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Cognitive decline and household financial decisions at older ages

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A B S T R A C T

Using data from the Health and Retirement Study, we examine the association between cognition and financial outcomes among older American couples. We first investigate the relationship between couple members' cognitive ability and financial responsibility within the household. Our results suggest that differences in the level of cognitive ability play a major role in determining who is the household financial decision-maker, while changes in cognitive ability of both couple members over time only marginally modify such choice. Next, we study changes in financial wealth following pronounced declines in cognitive test scores of household members. We observe significant reductions in wealth among households whose financial decision-maker experiences such declines. Wealth reductions are less sizeable among those with pension/annuity income and receiving help with finances from their children.

1. Introduction

Several global trends contribute to make financial planning at older ages increasingly challenging. Life expectancy is rising and, with it, the need for large savings to finance consumption over a longer horizon and guard against medical expenses. The progressive shift from defined-benefit to defined-contribution pensions has put more investment responsibility onto households. Recent developments in the public and private health insurance landscapes have made the task of selecting the "right" plan more daunting for seniors. In this scenario, cognitive decline that come with age may present a significant threat to older adults' economic wellbeing. In this paper, we study the extent to which financial responsibility within the household is related to the relative cognitive ability of its members and examine the financial consequences of cognitive aging.

Recent contributions in the economics literature indicate that cognitive measures contribute to explain heterogeneity in retirement wealth and asset holdings across individuals. Better cognitive skills correlate strongly with lifetime savings (Smith et al., 2010), stock market participation (Christelis et al., 2010) and portfolio diversification (Korniotis and Kumar, 2011). Agarwal and Mazumder (2013) observe that consumers with higher cognitive scores, especially math test scores, are significantly less prone to mistakes when using their credit cards or applying for a home equity loan. Agarwal et al. (2009) analyze life-cycle patterns in financial mistakes using a credit card transaction database and document that financial mistakes follow a U-shape pattern over the life course, with inexperience and cognitive decline being associated with poorer decisions at younger and older ages, respectively. This is consistent with the finding of Samanez-Larkin (2013) that risky financial mistakes at older ages are linked to broader network disruption in the brain which underlies losses in fluid cognitive ability. Hsu and Willis (2013) analyze the impact of information about cognitive decline on the choice of who is the household financial decision-maker. They find that a new diagnosis of a memory-related disease significantly increases the odds that the management of finances is turned over to a cognitively intact spouse. Notably, this often happens well after difficulties handling money have already emerged. Building on this literature, we revisit the association of an individual's cognitive ability with his/her status of household financial decision-maker and examine the extent to which cognitive declines lead to shifts in financial responsibility between couple members.

Neurological studies show that dealing with simple math problems and handling financial matters are among the first skills to be affected by cognitive decline and mild cognitive impairment. Triebel et al. (2009) assess changes in financial capacity over a 1-year period for cognitively healthy individuals, patients with mild cognitive impairment who converted to dementia and patients with mild cognitive impairment who did not become demented. At baseline, they find that healthy individuals have higher financial capacity scores than those with mild cognitive impairment. Also, those who did not convert to dementia have significantly higher financial capacity than those who did. At the 1-year follow-up, cognitively impaired patients who were eventually diagnosed with dementia exhibit substantially more pronounced decline than others in their ability to deal with financial

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matters and manage financial resources. Hence, signs of deteriorating financial skills may convey important information about an individual's cognitive health.

Recent research shows that when confronted with complex choice situations—that is, situations where there are various alternatives and their attributes are hard to discern and differentiate—individuals find it difficult to understand key attributes of alternatives and exhibit inadequate capacity to process relevant information and payoffs associated with different options (Bateman et al., 2016; Handel and Kolstad, 2015; Brown et al., 2017). Because of cognitive decline, older adults tend to have greater difficulty in dealing with such decision-making tasks (Keane and Thorp, 2016), while increasingly facing very complex choice sets related to retirement benefits, health care, and health insurance. Yet, the consequences of cognitive decline for actual savings and investment decisions as well as for asset management at older ages have not been fully studied and understood. This is a key research question with important policy implications. In most developed economies, wealth is disproportionately held by older adults who, because of cognitive decline, may be at a greater risk of poor financial decision making as well as of financial exploitation, ranging from thefts and scams to unauthorized access to accounts (Wood and Lichtenberg, 2017). Moreover, as shown by Okonkwo et al. (2008), individuals with mild cognitive impairment are typical not aware of their deteriorating financial skills and this greatly exposes them to financial vulnerability. Additional empirical evidence on the relationship between cognitive decline and household financial holdings and behavior is therefore critical to better evaluate the opportunity of interventions aiming at prolonging the financial independence of the aging population (Ball et al., 2002).

In this paper, we use data from the Health and Retirement Study (HRS) to examine the association between cognition and financial outcomes among older American couples. The wealth of information, available in the HRS, spanning individual physical health (including biomarkers), cognition, household composition and economic situation, allows us to investigate this relationship comprehensively and to take into account multiple confounding factors that may affect it.

Financial decision making is a rather complex process. It typically involves retrieving relevant information from memory, using acquired knowledge and skills, as well as the ability to compare different options and establish what the best course of action might be. As a result, it concerns a wide range of cognitive functions, from working memory and fluid intelligence to crystallized intelligence (McArdle and Woodcock, 1998). The HRS offers an extensive array of cognitive test scores, allowing us to separately examine specific skills and abilities and to identify which ones are more relevant for financial decision making at older ages. Furthermore, exploiting the longitudinal dimension of the HRS and the fact that interviews are conducted with both spouses/partners in a couple household, we are able to study how changes in cognitive health over time affect an individual's financial responsibility within the couple and a household's wealth trajectory. Tackling these issues, which have not been jointly considered in previous studies, and doing so exploiting rich and repeated individual-level information constitute the original and major contributions of this paper to the existing literature. For instance, the closest study to ours by Hsu and Willis (2013) focuses on how information about cognitive decline, largely captured by doctor's diagnosis of memory disease, affects the choice of the household financial decision maker, but not on how an experienced cognitive decline may potentially affect actual financial outcomes.

Our analysis is carried out in two steps. First, we assess the extent to which individuals' cognitive ability is related to financial responsibility within the household. Specifically, focusing on couple households, we estimate the effect of cognitive ability on the probability of being responsible for the household's financial decisions and, therefore, being designated as the survey financial respondent. We find compelling evidence that, conditional on a wide range of couple members' demographics, the cognitive ability of each partner matters in determining who is in charge of the household's finances. In OLS regressions, a one standard deviation increase in one's own total cognition score makes an individual 8 percentage points more likely to be the person responsible for the household's finances. Conversely, a one standard deviation increase in the partner's total cognition score reduces one's probability of being in charge of financial matters by 7 percentage points. In fixed-effects regressions, these estimated effects are still present and statistically significant, but considerably smaller in magnitude. This may suggest behavioral inertia, or lack of skills of the person (e.g., a wife) who should take on financial tasks that were traditionally the responsibility of the partner (e.g., her husband) experiencing a cognitive decline, or relatively similar cognitive declines for both partners as they age. These findings offer further insight on the nature of the sizeable cross-sectional correlation between one's financial responsibility within the household and cognitive ability documented in previous work (Smith et al., 2010). It appears that differences in the level of cognitive ability play a major role in determining who is the household financial decision-maker and that changes in cognitive ability of both couple members over time only marginally affects or modify such choice. Our findings are consistent with those of Hsu and Willis (2013), who estimate a Cox proportional hazard model and find that switching financial responsibility within the household often occurs only after the financial decision maker's cognition is impaired enough to induce severe difficulty with handling money. Compared to Hsu and Willis (2013), our fixed-effects regressions exploit individual changes in cognitive score and not new memory disease diagnosis by a doctor, which could be interpreted as a stronger sign of cognitive impairment and, hence, more likely to induce behavioral responses.

Second, for each respondent in the panel, we identify a noticeable decline in cognitive ability, defined by a 10%–15% drop in cognitive test scores over two consecutive interviews. We then compare financial wealth of households whose members experience such a cognitive decline to that of households whose members do not experience such a cognitive decline. For those who experience a cognitive decline, we also distinguish between the period of the decline and the period after the decline (households who do not experience a cognitive decline are only observed in the pre-decline period, by construction). This allows us to investigate whether wealth changes following a noticeable cognitive decline fade out, persist or are reinforced over time. We carry out this analysis separately for the sub-samples of financial respondents and non-financial respondents and explore heterogeneity by gender. Compared to households whose members do not experience a cognitive decline, those who suffer a decline bear significant reductions in financial wealth at the time of and after the decline. Such reductions are primarily concentrated among households where the person in charge of financial matters suffers the loss in cognition and more sizeable if the financially responsible person is a woman. These findings are robust to different measures of financial wealth and ways of defining cognitive decline. We find no evidence that the observed reductions in household wealth following a decline in cognitive ability can be, at least partially, attributed to an increase in household medical expenses. The data suggest that, after experiencing a cognitive decline, retirees with pension or annuity income did not bear as much wealth reduction as those who, besides Social Security benefits, rely mostly on distributions from retirement accounts. Finally, our empirical results weakly support the hypothesis that providing cognitively impaired seniors with informal help in dealing with finances (for instance from children and other family members) can effectively guard them against misuse and abuse of their resources, while preserving their financial independence.

As many older adults experience memory loss and, more generally, cognitive decline as part of an aging process, the level of dementia detection is very low. According to the recent meta-analysis by Lang et al. (2017), the prevalence of undetected dementia is estimated at 61% in the U.S. Our paper explores potential implications of this

phenomenon in the financial domain. Individuals who experience significant cognitive test score drops over a 4-year period, which are likely to remain undetected, have a low likelihood of being ever diagnosed with cognitive impairment or dementia. Yet, they exhibit detectable changes in financial wealth. At the same time, our study, coupled with the one by Hsu and Willis (2013), reveals that, as long as these individuals remain undiagnosed, they are unlikely to stop assuming financial responsibility, with potential adverse consequences for their economic wellbeing at older ages.

The rest of the paper proceeds as follows. Section 2 describes the data used in the study. Section 3 presents the results of the analysis relating cognitive ability to financial responsibility within the household. Section 4 provides evidence of differential household financial wealth trajectories before, at, and after a significant worsening in cognitive health, while Section 5 explores source of heterogeneity and potential mechanisms underlying these findings. Section 6 concludes.

2. Data

Our data are drawn from the Health and Retirement Study (HRS). Since 1992, the HRS has been following individuals over the age of 50 and their spouses (regardless of their age) to monitor transitions from work into retirement, measure economic wellbeing in later life and examine health trajectories over time. Interviews are conducted on a biannual basis. The cohort born between 1931 and 1941—the HRS cohort—constitutes the bulk of the sample. In order to keep a snapshot of the middle-aged population of the United States, the study updates its sample periodically. The cohorts born in 1942–47, 1948–53, and 1954–59 were added to the sample in 1998, 2004 and 2010, respectively.

The survey collects detailed information on demographics, family structure, health status, employment history, amount and sources of income, pension entitlements, wealth accumulation and portfolio composition. Cognitive tests initially administered to HRS respondents have undergone a few modifications in later waves. Homogeneous cognition variables, with consistent imputation of missing values, are available from 1996 to 2012. Because of this, we choose to use data over the period 1996–2012.

Wealth is measured at the household level by means of a very comprehensive battery of questions. Assets are separated into checking and savings accounts, CDs and Treasury bills, bonds, stocks and mutual funds, retirement accounts, housing equity, businesses and vehicles. Information about household secured and unsecured debt is also elicited. Questions about these items are asked to the person designated to be the most financially knowledgable in the household, the so-called *financial respondent*.[1]

We restrict attention to individuals in couple households over the age of 50 and below the age of 100. As mentioned above, the HRS interviews age-eligible individuals and their spouses. Hence, data for both couple members are drawn from the same survey wave. The focus of this study is on how cognitive health shapes an individual's financial responsibility within the household and a household's financial wealth trajectory. Regardless of cognitive decline, both these outcomes may be subject to major changes in the event of remarriage or death of one partner. Hence, to avoid potential confounding effects, we exclude from the sample individuals who separated/divorced over the observation period. Similarly, we exclude individuals who become widow/widower over the observation period. In practice, we only consider individuals who are married (spouse present or absent) or partnered over time. After dropping those with missing values for relevant variables, our analytical sample has 49,489 individual-time observations. These correspond to 17,922 unique respondents and 9,929 households. Among sampled individuals/households, about 30% are observed for at least 4 periods and about 60% for at least 2 periods.

The selected sample has 49% female respondents.[2] As far as the age composition is concerned, 17% are between 51 and 60 years of age, 30% are between 61 and 70 years of age, 40% are between 71 and 80 years of age, 12% are between 81 and 90 years of age and only 1% of the sample is above the age of 90.[3] On average, there is a 0.4-year age difference between couple members. The vast majority of couples are married (96%), with only a minority (4%) being partnered. Slightly less than half have at least some college education. About 25% report their health to be either fair or poor and 13% have some difficulties with activities of daily living (ADL). While the majority of the sample is retired or out of the labor force, a sizeable fraction of 30% is working for pay.

Median total household income is about $74,000 per year. Throughout the analysis, we will adopt three different measures of household financial wealth. The first is private financial wealth, defined as the sum of checking/savings accounts, CDs and Treasury bills, bonds, stocks and mutual funds. The average/median household holds $172,000/$30,500 in private wealth. A broader measure of financial wealth also includes the value of non-employer individual retirement accounts (IRAs). In this case, average and median values in the sample are $257,000 and $66,500, respectively. A final measure of non-housing financial wealth adds to the measure of private financial wealth the value of "other" savings or assets (e.g., jewelry, money owed by others, collection for investment purposes, rights in a trust or estate) and subtracts the value of non-housing debt. Mean and median net financial wealth are $170,000 and $30,000, respectively. These figures confirm the right-skewness of wealth distributions often found in individual surveys.

Along with physical status, cognitive functioning is a key dimension of an individual's current and future wellbeing, since it may greatly affect the process of financial decision-making and the ability to manage resources over a certain planning horizon. The HRS devotes a section of the questionnaire to measure cognitive functions using both established clinical instruments and individuals' self perceptions about their memory. Respondents are presented with immediate and delayed word recall tasks. Specifically, they are read a list of 10 words and asked to recall them in no particular order immediately and after approximately five minutes. We use the RAND-HRS summary score for total word recall, which sums the scores of the immediate and delayed word recall tests. As shown in Table 1, its sample mean and median are about 10. We also consider the serial 7 subtraction test, where individuals are asked to subtract 7 from 100 and continue subtracting 7 from each subsequent number for a total of five trials. The average score for the serial 7 subtraction test is 3.6 out of 5. We construct a mental status summary score by summing the scores of the backward counting test, the date naming test, the object naming test, and the president/vice president naming test.[4] As can be inferred from Table 1, the majority of the sample (60%) has a perfect score and only about 2% of the sample have a score of 5 or less.

It should be noted that, starting from 1998, date, object and president/vice president naming tests have been administered only to respondents 65 years of age and older, or to respondents who had not been interviewed in a prior wave. This HRS design implies a relatively large number of missing values for the mental summary score. The size

[1] We use the RAND-HRS, version P (Bugliari et al., 2016), which has imputation of financial variables.

[2] Sample statistics are reported in Table A.1 in the Appendix.

[3] The age composition is affected by the HRS age-eligibility criteria for administering cognitive tests. Further details are provided below.

[4] The backward counting test consists of counting backward from 20 to 1 for a total of 2 trials. For the date naming test, individuals are asked to report "today's date," including the month, day, year, and day of the week. In the object naming test individuals are asked the following two questions: "What do you usually use to cut paper?" and "What do you call the kind of prickly plant that grows in the desert?" For the president/vice president naming test, individuals are asked to name the current President and Vice President of the United States.

Table 1
Cognitive Test Scores – Sample Statistics.

	Range	Mean	Median	Std. Dev.
Total Word Recall	[0, 20]	9.47	10	3.55
Serial 7	[0, 5]	3.59	4	1.62
Mental Status	[0, 10]	9.30	10	1.17
Total Mental Status	[0, 15]	12.89	14	2.33
Total Cognition	[0, 35]	22.37	23	4.97
Poor Memory (self-reported)	[0, 1]	0.28	-	0.45
N		49,489		

of our analytical sample given above (49,489 individual-time observations) refers to individuals for whom the complete set of cognitive measures is available. To avoid confounding the estimated relationships of interest with changes in sample composition, we maintain the same analytical sample across analyses using different cognitive measures. Hence, for estimations based on tests administered to the entire sample (e.g., word recall, serial 7) we rely on a smaller sample size than we would otherwise obtain if we allowed the number of observations to vary depending on test score availability.[5] Our sample selection criteria also mean that the fraction of individuals below the age of 65 in our study is smaller than the actual one in the HRS. Having an under-representation of adults below the age of 65 aligns with the purpose of our study: substantial cognitive declines are typically observed at older ages and their effects on household financial decisions are more likely to be detected in a sample with an over-representation of seniors.

The RAND-HRS also provides a total cognition index score, ranging from 0 to 35, which sums the scores of all administered cognitive tests. Mean and median total scores are 22 and 23, respectively. Finally, the HRS asks individuals to rate their memory on a five-point scale: excellent, very good, good, fair and poor. We create an indicator variable for fair or poor memory status. Table 1 shows that 28% of the selected sample assess their memory status as fair or poor.

3. Financial responsibility within the household and cognitive ability

In this section, we assess the issue of whether and how an individual's cognitive ability is related to financial responsibility within the household. For this purpose, we focus on couple households (married or partnered) and estimate the relationship between cognitive ability and the likelihood of being responsible for the household's financial decisions as proxied by being designated as the survey financial respondent. Specifically, we estimate the following regression:

$$FR_{it} = \alpha + \beta Cog_{it} + \beta^{s} Cog^{s}_{it} + \gamma' x_{it} + \gamma^{s\prime} x^{s}_{it} + \delta' x^{h}_{it} + t + \eta_i + \epsilon_{it}, \qquad (1)$$

where the subscript i denotes individuals and the subscript t denotes time; the superscripts s and h indicate spouse-level and household-level variables, respectively. The dependent variable, FR, is an indicator for whether the individual is the person with most financial responsibility in the household and, accordingly, designated to be the household's financial respondent. The main variables of interest are Cog_{it} and Cog^{s}_{it}, which measure an individual's and his/her partner's cognitive ability, respectively. The vectors x and x^{s} contain characteristics such as age, education (an indicator for "high education" taking value 1 if the individual has at least some college education), work status, health status and difficulties with activities of daily living, separately for the respondents and his/her spouse or partner. The vector x^{h} accounts for household-level variables. In particular, we include age difference between couple members and indicators for types of marital arrangement, one for married with spouse absent and one for partnered (with an indicator for married with spouse present as the omitted category). We also include indicators for total household income and total household wealth (the RAND-HRS definition comprising both housing and non-housing wealth) quartiles. The regression equation features interview waves indicators, as denoted by t. We also allow the probability of being the financial respondent to be affected by time-invariant individual characteristics/traits (η_i). We estimate Eq. (1) by OLS and fixed-effects (FE).[6]

We use different cognitive variables, which are all standardized and separately included in the regression equation. Specifically, we consider total word recall, serial 7, mental status and total cognition scores. Hence, we study the associations of financial responsibility within the household with various cognitive functions (episodic memory, working memory and mental status) as well as with overall cognitive health (total cognition score). It should be noted that correlation between individual cognitive test scores ranges from 0.3 (between total word recall and serial 7) to 0.37 (between total word recall or serial 7 and mental status), suggesting that these scores capture indeed different cognitive domains.[7]

In Table 2, we present the OLS estimated coefficients of each of these measures. The results indicate that a one standard deviation increase in an individual's total word recall score increases the likelihood of being the financial respondent by 5 percentage points. On the other hand, a one standard deviation increase in the spouse's total word recall score decreases the chances that the person is the financial respondent by 5 percentage points. Estimated coefficients are qualitatively similar across cognition scores. Quantitatively, they are larger when the serial 7 test score and the total cognition score are used. For instance, a one standard deviation increase in an individual's total cognition score increases the probability of being responsible for the household's finances by 8 percentage points, whereas a standard deviation increase in the spouse's total cognition score decreases the same probability by 7 percentage points. These estimated effects are sizeable: moving from the top to the lowest decile of the total cognition score would decrease the likelihood of being in charge of the household's finances by 21 percentage points (from a base of 50%). In the last panel of Table 2, we focus on the subjective perception of memory status. We find that self-reported poor memory is associated with a nearly 5 percentage-point decrease in the likelihood of being the financial respondent.

As far as the effect of other variables is concerned (shown in Table A.2 in the Appendix), we observe that, conditional on age, education, health, cognition and work status, females are nearly 30 percentage points less likely to be the household financial respondent. Indeed, the fraction of financial respondents in our selected sample is 65% among men versus 35% among women. Notably, an increasing age difference between the individual and his/her partner is positively associated with the probability of being the financial respondent. Not surprisingly, the person with higher education (at least some college education) in the household is relatively more likely to be in charge of the household's finances. Similarly, couple members currently working for pay exhibit a higher probability of being the financial respondent. We do not find significant associations between the likelihood of being the financial respondent and health status or difficulties with activities of daily living.

The breakdown by gender and education reveals interesting patterns. A one standard deviation increase in one's cognitive test score is associated with a more pronounced (and statistically significant)

[5] Allowing sample sizes to vary with test score availability leads to very similar results as those presented in the text. The results of these analyses are available upon request to the authors.

[6] We opt for a linear probability model instead of a Logit/Probit model so to be able to estimate it both without and with individual fixed-effects. We obtain very similar results to those presented in Table 2 when we estimate the model by Logit or Probit without fixed-effects.

[7] In Table A.3 in the Appendix we include total word recall, serial 7 and mental status scores simultaneously in the regression equation. While the magnitudes of the estimated associations are somewhat smaller, the quality of the results remains unchanged.

Table 2
Financial Responsibility within the Household and Cognitive Ability Single Cognitive Scores – OLS Estimates.

	All	Male	Female	Low Ed	High Ed
Total Word Recall					
Respondent	0.049**	0.060**	0.038**	0.053**	0.041**
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Spouse	−0.047**	−0.038**	−0.057**	−0.052**	−0.039**
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Serial 7					
Respondent	0.064**	0.075**	0.055**	0.068**	0.053**
	(0.004)	(0.006)	(0.005)	(0.005)	(0.007)
Spouse	−0.060**	−0.052**	−0.070**	−0.063**	−0.054**
	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)
Mental Status					
Respondent	0.052**	0.052**	0.045**	0.049**	0.054**
	(0.004)	(0.005)	(0.005)	(0.005)	(0.006)
Spouse	−0.045**	−0.040**	−0.045**	−0.046**	−0.042**
	(0.003)	(0.005)	(0.005)	(0.004)	(0.005)
Total Cognition					
Respondent	0.079**	0.092**	0.065**	0.085**	0.067**
	(0.004)	(0.006)	(0.006)	(0.005)	(0.007)
Spouse	−0.073**	−0.062**	−0.085**	−0.079**	−0.062**
	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)
Poor Memory					
Respondent	−0.046**	−0.051**	−0.042**	−0.043**	−0.046**
	(0.008)	(0.010)	(0.011)	(0.009)	(0.013)
Spouse	0.044**	0.039**	0.049**	0.036**	0.056**
	(0.008)	(0.011)	(0.011)	(0.010)	(0.012)
N	49,489	25,412	24,077	28,708	20,781

Cognitive ability test scores are separately included in the regression equation. Other regressors are gender, race, age brackets, age difference between couple members, education of both couple members, indicators for spouse absent and partnered, health and work status of both couple members, difficulty with activity of daily living for both couple members, household total income and wealth quartiles, wave indicators. Standard errors clustered at the individual level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 3
Financial Responsibility within the Household and Cognitive Ability Single Cognitive Scores – Fixed-Effects Estimates.

	All	Male	Female	Low Ed	High Ed
Total Word Recall					
Respondent	0.003**	0.003	0.002	0.001	0.005**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Spouse	−0.003**	−0.003**	−0.003**	−0.003*	−0.004**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Serial 7					
Respondent	0.002*	0.004**	0.001	−0.001	0.008**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Spouse	−0.005**	−0.003*	−0.007**	−0.001	−0.009**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Mental Status					
Respondent	0.010**	0.011**	0.008**	0.008**	0.013**
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Spouse	−0.009**	−0.008**	−0.010**	−0.008**	−0.012**
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
Total Cognition					
Respondent	0.007**	0.008**	0.005**	0.004**	0.011**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Spouse	−0.008**	−0.007**	−0.010**	−0.006**	−0.011**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Poor Memory					
Respondent	−0.007**	−0.008**	−0.005	−0.006**	−0.008**
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)
Spouse	0.006**	0.006	0.006*	0.007**	0.005
	(0.002)	(0.004)	(0.003)	(0.003)	(0.004)
N	49,489	25,412	24,077	28,708	20,781

Other regressors are age brackets, age difference between couple members, indicators for spouse absent and partnered, health and work status of both couple members, difficulty with activity of daily living for both couple members, household total income and wealth quartiles, wave indicators. Standard errors clustered at the individual level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

increase in the likelihood of being the financial respondent for men (from 5 to 9 percentage points, depending on the cognition measure) than for women (from 3 to 6.5 percentage points, depending on the cognition measure). Accordingly, the relative influence of the spouse's cognitive ability on one's probability of being the financial respondent is less strong for male respondents than for female respondents. These results are in line with the findings of Smith et al. (2010), who observe that, even when they have a perfect zero (out of 3) on a numeracy test, men still have a 50% chance to be selected as the financial respondent. When they have a perfect numeracy test score (3 out of 3), they have an 80% chance of being the financial respondent. About 42% of sampled financial respondents have at least some college education. The selection of who is in charge of a couple's finances is more sensitive to members' relative cognitive abilities within the group of individuals with no college education (low education) than within the group of those with some college education (high education). Such estimated differences are statistically significant. For instance, a one standard deviation increase in total cognitive score is associated with a 9.2 percentage-point increase in the likelihood of being the financial respondent for the average person with no college education and with a 6.5 percentage-point increase for the average person with some college education.

In order to explicitly account for unobservable, time-invariant individual characteristics driving the selection of a couple's financial respondent, we estimate Eq. (1) by fixed-effects. In this case, we rely on within-individual variation in financial respondent status and cognitive scores to estimate the parameters of interest. The estimated coefficients reported in Table 3 are qualitatively consistent with the patterns described so far.[8] In general, one's cognitive decline is associated with a lower probability of being the financial respondent. On the other hand, a spouse's cognitive decline increases one's chances of being the financial respondent. Yet, the magnitude of the estimated associations between cognition and financial responsibility is substantially smaller than that obtained from cross-sectional regressions. Specifically, moving from the top to the bottom total cognition score decile would only decrease the likelihood of being the financial respondent by 2 percentage points. These fixed-effects estimates suggest the existence of great persistence in task division between couple members. Indeed, within-individual variation in financial respondent status is very limited: only 2.5% pass from not being to being the financial respondent and only 2% pass from being to not being the financial respondent across two consecutive periods. This is consistent with the observation by Hsu and Willis (2013) that switching financial responsibility within the household often occurs only after the financial decision maker's cognition is impaired enough to induce severe difficulty with handling money.

Differences by gender are robust to fixed-effects estimation. A one standard deviation increase in one's total cognition score increases the likelihood of being the financial respondent by 0.8 percentage points among men and by 0.5 percentage points among women. Conversely, a

[8] As shown in Table A.4 in the Appendix, the same patters are observed when multiple cognitive variables are simultaneously included in the regression equation.

one standard deviation increase in the spouse's total cognition score decreases the likelihood of being the financial respondent by 0.7 percentage points among men and by 1 percentage point among women. Thus, while their small magnitudes indicate great inertia in task division within the household, the estimated coefficients do reinforce the fact that the probability of managing household finances is less sensitive to changes in own cognition and more responsive to changes in spouse's cognition among females.

The breakdown by education shows significant difference in the impact of changes in cognitive ability on the likelihood of being the financial respondent for low- and high-educated individuals. The results also point to a larger impact among the latter than the former group. This finding, that may appear to be at odds with the evidence presented in Table 2, could be explained with the fact that better educated individuals are more discerning about, and hence more responsive to, experienced changes in their cognition.

4. Household financial outcomes before, at and after cognitive decline

In this section, we investigate potential changes in financial outcomes after household members experience a significant decline in cognition. We adopt two measures of "significant" cognitive decline, one when an individual's total word recall score—capturing memory status—drops by 15% or more over two consecutive HRS interviews (which span a four-year period) and one when an individual's total cognition score drops by 10% or more over two consecutive HRS interviews. The two thresholds of 15% and 10% are chosen so that they constitute noticeable declines in cognition, most likely not attributable to randomness or survey error, and, at the same time, identify a sizeable fraction (no less than 5%) of sampled individuals experiencing a cognitive decline over the observation period. With these thresholds, we obtain that 12% and 8% of the sample experience a significant cognitive decline over the observation period when the decline is measured using total word recall score and total cognition score, respectively.[9] Having defined a significant cognitive decline episode, we compare financial wealth of households whose members experience such instance to that of households whose members do not experience this event. For those who suffer a cognitive decline, we also distinguish between the period of the decline and the period after the decline (households who do not experience a cognitive decline are only observed in the pre-decline period, by construction). This allows us to investigate whether potential wealth changes following a noticeable cognitive decline fade out, persist or are reinforced over time. Formally, we estimate the following linear regression:

$$W_{it} = \alpha + \beta_0 AtCD_i + \beta_1 AfterCD_i + \gamma' x_{it} + \gamma^{s\prime} x^s_{it} + \delta' x^h_{it} + t + \upsilon_{it}, \qquad (2)$$

where the dependent variable, W, represents household financial wealth. The two main variables of interest are the indicators $AtCD_i$ and $AfterCD_i$. For individuals who experience a significant cognitive decline over the observation period, the indicator $AtCD_i$ takes value one for the waves when the decline is first observed and zero otherwise; the indicator $AfterCD_i$ takes value one for the waves after the decline is first observed and zero otherwise. The omitted category is the "pre-decline" period. For those individuals who experience a cognitive decline over the observation period, the "pre-decline" period indicator takes value one for the waves before the decline occurs. Individuals who do not experience a significant cognitive decline over the observation period are only observed in such "pre-decline" period ($AtCD_i$ and $AfterCD_i$ are always zero for these individuals). Hence, the regression in Eq. (2) effectively compares wealth trajectories of households with and without a cognitive decline (distinguishing the times during and after the decline for the former). Under the assumption that differences between these two groups, that may lead to different financial outcomes, are accounted for by our set of regressors and not driven by other unobservable characteristics, estimated differences in wealth trajectories may be attributed to differences in cognitive health. Since this assumption is rather strong, we remain cautious in attaching such causal interpretation to our estimates. Nonetheless, the results that follow are suggestive of possible consequences of cognitive decline for household finances.

As for the previous analysis, the regression equation includes the individual's and spouse's characteristics, ranging from age, education, health and work status, as well as difficulty with activities of daily living (ADL). The set of regressors in Eq. (2) also features the spouse's total cognitive score. As far as household-level variables are concerned, we control for total household income before the observed cognitive decline, via quartile indicators, and for total household out-of-pocket medical expenses in logarithmic form. We adopt two separate specifications. In the most parsimonious one, we exclude respondent's and spouse's work status and ADL difficulty as well as household medical expenses, as they are more likely to be directly affected by cognitive decline. In the richest specification, we include these variables too. Since the results are very similar across these two specifications, throughout the paper we only present the results from the richest specification.[10]

We consider different definitions of household financial wealth, which, compared to housing or total wealth (75% of which is made of housing wealth in our sample), should arguably be more sensitive to changes in individuals' cognitive ability. The basic measure is "Private Financial Wealth," computed as the sum of checking/savings accounts, stocks and stock mutual funds, bonds and bond mutual funds, government bonds, CDs and Treasury bills. A second, broader measure also includes the value of Individual Retirement Accounts (IRAs) not sponsored by an employer. Finally, we consider the RAND-HRS measure of "Net Financial Wealth." This is computed as Private Financial Wealth plus other non-financial assets (e.g., jewelry, money owed by others, collection for investment purposes, etc.) and minus non-housing debt. All monetary variables are expressed in 10,000 dollars as of 2012. To reduce the influence of outliers when estimating Eq. (2), we trim households in the top and bottom 0.05% of the wealth distribution.[11]

In Table 4, we present the estimated coefficients for the periods at and after a significant cognitive decline, which quantify potential differences in financial wealth trajectories between households whose members experience a noticeable decline in cognitive ability and households whose members do not. Across different wealth measures, the results show that, compared to households whose members do not suffer a cognitive decline (the omitted pre-decline period), households whose members experience a decline see their financial wealth decreasing considerably during and after the time of the decline. The estimated drop is similar in magnitude and not statistically different at the time when the decline is first observed and thereafter. Focusing on the bottom panel of Table 4, we estimate that at the time of and after a significant drop in total word recall score, household net financial

[9] We have checked and confirmed the robustness of the results to different threshold values in the range 10%–25% for total word recall and 5%–20% for total cognition score. We have also experimented with a definition of significant cognitive decline based on a combined score summing serial 7 and mental status scores. In this case, given that most individuals maintain a very high score over time (as revealed by the summary statistics in Table 1), a drop in the score not larger than 5% over two consecutive HRS interviews is needed in order to have at least 5% of the sample experiencing a cognitive decline over the observation period. Using such threshold, we obtain results (available upon request to the authors) that are in line with those presented in the paper.

[10] Table A.5 in the Appendix reports the full set of estimated coefficients for the two specifications separately.

[11] This implies that in the regressions using Private Financial Wealth and Private Financial Wealth plus IRAs, households with zero wealth are excluded. When the sample is not trimmed, the magnitude of the estimated coefficients is larger in absolute value (likely reflecting the effect of outliers), but the quality of the results remains unchanged.

Table 4
Financial Wealth before and after Cognitive Decline.

	Cognitive Decline based on:	
	Total Word Recall	Total Cognition
Private Financial Wealth		
At decline	−1.764*	−3.153**
	(1.070)	(1.117)
After decline	−2.498**	−3.459**
	(1.183)	(1.371)
N	48,197	48,197
Private Financial Wealth plus IRAs		
At decline	−2.053	−4.370**
	(1.427)	(1.384)
After decline	−3.153**	−4.389**
	(1.482)	(1.654)
N	48,198	48,198
Net Financial Wealth		
At decline	−2.101**	−3.643**
	(1.039)	(1.074)
After decline	−2.195*	−3.168**
	(1.199)	(1.378)
N	48,196	48,196

Other regressors are gender, race, age brackets, age difference between couple members, education of both couple members, indicators for spouse absent and partnered, health and work status of both couple members, total cognition score of the spouse, difficulty with activity of daily living for both couple members, household total income quartiles before the decline, log of household medical expenses, wave indicators. Standard errors clustered at the household level in parentheses. Differences in sample sizes across wealth measures are due to trimming households in the top and bottom 0.05% of the wealth distribution. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 5
Financial Wealth before and after Cognitive Decline by Financial Responsibility within the Household.

	Cognitive Decline based on:			
	Total Word Recall		Total Cognition	
	No-FinR	FinR	No-FinR	FinR
Private Financial Wealth				
At decline	−0.112	−3.158**	−1.797	−4.284**
	(1.749)	(1.524)	(1.863)	(1.412)
After decline	−1.431	−3.393*	−1.052	−5.631**
	(1.624)	(1.842)	(2.300)	(1.634)
N	17,923	22,288	17,273	22,182
Private Financial Wealth plus IRAs				
At decline	0.831	−4.826**	−1.950	−6.658**
	(2.295)	(1.974)	(2.349)	(1.673)
After decline	−2.027	−4.471*	−1.752	−6.785**
	(2.081)	(2.310)	(2.646)	(2.150)
N	17,922	22,289	17,272	22,183
Net Financial Wealth				
At decline	−0.115	−3.734**	−2.321	−4.843**
	(1.720)	(1.465)	(1.777)	(1.347)
After decline	−1.157	−2.893	−0.764	−5.309**
	(1.701)	(1.884)	(2.297)	(1.633)
N	17,923	22,287	17,273	22,181

Other regressors as in Table 4. Differences in sample sizes across wealth measures are due to trimming households in the top and bottom 0.05% of the wealth distribution. Standard errors clustered at the household level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

wealth is about $20,000 lower than when no (or before) cognitive decline is experienced. Similarly, at the time of and after a significant drop in total cognition score, household net financial wealth is over $30,000 lower compared to when there is no cognitive decline. These are substantial changes of about 12% and 18%, respectively, from an average net financial wealth of $170,000 in our sample.

Other coefficient estimates, reported in Table A.5 in the Appendix, are in line with what could be expected. Compared with White households, African American households have about $70,000 less in financial wealth. There exists a clear positive age gradient in asset holdings, with older households having a larger stock of wealth, which also points at lack of decumulation among American seniors (De Nardi et al., 2010). Household financial wealth is greater for couples with higher education, defined as having some college education or more, and higher income, which is measured before the experienced drop in cognitive scores. Compared to a couple where both members have no college education, couples where both members have at least some college education have about $110,000 more in financial wealth. The gap between the lowest and the highest income quartile is remarkable and estimated to be nearly $300,000. Work status is associated with lower wealth. This may reflect the fact that working individuals are younger, on average, and have less accumulated wealth. Households where its members report being in poor health tend to have less wealth than their healthier counterparts, although this association is not precisely estimated. Conditional on self-reported health status, difficulty with ADL does not correlate with household wealth level. It is worth noting that higher medical costs are associated with higher household financial resources.

4.1. Breakdown by financial responsibility within the household

Next, we examine to what extent wealth trajectories differ if the person experiencing a cognitive decline was also the household financial decision-maker prior to the decline. It should be noted that, given the documented inertia in the status of financial respondent, the vast majority of those who are financial respondents prior to a significant drop in cognitive test scores remain in charge of the household's financial decisions thereafter. In other words, splitting the sample into financial and non-financial respondents prior to the cognitive decline leads to virtually identical results as splitting the sample into financial and non-financial respondents over the entire observation period.

In Table 5, we note that the decrease in financial wealth observed when a significant cognitive decline occurs is concentrated among those households where the person whose cognition is worsening was also in charge of financial matters before the decline. More precisely, at and after a cognitive decline of the non-financial respondent, there is no evidence of household financial wealth decreasing compared to when no cognitive decline is experienced. In contrast, household wealth drops substantially if it is the financial respondent who faces a decline in cognition. These reductions appear slighlty larger in the period after the decline compared to the period when the decline is first observed, yet differences are not statistically significant.

A quantitative assessment of these results can be summarized as follows. When the non-financial respondent experiences a substantial drop in total cognition score, net financial wealth decreases, on average, by about $15,000, an amount not statistically different from zero. On the other hand, when the financial respondent experiences a substantial drop in total cognition score, net financial wealth decreases, on average, by about $50,000, an amount significant at the 5% level.

Table 6
Financial Wealth before and after Cognitive Decline by Financial Responsibility within the Household and Gender.

	Cognitive Decline based on:			
	Total Word Recall		Total Cognition	
	No-FinR	FinR	No-FinR	FinR
Private Financial Wealth				
At decline – Male	−1.338	−1.469	−3.736	−4.260**
	(3.117)	(2.068)	(3.168)	(1.868)
At decline – Female	0.613	−6.855**	−0.610	−4.341**
	(2.134)	(1.473)	(2.252)	(1.925)
After decline – Male	−4.746**	−1.715	−4.658**	−4.613**
	(1.776)	(2.568)	(2.260)	(2.131)
After decline – Female	0.427	−6.643**	1.455	−7.404**
	(2.283)	(1.617)	(3.393)	(1.959)
N	17,923	22,288	17,273	22,182
Private Financial Wealth plus IRAs				
At decline – Male	0.312	−2.993	−4.287	−7.024**
	(3.644)	(2.710)	(3.334)	(2.261)
At decline – Female	1.174	−8.832**	−0.523	−6.086**
	(2.923)	(1.871)	(3.112)	(2.170)
After decline – Male	−5.584**	−2.399	−5.640**	−5.740**
	(2.120)	(3.222)	(2.509)	(2.761)
After decline – Female	−0.035	−8.486**	0.952	−8.605**
	(2.917)	(2.178)	(3.928)	(2.882)
N	17,922	22,289	17,272	22,183
Net Financial Wealth				
At decline – Male	−0.990	−2.215	−3.792	−4.640**
	(3.073)	(1.990)	(3.103)	(1.797)
At decline – Female	0.419	−7.059**	−1.421	−5.182**
	(2.072)	(1.412)	(2.083)	(1.785)
After decline – Male	−4.500**	−1.298	−3.479	−4.685**
	(1.869)	(2.648)	(2.497)	(2.108)
After decline – Female	0.717	−5.983**	1.124	−6.396**
	(2.381)	(1.618)	(3.313)	(2.065)
N	17,923	22,287	17,273	22,181

Other regressors as in Table 4. Differences in sample sizes across wealth measures are due to trimming households in the top and bottom 0.05% of the wealth distribution. Standard errors clustered at the household level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Overall, differences between the sets of estimates based on non-financial and financial respondents are sizeable and statistically significant across both cognition and wealth measures.[12]

In Table 6, we investigate whether the observed patterns in household wealth following a worsening of couple members' cognitive ability vary not only with financial respondent status, but also with gender. For this purpose, we interact the variables $AtCD_i$ and $AfterCD_i$ in Eq. (2) with male and female indicators and, again, estimate the regression equation separately for the sub-samples of non-financial and financial respondents. This analysis reveals that drops in wealth are more sizeable if the financial respondent experiencing a decline in cognition is a woman. Focusing on net financial wealth, the drop in wealth at the time of and after a decline in total word recall score is about three times as big (and statistically significant) for female financial respondents. At the time of and after a decline in total cognition score, the estimated drop in wealth is about 20% larger for female than for male financial respondents, although this difference is not statistically significant. It is worth noting that, while wealth drops among non-financial respondents remain largely indistinguishable from zero, the results suggest that households do suffer wealth reductions when the male non-financial respondent experiences a worsening in cognition. This finding indicates that males may engage relatively more frequently in financial decision-making even when they are not primarily in charge of the household's finances and/or that the survey financial respondent status may not perfectly reflect financial responsibility within the household.

[12] The full set of estimated coefficients can be found in Table A.6 in the Appendix. The results are not affected by whether those who switch from being to not being the financial respondent after an experienced cognitive decline (about 0.7% of the sample) are excluded from the analysis.

Table 7
Household Medical Expenses before and after Cognitive Decline (Financial Respondents Only).

	Cognitive Decline Based on	
	Total Word Recall	Total Cognition
At Decline	−0.075	0.048
	(0.046)	(0.053)
After Decline	−0.065*	0.027
	(0.038)	(0.048)
N	24,435	24,435

Other regressors are gender, race, age brackets, age difference between couple members, education of both couple members, indicators for spouse absent and partnered, health and work status of both couple members, total cognition score of the spouse, difficulty with activity of daily living for both couple members, household total income quartiles before the decline, wave indicators. Standard errors clustered at the household level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

5. Potential sources of heterogeneity and mechanisms

In this section, we investigate further sources of heterogeneity shaping observed wealth trajectories and potential mechanisms that could give rise to the estimated drops in wealth following cognitive ability declines. An obvious candidate that could contribute to wealth reductions is out-of-pocket medical expenses. While the previous regressions control for household out-of-pocket medical costs, they do not tell us whether such costs increase significantly at the time of and after cognitive declines experienced by couple members. Thus, in Table 7 we estimate Eq. (2) using the logarithm of household out-of-pocket medical expenses as dependent variable on the sub-sample of financial respondents. As can be seen, we do not find any evidence of an increase in medical costs following a worsening in cognition. Not only are the coefficients of interest imprecisely estimated, but they appear also to be sensitive to which test score is used to identify cognitive declines.[13]

Next, we study whether wealth management after cognitive declines is affected by the type of retirement income at a household's disposal. Our hypothesis is that individuals with pension or annuity income may find it easier to budget and administer their resources than those who, besides Social Security retirement benefits, rely mostly on distributions from retirement accounts (IRAs, 401 k plans, etc.). To test this hypothesis, we interact the variables $AtCD_i$ and $AfterCD_i$ in Eq. (2) with an indicator for availability of pension/annuity income within the household. We carry out the estimation of this model on the sub-sample of non-working individuals designated as household financial respondents. In this sub-sample, 30% of households receive income from pension or annuity and 62% receive Social Security retirement benefits (in these regressions we add a control for whether either couple member receives Social Security retirement benefits). Individuals with and without pension/annuity income, who typically hold different types of jobs, may exhibit different characteristics, including level of cognition and speed of cognitive aging. Yet, we do not observe

[13] The complete set of estimated coefficients is in Table A.7 in the Appendix.

Table 8
Financial Wealth before and after Cognitive Decline by Availability of Pension/Annuity (P/A) Income (Non-Working Financial Respondents Only).

	Cognitive Decline based on:	
	Total Word Recall	*Total Cognition*
Private Financial Wealth		
At decline – No P/A	−6.467**	−4.927**
	(2.030)	(2.248)
At decline – P/A	−1.188	−3.862*
	(2.449)	(2.099)
After decline – No P/A	−5.305**	−4.677**
	(1.880)	(2.252)
After decline – P/A	−3.652	−3.923*
	(2.452)	(2.266)
N	14,807	14,807
Private Financial Wealth plus IRAs		
At decline – No P/A	−8.661**	−7.260**
	(2.490)	(2.800)
At decline – P/A	−4.372	−6.029**
	(2.698)	(2.356)
After decline – No P/A	−8.215**	−7.088**
	(2.204)	(2.699)
After decline – P/A	−4.184	−3.598
	(2.985)	(3.176)
N	14,807	14,807
Net Financial Wealth		
At decline – No P/A	−6.906**	−5.501**
	(1.979)	(2.175)
At decline – P/A	−1.527	−3.919**
	(2.308)	(1.976)
After decline – No P/A	−5.142**	−3.734*
	(1.868)	(2.245)
After decline – P/A	−3.678	−4.029*
	(2.429)	(2.235)
N	14,806	14,806

Other regressors as in Table 4. Differences in sample sizes across wealth measures are due to trimming households in the top and bottom 0.05% of the wealth distribution. Standard errors clustered at the household level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

noticeable differences in cognitive health. The prevalence of cognitive decline is 8% among those with pension/annuity income and 9% among those without it, and this difference of one percentage point is not statistically significant.

The results of this analysis, reported in Table 8, provide empirical evidence supporting our prior. In fact, wealth drops after cognitive declines are relatively more pronounced when the household does not receive any pension or annuity income. Specifically, following a decline in total word recall score, net financial wealth is reduced by about $60,000, among those without pension/annuity income, and only by about $25,000, among those with pension/annuity income (this difference has a *p*-value of 0.06). Following a decline in total cognition score, net financial wealth is reduced by about $46,000, among those without pension/annuity income, and by about $39,000, among those with pension/annuity income (this difference is not statistically significant). Across cognitive scores and wealth measures, we do not find statistically significant differences between financial wealth reductions during the waves when the cognitive decline occurs and during the waves after that. In general, heterogeneity driven by type of retirement income is more apparent when cognitive decline is measured by reductions in total word recall than in total cognition score. This may suggest that memory and focus, better capture by immediate and delayed word recall tasks, are among the most critical cognitive functions in determining the quality of financial decision making and management of retirement wealth at older ages. In agreement with this, Hurd et al. (2013) find that word recall test scores are especially predictive of the probability of dementia.

Older adults must make numerous challenging decisions that have serious implications for their financial stability and overall wellbeing. These include, but are not limited to, managing accumulated financial assets and choosing among available health insurance options. Because of cognitive aging, they may face great difficulty in making optimal choices in these domains (Keane and Thorp, 2016). Cognitive decline could also increase susceptibility to financial exploitation, ranging from thefts and scams to unauthorized access to accounts (Wood and Lichtenberg, 2017). Financial mistakes and fraud may be some of the factors contributing to the observed decrease in household wealth following a significant decline in cognition of the financial-decision maker. While the data at our disposal do not allow us to directly check whether individuals with declining cognitive ability are more prone to financial mistakes and exploitation, we can assess whether their wealth trajectories differ depending on whether or not they receive help from their children in dealing with financial matters. Indeed, informal assistance from children, or from family members more generally, may represent an effective way to guard seniors with functional decline against misuse and abuse of their resources, while preserving their financial independence (Belbase and Sanzenbacher, 2016).[14]

The HRS contains information about whether respondents receive help with activities of daily living (dressing, walking, bathing, eating, etc.), with instrumental activities of daily living (meal preparation, grocery shopping, taking medication, etc.), as well as with finances. In particular, respondents report who helps with each of these activities and their relationship with such person(s). We rely on the RAND-HRS variable recording the number of children helping with finances and create an indicator for whether the respondent has ever received help in dealing with financial matters over the observation period.[15] We observe that only slightly more than 2% of financial respondents in our sample have received help with finances from their children. We interact the variables $AtCD_{iw}$ and $AfterCD_i$ in Eq. (2) with this indicator and estimate the model focusing on household financial respondents only. The corresponding results are reported in Table 9. They suggest that following a cognitive decline, household wealth decreases by less when the allegedly impaired financial decision-maker receives helps from the children. Specifically, at the time of and after a substantial decline in total cognition score, net financial wealth is reduced by about $50,000 among those who do not receive help with finances and by around $25,000 among those who do receive help. This pattern is consistently observed across different wealth measures and definitions of cognitive decline. However, due to limited number of individuals who report being helped with finances by their children, standard errors are relatively large and estimated differences between those who receive and those who do not receive help managing their finances are never statistically significant. Because of this, we refrain from placing too much weight on these results.

6. Conclusions

In this paper, we investigate the relationship between cognition and financial outcomes among older American couples. Specifically, we assess the extent to which cognitive ability and cognitive decline determine financial responsibility within a couple household. We also compare financial wealth trajectories of households whose members

[14] A formal way of preventing misuse and abuse of Social Security benefits among impaired retirees is the Social Security's Representative Payment Program, which provides financial management for the Social Security and SSI payments of beneficiaries who are incapable of managing their money.

[15] Due to the high frequency of missing values, this indicator, as opposed to one measuring whether the respondent is currently receiving help with finances, allows us to retain the analytical sample used so far.

Table 9
Financial Wealth before and after Cognitive Decline by Help with Financial Matters from Children (Financial Respondents Only).

	Cognitive Decline based on:	
	Total Word Recall	Total Cognition
Private Financial Wealth		
At decline – No Help	−3.451**	−4.741**
	(1.577)	(1.350)
At decline – Help	2.144	−2.394
	(4.420)	(4.082)
After decline – No Help	−3.107*	−5.224**
	(1.854)	(1.562)
After decline – Help	−3.392	−2.697
	(4.369)	(5.283)
N	23,549	23,549
Private Financial Wealth plus IRAs		
At decline – No Help	−5.249**	−7.248**
	(2.040)	(1.635)
At decline – Help	1.491	1.487
	(4.659)	(4.904)
After decline – No Help	−4.281*	−6.776**
	(2.320)	(1.984)
After decline – Help	−2.668	−3.054
	(5.361)	(6.200)
N	23,550	23,550
Net Financial Wealth		
At decline – No Help	−4.030**	−5.145**
	(1.517)	(1.309)
At decline – Help	1.478	−2.160
	(4.311)	(3.968)
After decline – No Help	−2.831	−5.304**
	(1.898)	(1.533)
After decline – Help	−4.632	−3.197
	(4.223)	(4.930)
N	23,548	23,548

Other regressors as in Table 4. Differences in sample sizes across wealth measures are due to trimming households in the top and bottom 0.05% of the wealth distribution. Standard errors clustered at the household level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

experience a noticeable decline in cognition with those of households whose members do not.

We carry out this analysis in a sample drawn from the Health and Retirement Study (HRS). The extensive array of cognitive test scores and demographics available in the HRS, alongside with detailed household asset holding information, allow us to examine how specific skills and abilities shape financial decision making at older ages, to account for multiple confounding factors that might affect this relationship and to check the robustness of our results to alternative measures of financial outcomes.

We find that, within a couple, each member's cognitive ability does play a role in the selection process leading to designate the person mostly responsible for financial decisions. This role, however, is economically modest once individual time-invariant characteristics are accounted for in fixed-effects regressions. This suggests that differences in the level of cognition between couple members determine who is the financial decision-maker, while changes in cognitive ability over time modify this choice only marginally. Such result is consistent with behavioral inertia or lack of skills of the person who should take on financial tasks previously performed by the partner suffering a relatively faster cognitive aging.

We estimate significant reductions in household financial wealth following a cognitive decline experienced by household members. Such reductions are notably more pronounced if the person in charge of financial matters suffered the loss in cognition. They are also more sizeable if the financial decision-maker is a woman rather than a man. A possible explanation for this finding is that females are more likely than men to exhibit excessive spending behavior (Hira and Mugenda, 2000) and more likely to be altruistic, especially when altruism is expensive like charitable giving and gifts to relatives (Andreoni and Vesterlund, 2001). Both these tendencies may be exacerbated by major cognitive declines. We find no evidence that the observed reductions in household wealth following a decline in cognitive ability are associated with substantial increases in household medical expenses. Wealth declines are relatively more modest among retirees with pension or annuity income and among cognitively impaired seniors receiving help from their children in dealing with finances.

Our study is subject to some limitations. First, as we have discussed above, the observed reductions in financial wealth following a noticeable cognitive decline of a household's members can be attributed to the cognitive decline itself only to the extent that variables driving differences between households who experience a cognitive decline and households who do not are accounted for. While we control for a wide range of individual-level and household-level demographics, we cannot rule out that these two groups may differ in unobservable characteristics/preferences that, in turn, may lead to different financial outcomes. For this reason, we view our results as suggestive of a relationship between cognitive decline and wealth reductions and refrain from giving them a causal interpretation. Second, our sample only includes couples. Thus, our finings cannot be generalized to the entire population of older adults. In particular, our analysis does not investigate possible shifts in financial responsibility within the household after divorce/remarriage or changes in financial wealth trajectories after remarriage or death of a spouse. The latter is a highly relevant issue especially as far as widows are concerned. In fact, women tend to outlive their husbands, have, on average, lower levels of financial literacy and numeracy than men, and are often less prepared to take over financial tasks in the absence of their partners. We leave the study of this issue for future research. Finally, we acknowledge that the measures of financial responsibility within the household and cognitive decline used in the empirical analysis are both imperfect. Yet, we do not expect contamination from measurement error to affect the quality of our results.

Rising life expectancy is contributing to rapid increases in the size of the older population and is expected to lead to a sharp rise in cognitive impairment and dementia cases. Currently, an estimated 5.5 million Americans are living with Alzheimer's dementia (Alzheimer's Association, 2017), with 5.3 million people age 65 and older and approximately 200,000 individuals under the age of 65. This figure will escalate rapidly in coming years, as the American population age 65 and older is projected to nearly double from 46 million to 98 million by 2060 (Mather et al., 2015). Cognitive impairment and, eventually, dementia cause progressive and largely irreversible declines in functional capacities. These losses may pose enormous financial risk for the household, not only in terms of costs of care, but also in terms of financial mismanagement. By documenting drops in household financial wealth following a decline in cognition experienced by the person in charge of financial decisions, our study highlights the potential benefits of preparing for the loss of functional capacities (e.g., by changing how resources are managed when cognitive difficulties set in) and/or of interventions designed to prolong the independence of the aging population Ball et al. (2002). Future research driven by new data availability should investigate and identify the major channels contributing to the observed reductions in household wealth following cognitive declines.

Acknowledgement

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Appendix A

Tables A.1, A.2, A.3, A.4, A.5, A.6, A.7.

Table A.1
Sample Statistics.

	Mean	Median	Std. Dev.
Demographics			
Female	0.49	–	0.50
Age 51–60	0.17	–	0.38
Age 61–70	0.30	–	0.46
Age 71–80	0.40	–	0.49
Age 81–90	0.12	–	0.32
Age 91 +	0.01	–	0.08
Couple age difference	0.38	0	5.38
Married (spouse present)	0.96	–	0.20
Married (spouse absent)	0.00	–	0.07
Partnered	0.04	–	0.19
High education	0.42	–	0.49
Poor health	0.25	–	0.43
Working for pay	0.29	–	0.45
Some ADL difficulty	0.13	–	0.34
Income and Financial Wealth			
HH total income	73,785	49,432	95,498
HH private financial wealth	171,993	30,375	527,959
HH private financial wealth + IRAs	256,838	66,339	707,498
HH net financial wealth	169,849	30,000	531,586
HH out-of-pocket medical expenses	7,079	3,894	16,051
N		49,489	

Table A.2
Financial Responsibility within the Household and Cognitive Ability (Other Coefficient Estimates).

	Using Total Word Recall Score		Using Mental Status Score		Using Total Cognition Score	
	OLS	FE	OLS	FE	OLS	FE
Female	−0.290**		−0.259**		−0.284**	
	(0.010)		(0.010)		(0.010)	
African American	−0.002		−0.002		−0.001	
	(0.015)		(0.015)		(0.015)	
Other Race	−0.020		−0.021		−0.019	
	(0.020)		(0.020)		(0.020)	
Age 61–70	0.000	0.003	−0.001	0.003	0.000	0.004
	(0.008)	(0.005)	(0.008)	(0.005)	(0.008)	(0.005)
Age 71–80	−0.000	0.004	−0.003	0.003	0.000	0.004
	(0.011)	(0.007)	(0.010)	(0.007)	(0.010)	(0.007)
Age 81–90	−0.007	0.006	−0.008	0.005	−0.004	0.005
	(0.015)	(0.009)	(0.014)	(0.009)	(0.015)	(0.009)
Age 90 +	−0.028	−0.010	−0.019	−0.009	−0.024	−0.011
	(0.040)	(0.015)	(0.040)	(0.015)	(0.040)	(0.015)
Couple age difference	0.005**	0.007**	0.005**	0.007**	0.006**	0.007**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
R high education	0.095**		0.099**		0.087**	
	(0.010)		(0.010)		(0.010)	
S high education	−0.092**	0.108**	−0.096**	0.108**	−0.084**	0.108**
	(0.010)	(0.019)	(0.010)	(0.019)	(0.010)	(0.019)
Spouse absent	0.016	0.015	0.013	0.015	0.014	0.015
	(0.036)	(0.015)	(0.036)	(0.015)	(0.036)	(0.015)
Partnered	0.017	0.118**	0.016	0.119**	0.016	0.119**
	(0.019)	(0.013)	(0.019)	(0.013)	(0.019)	(0.013)
R poor health	−0.003	−0.004	−0.005	−0.003	0.003	−0.003
	(0.008)	(0.003)	(0.008)	(0.003)	(0.008)	(0.003)
S poor health	0.005	0.000	0.007	0.000	−0.002	−0.000
	(0.008)	(0.003)	(0.008)	(0.003)	(0.008)	(0.003)
R working	0.034**	−0.001	0.035**	−0.001	0.030**	−0.001
	(0.009)	(0.003)	(0.009)	(0.003)	(0.009)	(0.003)
S working	−0.032**	0.004	−0.034**	0.004	−0.028**	0.004
	(0.009)	(0.003)	(0.009)	(0.003)	(0.009)	(0.003)
R ADL difficulty	−0.007	−0.008**	−0.004	−0.007**	−0.002	−0.007**

(*continued on next page*)

Table A.2 (*continued*)

	Using Total Word Recall Score		Using Mental Status Score		Using Total Cognition Score	
	OLS	FE	OLS	FE	OLS	FE
	(0.004)	(0.002)	(0.004)	(0.002)	(0.004)	(0.002)
S ADL difficulty	0.007	0.006**	0.004	0.005**	0.002	0.005**
	(0.004)	(0.002)	(0.004)	(0.002)	(0.004)	(0.002)
HH income q2	−0.002	0.000	−0.002	0.000	−0.002	0.000
	(0.009)	(0.003)	(0.009)	(0.003)	(0.009)	(0.003)
HH income q3	−0.003	0.002	−0.003	0.002	−0.003	0.002
	(0.010)	(0.003)	(0.010)	(0.003)	(0.010)	(0.003)
HH income q4	0.002	0.002	0.001	0.002	0.002	0.002
	(0.011)	(0.004)	(0.011)	(0.004)	(0.011)	(0.004)
HH wealth q2	0.001	0.003	0.001	0.003	0.001	0.003
	(0.010)	(0.003)	(0.010)	(0.003)	(0.009)	(0.003)
HH wealth q3	0.000	0.001	0.000	0.001	0.001	0.001
	(0.011)	(0.004)	(0.011)	(0.004)	(0.011)	(0.004)
HH wealth q4	−0.000	0.001	0.000	0.001	0.000	0.001
	(0.013)	(0.005)	(0.013)	(0.005)	(0.012)	(0.005)
N	49,489	49,489	49,489	4,9489	49,489	49,489

R: respondent; S: spouse; HH: household. Regressions also include wave indicators. Standard errors clustered at the individual level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table A.3
Financial Responsibility within the Household and Cognitive Ability Multiple Cognitive Scores – OLS Estimates.

	All	Male	Female	Low Ed	High Ed
Total Word Recall					
Respondent	0.031**	0.041**	0.021**	0.031**	0.028**
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Spouse	−0.029**	−0.021**	−0.039**	−0.031**	−0.025**
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Serial 7					
Respondent	0.051**	0.060**	0.046**	0.056**	0.041**
	(0.004)	(0.006)	(0.005)	(0.005)	(0.007)
Spouse	−0.048**	−0.043**	−0.056**	−0.050**	−0.044**
	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)
Mental Status					
Respondent	0.029**	0.027**	0.026**	0.026**	0.036**
	(0.004)	(0.005)	(0.005)	(0.005)	(0.006)
Spouse	−0.026**	−0.024**	−0.022**	−0.025**	−0.025**
	(0.003)	(0.005)	(0.005)	(0.004)	(0.005)
N	49,489	25,412	24,077	28,708	20,781

Cognitive test scores are included simultaneously in the regression equation. Other regressors as in Table 2. Standard errors clustered at the individual level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table A.4
Financial Responsibility within the Household and Cognitive Ability Multiple Cognitive Scores – Fixed Effects Estimates.

	All	Male	Female	Low Ed	High Ed
Total Word Recall					
Respondent	0.001	0.001	0.002	0.000	0.003
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Spouse	−0.002*	−0.002	−0.002	−0.002	−0.003
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Serial 7					
Respondent	0.001	0.002	0.000	−0.001	0.005**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Spouse	−0.003**	−0.002	−0.005**	−0.000	−0.008**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Mental Status					
Respondent	0.009**	0.010**	0.008**	0.008**	0.012**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Spouse	−0.009**	−0.007**	−0.010**	−0.008**	−0.011**
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
N	49,489	25,412	24,077	28,708	20,781

Cognitive test scores are included simultaneously in the regression equation. Other regressors as in Table 3. Standard errors clustered at the individual level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table A.5
Net Financial Wealth before and after Cognitive Decline (All Estimated Coefficients).

	Cognitive Decline Based on			
	Total Word Recall		Total Cognition	
At decline	−1.976*	−2.101**	−3.612**	−3.643**
	(1.046)	(1.039)	(1.077)	(1.074)
After decline	−2.045*	−2.195*	−3.073**	−3.168**
	(1.198)	(1.199)	(1.369)	(1.378)
Female	0.615**	0.687**	0.643**	0.728**
	(0.136)	(0.141)	(0.134)	(0.138)
African American	−7.723**	−7.064**	−7.539**	−6.870**
	(0.659)	(0.662)	(0.652)	(0.655)
Other Race	−3.589**	−2.686**	−3.561**	−2.651**
	(0.907)	(0.930)	(0.903)	(0.927)
Age 61–70	10.537**	6.658**	10.580**	6.621**
	(0.827)	(0.965)	(0.835)	(0.972)
Age 71–80	16.877**	11.616**	17.051**	11.681**
	(0.976)	(1.145)	(0.992)	(1.155)
Age 81–90	26.377**	20.094**	26.577**	20.153**
	(1.821)	(1.781)	(1.872)	(1.821)
Age 91 +	33.097**	26.101**	33.190**	26.012**
	(3.229)	(3.275)	(3.276)	(3.316)
Couple age difference	−0.400**	−0.316**	−0.407**	−0.321**
	(0.029)	(0.028)	(0.029)	(0.028)
R high education	6.017**	5.823**	5.824**	5.619**
	(0.638)	(0.628)	(0.626)	(0.617)
S high education	5.828**	5.612**	5.751**	5.530**
	(0.648)	(0.636)	(0.639)	(0.626)
Spouse absent	−3.006	−3.195	−2.631	−2.842
	(4.088)	(4.270)	(4.086)	(4.271)
Partnered	0.924	1.100	1.129	1.310
	(1.332)	(1.323)	(1.315)	(1.305)
R poor health	−0.061	−0.902*	−0.028	−0.893*
	(0.486)	(0.522)	(0.483)	(0.520)
S poor health	0.216	−0.662	0.276	−0.628
	(0.494)	(0.529)	(0.494)	(0.529)
S tot cog score	0.161**	0.188**	0.162**	0.190**
	(0.067)	(0.066)	(0.067)	(0.066)
HH income q2 (before)	0.013	−0.054	−0.043	−0.089
	(0.502)	(0.536)	(0.507)	(0.542)
HH income q3 (before)	5.900**	6.238**	6.025**	6.397**
	(0.719)	(0.774)	(0.724)	(0.779)
HH income q4 (before)	26.771**	27.892**	27.171**	28.384**
	(1.298)	(1.353)	(1.311)	(1.371)
R working		−4.674**		−4.731**
		(0.718)		(0.717)
S working		−4.915**		−5.079**

(*continued on next page*)

Table A.5 (*continued*)

	Cognitive Decline Based on			
	Total Word Recall		Total Cognition	
		(0.708)		(0.709)
R ADL difficulty		−0.086		−0.040
		(0.421)		(0.423)
S ADL difficulty		0.067		0.101
		(0.420)		(0.419)
Log medical expenses		1.522**		1.504**
		(0.338)		(0.338)
N	48,196	48,196	48,196	48,196

R: respondent; S: spouse; HH: household. Regressions also include wave indicators. Standard errors clustered at the household level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table A.6
Net Financial Wealth before and after Cognitive Decline by Financial Responsibility within the Household (All Estimated Coefficients).

	Cognitive Decline Based on			
	Total Word Recall		Total Cognition	
	No-FinR	FinR	No-FinR	FinR
At decline	−0.115	−3.734**	−2.321	−4.843**
	(1.720)	(1.465)	(1.777)	(1.347)
After decline	−1.157	−2.893	−0.764	−5.309**
	(1.701)	(1.884)	(2.297)	(1.633)
Female	4.273**	−2.933**	4.010**	−2.915**
	(1.236)	(1.099)	(1.258)	(1.106)
African American	−7.085**	−7.040**	−6.891**	−6.783**
	(0.738)	(0.713)	(0.745)	(0.703)
Other Race	−4.380**	−1.752	−4.472**	−1.568
	(1.249)	(1.138)	(1.249)	(1.144)
Age 61–70	6.207**	7.367**	5.896**	7.251**
	(1.216)	(1.079)	(1.172)	(1.092)
Age 71–80	11.138**	13.095**	11.338**	13.148**
	(1.403)	(1.299)	(1.373)	(1.340)
Age 81–90	21.432**	20.841**	21.179**	20.878**
	(2.253)	(1.960)	(2.306)	(2.029)
Age 91 +	30.268**	24.654**	30.390**	25.554**
	(6.146)	(3.298)	(6.418)	(3.364)
Couple age difference	−0.269**	−0.341**	−0.307**	−0.367**
	(0.117)	(0.086)	(0.120)	(0.086)
R high education	6.814**	5.154**	6.527**	4.916**
	(1.155)	(0.797)	(1.178)	(0.790)
S high education	4.517**	6.115**	4.411**	6.163**
	(0.921)	(1.035)	(0.942)	(1.035)
Spouse absent	0.048	−3.839	0.680	−3.182
	(8.069)	(4.607)	(7.938)	(4.609)
Partnered	0.922	1.851	1.367	1.595
	(1.522)	(1.539)	(1.582)	(1.405)
R poor health	0.008	−1.365	−0.107	−1.257
	(0.979)	(0.844)	(0.993)	(0.844)
S poor health	−0.805	−0.181	−0.483	−0.212
	(1.013)	(0.851)	(1.053)	(0.856)
S tot cog score	0.377**	0.083	0.316**	0.087
	(0.105)	(0.092)	(0.110)	(0.092)
HH income q2 (before)	−0.832	−0.004	−0.474	−0.003
	(0.737)	(0.613)	(0.746)	(0.636)
HH income q3 (before)	4.782**	6.389**	5.548**	6.399**
	(0.989)	(0.856)	(1.010)	(0.863)
HH income q4 (before)	24.792**	27.362**	26.625**	27.927**
	(1.606)	(1.513)	(1.744)	(1.529)
R working	−6.911**	−2.410*	−7.369**	−2.571*
	(1.254)	(1.412)	(1.255)	(1.413)
S working	−2.105	−6.554**	−2.439	−6.637**
	(1.559)	(1.131)	(1.595)	(1.140)
R ADL difficulty	−0.969**	1.106	−1.061**	1.212
	(0.480)	(0.960)	(0.476)	(0.947)
S ADL difficulty	0.419	−0.940**	0.632	−0.947**
	(0.714)	(0.429)	(0.747)	(0.430)
Log medical expenses	1.325**	1.500**	1.013**	1.475**

(*continued on next page*)

Table A.6 (*continued*)

	Cognitive Decline Based on			
	Total Word Recall		Total Cognition	
	No-FinR	FinR	No-FinR	FinR
	(0.387)	(0.347)	(0.382)	(0.345)
N	17,923	22,287	17,273	22,181

R: respondent; S: spouse; HH: household. Regressions also include wave indicators. Standard errors clustered at the household level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table A.7
Household Medical Expenses before and after Cognitive Decline (Financial Respondents Only).

	Cognitive Decline Based on	
	Total Word Recall	Total Cognition
At Decline	−0.075	0.048
	(0.046)	(0.053)
After Decline	−0.065*	0.027
	(0.038)	(0.048)
Female	−0.028	−0.027
	(0.027)	(0.027)
African American	−0.148**	−0.149**
	(0.041)	(0.042)
Other Race	−0.359**	−0.352**
	(0.070)	(0.070)
Age 61–70	0.204**	0.198**
	(0.030)	(0.030)
Age 71–80	0.270**	0.260**
	(0.033)	(0.033)
Age 81–90	0.412**	0.394**
	(0.043)	(0.043)
Age 91 +	0.398**	0.376**
	(0.115)	(0.116)
Couple age difference	−0.008**	−0.008**
	(0.002)	(0.002)
R high education	0.106**	0.106**
	(0.026)	(0.026)
S high education	0.092**	0.091**
	(0.025)	(0.025)
Spouse absent	0.155	0.164
	(0.132)	(0.133)
Partnered	−0.190**	−0.189**
	(0.055)	(0.055)
R poor health	0.231**	0.231**
	(0.024)	(0.024)
S poor health	0.270**	0.271**
	(0.024)	(0.024)
S tot cog score	0.003	0.003
	(0.002)	(0.002)
HH income q2 (before)	0.439**	0.450**
	(0.052)	(0.053)
HH income q3 (before)	0.538**	0.543**
	(0.051)	(0.053)
HH income q4 (before)	0.611**	0.629**
	(0.055)	(0.056)
R working	0.006	0.004
	(0.024)	(0.024)
S working	−0.023	−0.024
	(0.025)	(0.025)
R ADL difficulty	0.071**	0.071**
	(0.015)	(0.015)
S ADL difficulty	0.089**	0.088**
	(0.014)	(0.014)
N	24,435	24,435

R: respondent; S: spouse; HH: household. Regressions also include wave indicators. Standard errors clustered at the household level in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Appendix B. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.jeoa.2018.03.003.

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