*-squared	0.1124	0.1151	0.045	0.045	0.124	0.125	0.0234	0.0235
Mean Dependent Variable	0.273		131.496		131.496		-3.977	

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The models also include variables identifying missing values for dichotomous variables and mean-filled continuous variables.