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How Accurate are Expected Retirement Savings?

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How Accurate are Expected Retirement Savings

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Abstract

This paper examines the ability of workers nearing retirement to report their expected retirement savings, where retirement savings refers to funds held in savings, checking, and investment-type accounts. Responding to such a question is likely to be difficult, even for those who are near retirement, because it requires respondents to assess when they will retire, their likely income stream between the survey date and retirement, and what portfolio choices will be made at retirement. Based on two nationally representative surveys collected two decades apart, we find that most individuals provide some response to the question, particularly when they are allowed to provide a range. Moreover, the responses that are given have substantial predictive power for actual retirement savings, even when compared to the savings in the initial wave. Despite this predictive power, there is evidence that responses do not satisfy the more stringent requirements of the rational expectations hypothesis.

1. Introduction

The central model for understanding a variety of behaviors that are examined in the economics of aging literature is the life-cycle model. This model provides numerous theoretical and empirical insights into a range of topics, including optimal retirement timing, saving adequacy, and bequest behavior. Under this model, forward-looking households gather information about their employment opportunities and relevant retirement systems, formulate beliefs about future income and expenses, and then plan their consumption and work effort accordingly. These planning activities can be difficult and costly. Perhaps not surprisingly, studies have documented important gaps in knowledge and planning activities of workers.[1]

In this paper, we directly examine an important question about retirement knowledge: how do workers' expected retirement savings compare to their realized levels of savings at retirement, where retirement savings refers to financial assets (e.g., savings, checking, and investment accounts) held at retirement? Answering this question is likely to be exceedingly difficult because retirement savings are affected by future shocks and these shocks may precipitate revisions to consumption and work decisions. Yet, if individuals behave according to the life-cycle model, workers must gather such information and assess its consequences on a continual basis.

To examine workers' retirement savings expectations, we use two data sets: the Health and Retirement Study (HRS) that covers the 1990s and the Retirement History Survey (RHS) that

[1] Lusardi (2003) finds that roughly 30 percent of households near retirement have done little retirement planning. Furthermore, she finds that a lack of planning leads to a different choice of asset portfolio and to a lower level of wealth holding prior to retirement. Gustman and Steinmeier (2005) find that only half of respondents are able to report expected Social Security benefits and pension benefits, and only half of these reporters are within 25 percent of objective measures of their value. Gustman and Steinmeier conclude, "Since models of retirement and savings typically assume well-informed individuals, the existence of imperfect knowledge raises a number of important questions about standard models…" (p. 394). Chan and Stevens (2004) find that households are five times more responsive to pension incentives when they are correctly informed about their future benefits.

covers the 1970s. These data sets have the advantage that they target individuals near normal retirement ages, collecting detailed information on income, assets, and retirement plans. Examining respondents in both surveys allows us examine the consistency of behavior across two distinct time periods.

Research using subjective expectations questions has increased dramatically in recent years. Across a number of domains, these subjective measures are powerful predictors of future outcomes.[2] In particular, these questions have been used in the retirement literature. A number of studies have examined the predictive power of individual date of retirement expectations and have found that these measures are strong predictors of future retirement dates (Bernheim 1989; Disney and Tanner 1999; Loughran, Panis, Hurd, and Reti 2001).[3] In addition, deviations between expected and actual retirement ages are correlated with wealth and health changes as well as marital transitions (e.g., Disney and Tanner 1999). Maestas (2004) finds that many older workers who returned work after retiring had planned on doing so.

In the line of work most closely related to the analysis presented here, researchers examine the ability of households to predict future Social Security benefits. Bernheim (1988) compares individual expectations of future Social Security benefits with future benefit realizations and finds evidence consistent with individuals forming rational expectations. Dominitz, Manski, and Heinz (2002) expand upon this research by eliciting individual subjective distributions of expected benefit levels. Recent work shows that the accuracy of Social Security benefit expectations improves as individuals near retirement (Rohwedder and Kleinjans 2005) and some behavioral responses to misperceptions of these benefits (Rohwedder and van Soest 2006).

[2] Topics for which expectations have been studied include mortality (Hurd and McGarry 1995; Smith, Taylor, and Sloan 2001; Hurd and McGarry 2002), income (Dominitz and Manski 1997; Dominitz 1998), and job loss (Stephens 2004).

[3] Haider and Stephens (2004) use these measures in their analysis of the so-called "retirement consumption puzzle."

Our analysis yields several important findings. First, workers are generally willing to answer direct questions about their expected retirement savings. Second, reported expected retirement savings are predictive of actual retirement savings, and on average, expected retirement savings are quite accurate. Third, despite the average accuracy of expected retirement savings, most workers deviate from their expected savings by a very large amount and there is suggestive evidence that, for some workers, expected savings are greatly influenced by uncertainty.

2. Data

2.1. Data Overview

We rely upon two data sets in this paper, the Health and Retirement Study (HRS) and the Retirement History Survey (RHS). Both data sets focus on individuals nearing retirement, contain large samples of older workers, and collect detailed information about income, assets, health, and retirement. We provide an overview of the key aspects of the data sets here and provide additional details in the appendix.

The Health and Retirement Study (HRS) is an on-going longitudinal survey that began in 1992.[4] The initial cohort consisted of approximately 7,700 households that contained at least one person born between 1931 and 1941, or ages 51-61 in the initial wave. Age-eligible household members and their spouses (regardless of birth year) were interviewed, resulting in over 12,000 initial respondents, and this initial cohort has been interviewed biennially since 1992. We use the publicly available versions of the first six waves (1992-2002).

The Retirement History Study (RHS) began in 1969 and re-interviewed respondents biennially until 1979. The initial sample of approximately 11,000 individuals included men and

[4] See Juster and Suzman (1995) and the HRS website (http://hrsonline.isr.umich.edu/) for an overview of the HRS.

unmarried women born between 1905 and 1911 (ages 58-63 in the initial wave). At the end of the survey period, a total of six waves of information had been collected.

Both of these surveys include a question about expected retirement savings:

> HRS 1992: "Not counting IRA, KEOGH, or any pension fund assets that you [and your (wife/husband/partner)] may have, roughly how much savings and reserve funds do you expect to have accumulated by the time you retire?"
>
> RHS 1969: "Altogether about how much do you (and your spouse) expect to have accumulated when you retire, such as money in saving accounts, investments, profit-sharing plans, reserve funds, and anything else (not including this house)?"

The major difference between the two questions is that the HRS question explicitly excludes balance-type retirement savings accounts; no such exclusions were necessary for the RHS because such saving vehicles were much less common.[5] The HRS survey also included a series of unfolding bracket questions to mitigate non-response.[6] For our analysis, we assume that individuals report expected retirement savings in nominal dollars, and thus, we do not adjust these self-reports to the year of actual retirement. In both surveys, respondents stating that they plan to never retire are not asked these questions and therefore are not in our analysis.

To accord with these expected retirement questions, our primary definition of savings in the HRS is based on four underlying categories: (a) money in checking or savings accounts or money market funds, (b) money in certificates of deposit, government savings bonds, or Treasury bills, (c) the value of corporate, municipal, government or foreign bonds, and (d) the value of stocks, mutual funds, and investment trusts held outside of pension-type accounts. Similarly, our primary definition of savings in the RHS is based on four categories: (a) money in checking accounts, (b) savings accounts at banks, savings and loans, credit unions, Christmas

[5] See Mitchell (1992) for a discussion of trends in pension plan coverage.

[6] Unfolding bracket questions are commonly used in the HRS for those individuals who do not provide an exact value. For example, the first question in the unfolding bracket sequence for the expected savings question is, "Would it be more than $10,000?" A respondent who answers the series of questions can then be placed in the following brackets: $0 to 2,500, $2,500 to 10,000, $10,000 to 50,000, $50,000 to 250,000, or greater than $250,000.

clubs, and certificates of deposit, (c) U.S. savings bonds, and (d) stocks, bonds, or shares in mutual funds. The appendix lists the complete set of asset questions for both surveys and shows select results for alternative savings definitions.

For our analysis, we limit our attention to males. Our main reason for imposing this restriction is that the RHS only collected detailed information from women when a spouse was not present. We also exclude individuals who in wave 1 (a) report being fully retired or (b) report "never" to a direct question about when he expects to retire. We exclude these individuals because they were not asked the question about expected savings at retirement.

Both surveys collect asset and labor force participation information at the time of the survey and income information about the previous year. We define retirement to be the first wave in which a person reports being fully retired based on the question "At this time do you consider yourself partly retired, completely retired, or not retired at all?" that appears in both surveys. We then define retirement savings as the current asset holdings in the first wave after an individual retires. Unfortunately, the third (1973) wave of the RHS did not collect any asset information, and we simply drop individuals who retire in this wave for analyses in which we need asset information.

2.2. Interpreting the expected retirement savings questions

Several attributes of the expected retirement savings question influence our analysis strategy. First, these questions ask individuals to make a projection about an outcome, the amount of savings they will possess at retirement, which likely will be influenced by numerous shocks and choices over several years. For example, an individual's savings at retirement are influenced by the future choice of when to retire, labor and capital market earnings until retirement, expenditures until retirement, and beliefs about income and expenditures following retirement.

In contrast, a question about expected Social Security benefits is asking an individual to make projections about their future retirement date and labor earnings until that date. Because of the added complexity for the expected retirement savings question, we carefully consider whether individuals choose to respond to these questions and how individuals choose to respond.

A second attribute is that the question asks an individual about the total balance of various checking, savings, and investment accounts. Strictly speaking, responders should ignore other forms of wealth (e.g., business or property wealth) and debt when responding to the question, and in the case of the HRS question, the responder should also ignore pension account balances. This attribute further increases the complexity of the question because the responder should make projections about future wealth portfolio choices (e.g., what fraction of household wealth will be held as property or in cash accounts at retirement?). Moreover, the response to the expectation question and the actual outcome is bounded below by zero.

A third attribute is whether the phrase "do you expect" used in both surveys should be interpreted as eliciting an individual's mathematical expectation about retirement savings. Recent papers have examined response patterns to subjective expectation questions that do not fit into a simple expectations framework. Perhaps most important for our work, Lillard and Willis (2001) examine subjective probability questions about discrete events in the future (e.g., the probability someone lives to age 75, works past age 62, or gives financial help to family members). They note that most individuals provide the probabilities 0, 50, or 100 to such questions, probabilities which they term "focal" responses. If individuals provide true probabilities, few if any should respond 0 or 100 and a response of 50 should be no more prevalent than responses of 40 or 60 or even 49 or 51. Lillard and Willis (2001) develop a model in which individuals who are uncertain about the true probability provide a focal response and

provide evidence consistent with their model. Bassett and Lumsdaine (1999) show that some individuals appear to be systematically optimistic when responding to subjective expectation questions, and Bassett and Lumsdaine (2001) show that individuals provide similar probability responses to questions regardless if the questions are asking about similar events. Because expected value questions such as the ones examined here also require probabilistic thinking, we will consider other models of response, especially given the complexity of probabilities that must be considered.

3. How Much Retirement Savings Do Individuals Expect?

3.1. Do individuals respond to expected retirement saving questions?

To examine the importance of non-response to expected retirement saving questions, Table 1 presents the share of households in the HRS by whether the household gave an actual value response, a response using an unfolding bracket, a response using a range card, or no response at all.[7] The Table shows that 57 percent of households give an actual value, 36 percent use unfolding brackets, and the remaining households are evenly divided between range card responses and complete non-response. Table 2 presents similar results for the RHS, which did not employ either unfolding brackets or range cards. Interestingly, over 80 percent of RHS households give an actual value response to the question, over 20 percent more than responded with an exact value in the HRS. However, because the HRS used additional methods to elicit answers, the HRS contains no information on expected retirement savings for 4 percent of the population, whereas the RHS contains no information for nearly 20 percent of the population.

[7] In the first wave of the HRS, some respondents who did not provide an exact value were asked to choose from a set of pre-defined brackets that were listed on a "range card" rather than respond to the series of unfolding bracket questions. Because few people responded with the range card and the actual ranges on these cards cannot be recovered, we drop range card responders for most of our analysis.

In the subsequent panels in Tables 1 and 2, we explore several explanations for differences in response type. Panel A provides information about whether the response type differs by demographic or financial characteristics. The results for the HRS show that value respondents have higher income and wealth levels than those responding by other methods, but that the demographic characteristics are fairly similar across all methods (Panel A of Table 1). The patterns are somewhat reversed in the RHS (Panel A of Table 2), with the respondents who give actual values being slightly less educated and having lower levels of income and wealth than value responders.

Another explanation for the differences in response type is that there may be differences in how households have prepared for retirement; presumably, individuals who have spent more time planning for retirement should be more likely to respond to the question. The availability of numerous retirement planning questions in both surveys allows for an examination of this possibility. In the HRS (Panel B of Table 1), questions on retirement planning indicate that those giving actual values are slightly better off relative to non-responders in terms of having thought about retirement, looking forward to retirement, and being less likely to expect a fall in living standards. The differences between the value responders and unfolding bracket responders, however, are much smaller except for having thought about retirement. In contrast, RHS respondents (Panel B of Table 2) do not suggest that increased retirement preparations leads to an individual to be more likely to respond with a value.

Still another explanation may be that the overall probability of response to any survey question varies across individuals, perhaps because of a general unwillingness to respond to survey questions or because of a systematic inability to recall information. To examine this explanation, we construct measures of non-response to income, housing wealth, and financial

wealth questions, where the measures represent the fraction of the underlying questions to which the individual responds.[8] In addition, we also construct a binary indicator for whether or not the respondent answered "don't know" to the question asking when the respondent plans to retire. The results are shown in Panel C of Tables 1 and 2. For households that provide values to the savings expectations questions, the share of questions to which they do not respond in the three categories of questions (excluding the expected retirement age question) is at most five percent. Moving across the rows, the level of non-response is always higher for survey participants who do not respond or who use another method of response. Importantly, there is a dramatic increase in the level of non-response for the questions related to current household wealth.

A final explanation for the respondents failing to provide a value to the expected retirement savings question is that they are more uncertain about future outcomes than are households providing a response. Following Lillard and Willis (2000), we use thirteen questions in the HRS that elicit responses to probabilistic questions to construct an index of the propensity to give non-focal responses (e.g., probabilities other than zero, 50-50 or 100).[9] Panel D of Table 1 presents the share of exact responses to the probabilistic questions. As the table indicates, roughly half of the responses to the 13 subjective probability questions are non-focal responses across response types, except for non-responders to the expected retirement saving question. Non-responders provide 10 percent fewer non-focal responses.

To examine the role of these explanations jointly, we present linear probability estimates of whether or not households provide value responses to the savings expectations questions in

[8] For the HRS, we consider 4 financial wealth components, 2 housing wealth components, and 8 income components. For the RHS, we consider 6 financial wealth components, 2 housing wealth components, and 24 income components.

[9] Each of the thirteen questions asks respondents to give a probabilistic response about a series of future events. For example, they ask about the chances an individual will lose a job or live past age 75. In the current version of the paper, we ignore item non-response to the probabilistic questions although we note that it is under than 3 percent for most of these questions. In addition, the questions regarding job loss probability are only asked of those respondents who are employed by someone.

Table 3.[10] The first specification for each survey (columns 1 and 4) includes the household characteristics and the retirement planning variables from Tables 1 and 2, and the second specification adds the non-response to other questions variables (columns 2 and 5).[11] Consistent with the previous tables, demographic and financial characteristics explain little of the variation, but the non-response variables are highly significant and greatly increase the explanatory power of the model for both the HRS and the RHS. In the HRS, we additionally examine whether the variation in response type is attributable to differences in probabilistic thinking by also including the share of non-focal responses to the other probability questions (column 3). Our results indicate that individuals who provide a non-focal response are significantly more likely to provide a value response and that including this measure somewhat increases the overall fit of the model. This latter result is consistent with households that are more uncertain about future events being less likely to answer the expected retirement savings question

3.2. What responses are given?

Figures 1a and 1b present the distribution of the expected retirement savings responses for households that provide values.[12] The two most prominent features of these responses can be clearly seen in these figures. First, the degree of "lumpiness" increases as the values increase. In other words, respondents with lower levels of expected wealth primarily report values that are divisible by 100 or 1000. At higher levels of wealth, the responses are primarily divisible by

[10] We analyze those who give value responses versus non-value responses so we can process the HRS and RHS in a parallel fashion and because our later analyses focus on value responders.

[11] Because of space considerations and differences between surveys, the coefficients on retirement planning variables are not included in the table.

[12] In Appendix Table 1, we compare bracket responders to value responders by assigning value responders to a similar set of brackets. Consistent with the earlier results, the value responders in each bracket have higher levels of income and wealth and are less likely to exhibit non-response to other survey questions. However, when compared to differences across brackets (comparing the characteristics of those in the lower brackets to the higher brackets), the differences between value responders and bracket responders are quite small. Subsequent draft of the paper will provide more detailed results on bracket responders.

5,000 and eventually 10,000. Second, a large share of respondents (nearly 40 percent in the RHS and 20 percent in the HRS) reports that they expect their level of retirement wealth to be zero. While we later show that these respondents in fact retire with low levels of savings, it is unlikely that a subjective mathematical expectation of savings is zero.

Table 4 presents the distribution of expected retirement savings responses in the two datasets in nominal dollars (Panel A) and in 2004 dollars (Panel B). Once again, the distribution in nominal dollars shows the importance of zeroes and the tendency of individuals to respond with relatively round amounts. Not surprisingly, even after accounting for inflation (Panel B), the expected retirement savings of HRS households greatly exceeds that of the RHS households. This difference is not due to the growth of IRAs and defined contribution pension plans because the HRS question explicitly instructs households not to include these values.

Appendix Table 2 uses the same covariates as shown earlier to predict the responses to the expected retirement savings questions. Income and wealth at the survey date are strong predictors of the value of expected retirement savings in both surveys, providing some initial evidence that the responses may be reasonable. Interestingly, those not reporting an expected retirement age report higher expected savings. However, many of the remaining variables have different signs across the two regressions. For example, education and marital status have different signs in the two surveys and all but education in the HRS are statistically significant. The coefficient for expected years until retirement is statistically significant in the HRS but not in the RHS, although this difference may be attributable to the HRS households being further from their expected retirement than RHS households.

4. Do Individuals Realize their Expected Retirement Savings?

To examine directly the accuracy of retirement savings expectations, we only analyze respondents that we observe retiring. At the time of their initial survey, RHS respondents are, on average, roughly four years from their expected retirement age while HRS respondents are eight years before retirement (see Tables 1 and 2). As such, it is not too surprising that we observe a higher fraction of RHS respondents retire during the survey period than HRS respondents and HRS respondents are more likely to have left the survey prior to retirement than are RHS respondents.[13] Because prior studies have found that earlier-than-expected retirement is associated with adverse health and labor market shocks (Anderson, Burkhauser, and Quinn 1986; Disney and Tanner 1999; Loughran, Panis, Hurd, and Reti 2001), limiting our analysis to the subset of households we observe retiring may bias our interpretation of the accuracy of responses. However, this subset amounts to nearly 60 percent of the HRS households and nearly 90 percent of the RHS households that do not leave the sample prior to either the last survey or retirement.[14]

4.1. Are the responses predictive of and rational for actual retirement savings?

Figures 2a and 2b plot the log of retirement savings expectations on the x-axis and the log of realized retirement savings on the y-axis for respondents in the HRS and RHS, respectively.[15] If respondents have perfect foresight, then all of the points in the Figures would lie along the 45-degree line that is also shown. Instead, actual retirement savings deviates from the reported

[13] Our RHS sample spans 1969 to 1979, while our HRS sample spans 1992 to 2002. Thus, these differences are not due to difference in the length of the period of time that we observed respondents.

[14] Appendix Tables 3 and 4 present descriptive statistics for HRS and RHS respondents, respectively, by whether they were observed retiring, left the sample before retiring, or were still observed having not retired as of the final survey wave included in the sample. Relative to those still working, the retiring workers expected to retire sooner and had put more effort into retirement planning as of the initial survey. However, none differences in the observable characteristics are stark.

[15] For these Figures, a value of zero for either a retirement savings expectation or realization is re-coded with a value of one so that the log of this value equals zero and can be plotted with the remaining values.

expected value, and in many cases, these deviations are rather large in percentage terms.[16] Figures 2a and 2b also present the average realization conditional on the expected value using a Lowess smoother. These smoothed values indicate expected retirement savings are correct, on average, over a large range of values in the RHS (Figure 2b), whereas the smoothed realizations are, on average, below their expected values in the HRS (Figure 2a). If the households observed retiring in the HRS are disproportionately comprised of earlier-than-expected retirements, then some of this difference may be due to a larger degree of sample selection in the HRS.

To further examine the expected retirement savings question, consider the regression equation

$$RS_{\tau,i} = \alpha + \beta E_1(RS_{\tau,i}) + \gamma X_{1,i} + \varepsilon_i, \qquad (1)$$

where $RS_{\tau,i}$ is the actual retirement savings for respondent i that retires in wave τ, $E_1(RS_{\tau,i})$ is expected retirement savings in the initial survey wave, $X_{1,i}$ is a vector of observable characteristics in the initial survey wave, and ε_i is an error term. We use equation (1) to examine two issues. First, we assess the predictive content of the expected retirement savings question relative to an alternative objective measure of wealth. Second, we test whether the expected savings responses are consistent with the rational expectations hypothesis.

Following Bernheim (1988), the rational expectations hypothesis (REH) implies strong predictions about equation (1)—that α=0, β=1, and γ=0. The REH implies that ε_i is an expectation error, orthogonal to both expected retirement savings, $E_1(RS_{\tau,i})$, and all observable (and unobservable) characteristics available at the initial survey wave, $X_{1,i}$. Moreover, because

[16] We present descriptive characteristics of these deviations in Appendix Table 5. For example, in the HRS, over half of respondents realize retirement savings that deviate from expected retirement savings by at least 100 percent. Future drafts will explore these deviations in more detail.

households fully incorporate all available information into their expectations under the REH, the observable characteristics, $X_{1,i}$, should have no explanatory power in equation (1) since we are conditioning on expected retirement savings, $E_1(RS_{r,i})$. Excluding the observable characteristics from equation (1), a weaker test of the REH is α=0 and β=1.

Table 5 presents the results of estimating equation (1) to examine the predictive power of expected retirement savings and to test the weak and strong forms of the REH. Column 1 of the Table only includes expected savings as a regressor. Importantly, the expected savings variable explains a large share of the variation in realized retirement savings in both surveys with R-squares of 0.417 and 0.312 in the HRS and RHS, respectively. Column 1 also represents the weak test of the REH. For the HRS (Panel A), the results are consistent with the hypothesis because we cannot reject either of the null hypotheses that α=0 or β=1. In contrast, the findings in the RHS (Panel B) are inconsistent with REH for both parameter estimates.

One concern may be that expected savings, in fact, provide no additional information beyond what one would find using an objective measure(s) to predict retirement savings. If respondents were using, say, adaptive expectations, then we would expect that savings as of the initial survey wave to be just as good a predictor of realized retirement savings as the reported expected retirement savings. Column 2 of Table 5 estimates equation (1) but where the only regressor included in the model is wave 1 savings. In both surveys, although the estimated coefficients on wave 1 savings are statistically significant, the R-squares are lower than those shown in column 1 where we only use expected savings.

We can directly compare the predictive content of the expected retirement savings responses to that of wave 1 savings by including both of these regressors in equation (1). Notice this specification tests the stronger form of the REH where wave 1 savings is the only characteristic

included in $X_{1,i}$. Column 3 presents the results from estimating this specification. In the HRS (Panel A), we find that the coefficient on expected savings is not significantly different than one while that coefficient on wave 1 actual savings and the intercept are not significantly different than zero, findings that are consistent with the REH. Not surprising given these estimates, the R-square in column 3 is essentially unchanged column 1 where expected savings is the only regressor. On the other hand, all three of the coefficients are inconsistent with the hypothesis when using the RHS (Panel B).

Column 4 of Table 5 tests a stronger form of the REH by including all of the variables that we have previously used in the analysis in $X_{1,i}$. While the coefficient on the expected retirement savings remains consistent with its predicted value in the HRS (Panel A), the coefficients on the intercept term and initial savings are now significant, which is inconsistent with the REH. Moreover, although not shown here, a number of characteristics such as marital status, age, and household income as of the initial survey are significantly related to actual retirement savings. As with the previous estimates, the findings for the RHS using the full set of regressors reject the REH (Panel B).[17]

Unlike the studies that examine the expectations of Social Security benefits (Bernheim 1988) and household income (Dominitz 1998), a large share of respondents to the expected retirement savings questions (20 and 40 percent of respondents in the HRS and RHS, respectively) report a value of zero. Moreover, since the question inquires about account balances rather than net savings, one would not expect to find negative values reported by respondents and, indeed, no one responds with such a value. This lower bound on both expected and realized retirement savings, however, invalidates the tests of the REH presented above.

[17] In Appendix Table 6, we examine alternative definitions of retirement savings and the results are fairly similar to those shown in Table 5.

For illustrative purposes, suppose that retirement savings is a latent variable, R_i^*, that is normally distributed with a respondent specific mean μ_i. Observed retirement savings, R_i, equals R_i^* if R_i^* exceeds zero while R_i equals 0 if R_i^* is less than or equal to zero. Further suppose that households report μ_i as their response to the expectation retirement savings question (although we will examine this assumption below). These assumptions lead retirement savings to be a censored dependent variable in equation (1). Applying OLS in this case will bias the intercept upwards (rather than equal to 0, as predicted by REH) and bias the coefficient on expected savings towards zero (rather than equal to 1, as predicted by REH). Such biases are consistent with the point estimates on expected retirement savings in Table 5 are less than one and why the magnitude of the gap is much larger for the RHS than the HRS, given the RHS has a much larger share of respondents reporting zero expected retirement savings.

A simple alternative approach is to test the REH on a subset of households for whom censoring of the dependent variable is not an issue. As such, we re-estimate equation (1) using households that expect their retirement savings to exceed $20,000 and $5,000 in the HRS and the RHS, respectively.[18] The share of households in these subsets that in fact realize zero retirement savings is four percent for the HRS and less than one percent in the RHS.

Table 6 presents the results of estimating equation (1) on households where expected retirement savings exceeds the thresholds shown above. In the HRS, the point estimates on the expected retirement savings move closer to zero which is the predicted impact of removing the low expected savings respondents. The estimates in the first two columns remain consistent with the rational expectations hypothesis. However, the strong form of the test shown in column 3 of

[18] Because we are selecting respondents based on values of the regressor but not on the dependent variable, the parameter estimates will be unbiased.

the Table remains inconsistent with the hypothesis. In the RHS, however, the results neither move in the predicted direction nor are consistent with the REH.

4.2. Alternative response models

Although the expected retirement savings question contains much predictive power, an important issue that we are just beginning to address is how individuals respond to the question. The typical interpretation, including that assumed in the above REH analysis, is that workers report the mathematical expectation from the distribution of potential outcomes. The significant share of zero value responses to these questions, especially in the RHS, calls into question whether households are in fact reporting the mathematical expectation. When thinking about all of the possible states of the world, it is highly likely that there exist at least some states of the world in which positive assets would be present in an account at retirement. Thus, it is difficult to rationalize the large number of zero responses as being a true mathematical expectation.

One possibility is that households that report they expect zero savings at retirement in fact mean that the *most likely* outcome is for them to end up with no savings at retirement. We plan to adapt the Lillard and Willis (2000) modal response model to explain responses to the expected retirement savings questions. Some of our results already suggest such a model to be important. For example, individuals who provide non-focal responses to other probability questions are more likely to provide a value for expected retirement savings (column 3 in Table 3). In addition, other results (see Appendix Figure 1) indicate that at least some of the zero responders realize very large retirement savings. Another possibility is that individuals assess the mathematical expectation, but then round the expectation to the nearest focal response. We also plan to investigate whether any testable implications can be derived to delineate between the

modal response model, a rounding response model, and the more typical mathematical expectation response model.

5. Discussion and Conclusion

This paper examines the ability of workers nearing retirement to report the savings they expect when they retire. Responding to such a question is likely to be difficult, even for those who are near retirement, because it requires respondents to assess when they will retire, their likely income stream between the survey date and retirement, and what portfolio choices will be made at retirement. Despite these difficulties, most individuals provide some response to the question, particularly when they are allowed to provide a range. Moreover, the responses that are given have substantial predictive power for actual retirement savings, even when compared to the savings in the initial wave. Despite this predictive power, there is evidence that responses do not satisfy the more stringent requirements of the rational expectations hypothesis.

Although we have made substantial progress in understanding knowledge about retirement savings, several important tasks remain. First, much of our analysis has focused on value responders. However, many responders chose to provide a bracket response rather than a value response, and preliminary analyses suggest that the bracket responses contain much information. Future analyses will more fully incorporate the bracket responders. Second, our results suggest that responders may not be providing a simple mathematical expectation when responding to the question. Future analyses will analyze other response models. Third, our analysis has ignored the very important question of whether this knowledge matters. For example, do individuals respond if they fail to meet their savings expectations?

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Table 1: Mean Characteristics by Response Type to Expected Retirement Savings Question, HRS

	Value	Bracket	Range	Missing
N	1,676	1,078	127	114
Share	0.57	0.35	0.04	0.04
A. Household Characteristics				
Age	55.7	55.4	55.6	56.0
Education	12.8	12.3	13.6	12.8
Married	0.82	0.84	0.85	0.80
Savings	52,900	27,700	44,300	31,300
Housing wealth	65,900	56,800	55,000	62,200
Household income	64,100	55,700	56,200	54,100
B. Retirement Planning				
Years until expected retirement | year given	7.82	8.09	7.84	7.76
Have you thought about retirement? (1=a lot or some, 0=a little or hardly at all)	0.64	0.55	0.66	0.49
Attended any meeting on retirement planning? (1=yes, 0=no)	0.20	0.17	0.22	0.20
Are you looking forward to retiring? (1=yes, 0=pro-con or no)	0.68	0.66	0.64	0.58
Do you expect your living standard to change? (1=increase or stay the same, 0=decline)	0.60	0.63	0.59	0.49
C. Non-Response to Other Questions				
Does not know expected retirement age	0.10	0.16	0.09	0.22
Share of missing values for 4 wealth components	0.05	0.14	0.32	0.31
Share of missing values for 2 housing components	0.01	0.03	0.06	0.13
Share of missing values for 8 income components	0.03	0.06	0.11	0.24
D. Response to 13 Probabilistic Questions				
Share of non-focal responses	0.51	0.48	0.55	0.40
Share of "0%" focal responses	0.20	0.20	0.17	0.25
Share of "50%" focal responses	0.19	0.20	0.19	0.20
Share of "100%" focal responses	0.10	0.11	0.09	0.14

Note: All values are reported in nominal dollars.

Table 2: Mean Characteristics by Response Type to Expected Retirement Savings Question, RHS

	Value	Missing
N	3,371	812
Share	0.81	0.02
A. Household Characteristics		
Age	60.1	60.3
Education	9.9	10.4
Married	0.89	0.91
Savings	10,800	12,800
Housing wealth	10,500	13,100
Household income	11,100	11,600
B. Retirement Planning		
Years until expected retirement | year given	4.31	4.25
Have you talked with others about retirement? (1=yes, 0=no)	0.41	0.37
Will you be able to get along all right? (1=yes, 0=financial problems)	0.55	0.62
"Retirement will be a pleasant time". Agree? (1=strongly agree or agree, 0=disagree or strongly disagree)	0.78	0.76
C. Non-Response to Other Questions		
Does not know expected retirement age	0.17	0.31
Share of missing values for 6 wealth components	0.03	0.19
Share of missing values for 2 housing components	0.01	0.06
Share of missing values for 24 income components	0.03	0.07

Note: All values are reported in nominal dollars.

Table 3: Linear Probability Regressions to Predict Which Respondents Provide Values, HRS and RHS

	HRS			RHS	
	(1)	(2)	(3)	(4)	(5)
Age	0.009	0.007	0.006	0.000	-0.007
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Education	0.002	0.006	0.004	-0.005	0.001
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Married	-0.049	-0.031	-0.036	-0.033	-0.029
	(0.025)	(0.023)	(0.023)	(0.020)	(0.024)
Savings/100,000	0.017	0.019	0.019	0.003	0.001
	(0.006)	(0.006)	(0.006)	(0.003)	(0.003)
Housing wealth/100,000	0.008	0.025	0.025	-0.052	-0.020
	(0.010)	(0.009)	(0.009)	(0.013)	(0.012)
Household income/100,000	0.012	0.012	0.011	0.004	-0.002
	(0.014)	(0.013)	(0.013)	(0.016)	(0.015)
DK expected retirement age		-0.132	-0.135		-0.110
		(0.034)	(0.034)		(0.019)
Share missing wealth values		-0.753	-0.756		-0.963
		(0.046)	(0.046)		(0.043)
Share missing housing values		-0.067	-0.068		-0.151
		(0.073)	(0.073)		(0.050)
Share missing income values		-0.336	-0.324		-0.164
		(0.069)	(0.069)		(0.099)
Share non-focal probabilistic resp.			0.091		
			(0.037)		
Retirement planning variables?	Yes	Yes	Yes	Yes	Yes
R-square	0.019	0.135	0.137	0.023	0.185
N	2,995	2,995	2,995	4,183	4,183

Note: All values are reported in 2004 dollars based on the PCE deflator.

Table 4: Expected Retirement Savings for Value Responders, HRS and RHS

	HRS	RHS
N	1,676	3,371
Share of zero values	20.2%	39.8%
Panel A. Nominal Dollars		
Mean	143,318	16,629
5th	0	0
10th	0	0
25th	10,000	2
50th	50,000	2,400
75th	110,000	12,700
90th	300,000	40,000
95th	500,000	60,000
Panel B. 2004 Dollars		
Mean	180,761	71,271
5th	0	0
10th	0	0
25th	12,612	0
50th	63,062	10,287
75th	138,178	54,434
90th	378,376	171,445
95th	630,628	257,167

Note: Adjustments to 2004 dollars are made with the PCE deflator.

Table 5: OLS Regressions to Predict Actual Retirement Savings, HRS and RHS

	(1)	(2)	(3)	(4)
A. HRS				
Intercept	20,089	60,078	20,024	577,136
	(12,900)	(14,021)	(12,895)	(276,390)
Wave 1 Expected Savings	0.979		0.915	0.974
	(0.040)		(0.065)	(0.065)
Wave 1 Actual Savings		1.323	0.137	0.440
		(0.075)	(0.107)	(0.120)
Other Characteristics?	No	No	No	Yes
R-square	0.417	0.276	0.418	0.455
N	828	828	828	828
B. RHS				
Intercept	8,555	8,900	6,972	11,788
	(747)	(771)	(732)	(23,450)
Wave 1 Expected Savings	0.553		0.380	0.319
	(0.021)		(0.026)	(0.026)
Wave 1 Actual Savings		0.750	0.416	0.338
		(0.320)	(0.037)	(0.038)
Other Characteristics?	No	No	No	Yes
R-square	0.312	0.271	0.365	0.403
N	1,491	1,491	1,491	1,491

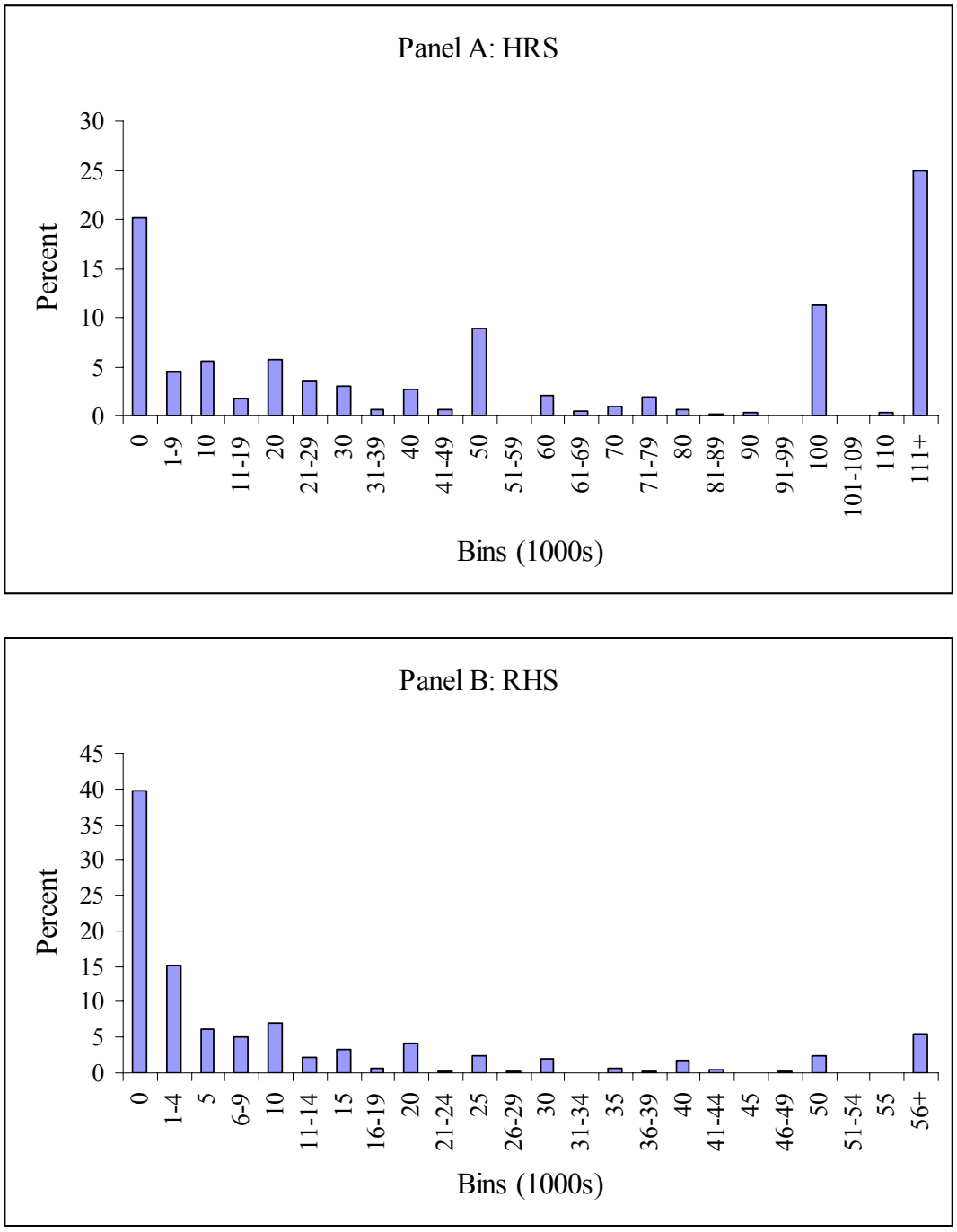
Note: All values are reported in nominal dollars.

Table 6: OLS Regressions to Predict Actual Retirement Savings, HRS and RHS
Among Respondents with Expected Savings above Threshold

	HRS			RHS		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	10,454	10,808	1,178,533	17,448	14,798	14,640
	(22,440)	(22,476)	(469,657)	(2,063)	(2,090)	(59,058)
Wave 1 Expected Savings	0.990	0.961	1.023	0.463	0.350	0.310
	(0.055)	(0.087)	(0.087)	(0.036)	(0.042)	(0.043)
Wave 1 Actual Savings		0.060	0.480		0.308	0.249
		(0.142)	(0.157)		(0.062)	(0.063)
Other Characteristics?	No	No	Yes	No	No	Yes
R-square	0.413	0.413	0.473	0.223	0.256	0.293
N	471	471	471	567	567	567

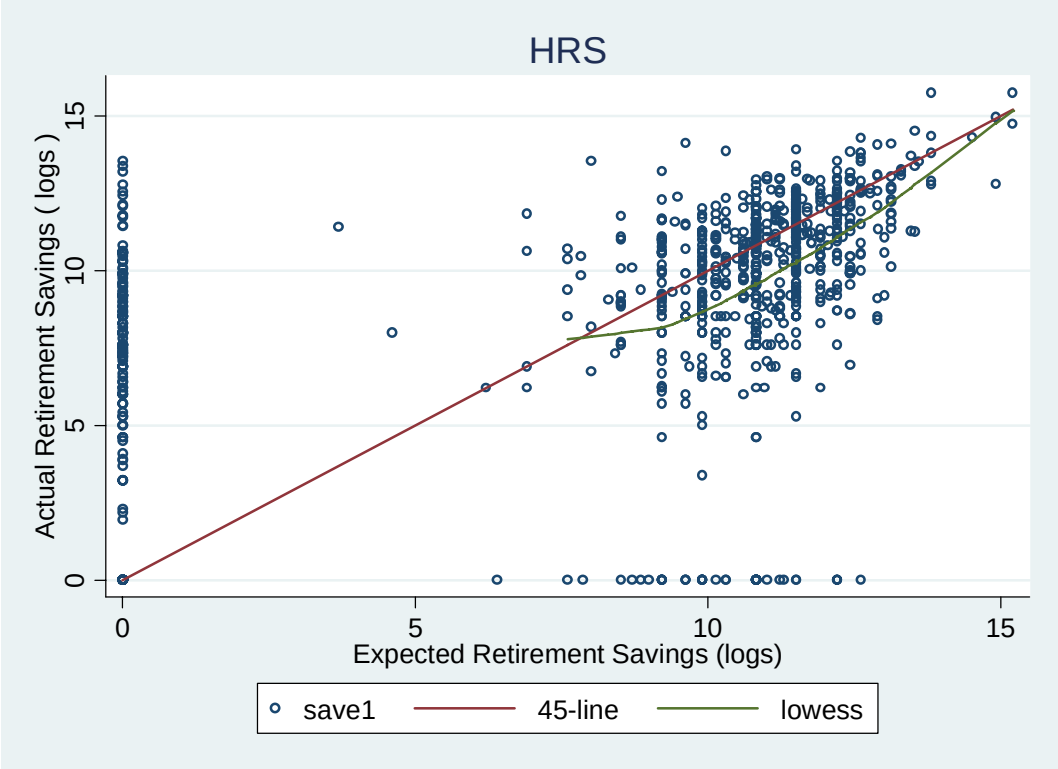
Note: The threshold for expected retirement savings in this Table is $20,000 in the HRS and $5,000 in the RHS. All values are reported in nominal dollars.

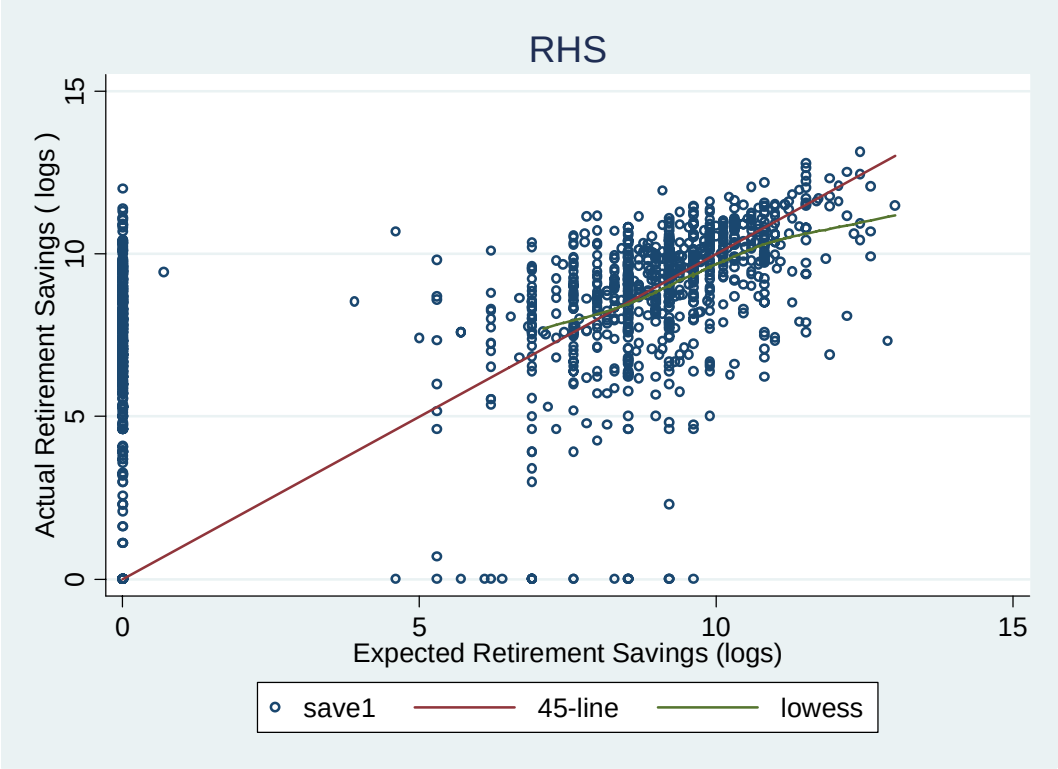
Figure 1: Histogram of Expected Retirement Savings, HRS and RHS



Note: All values are reported in nominal dollars.

Figure 2: Actual Versus Expected Retirement Savings, HRS and RHS





Appendix

A.1. The Health and Retirement Study

The HRS interviewed 4,596 men in the first wave who were born between 1931 and 1941 (excluding the "overlap sample" individuals). We dropped those men who were not asked the retirement savings expectation question (men who reported being fully retired and men who reported they planned on never retiring), leaving 2,995 men in our analysis sample.

We use data collected on the following financial and property assets for the household: stocks, checking and savings accounts, certificate of deposits, bonds, trusts, business holdings, real estate (including second homes), vehicles, financial debt, and a final "other" category intended to collect any other real assets of the household. The financial asset variable used in Section 3 only includes stocks, checking accounts, certificate of deposits, and bonds. Housing wealth is calculated as the difference between housing value and direct debt owed on the house (mortgages and other loans). The household income variable is based on about 30 different income sources; we only use income for the sample member and partner/spouse. All asset and income variables use unfolding brackets to mitigate non-response. We use the HRS-provided imputations for asset and income variables.

Wave 1 HRS asks individuals about the probability of thirteen future events, ranking them on a scale of 0 to 10; in subsequent waves, these responses were given on a scale of 0 to 100. The questions ask about the likelihood of losing a job, finding an equally good job (if that job was lost), working full-time after age 62, working full-time after age 65, health limiting work activity within 10 years, giving financial help to family members, living to age 75, living to age 85, housing prices will increase in your neighborhood, Congress will make Social Security more generous, Congress will make Social Security less generous, the economy will suffer a major

depression within 10 years, and the economy will experience double digit inflation within 10 years.

A.2. The Retirement History Survey

The RHS interviewed 8,132 men in the first wave. We dropped those men who were not asked the retirement savings expectation question (men who reported being fully retired and men who reported they planned on never retiring), leaving 4,183 men in our analysis sample.

We use data collect on the following financial assets for the household: stocks, checking account, savings account, bonds, and any other amount owed to the household.[19] The financial asset variable used in the Section 3 includes all of these sources. Housing wealth is calculated as the difference between housing value and direct debt owed on the house (mortgages and other loans). In wave 1, housing wealth cannot be separated from farm wealth for those sample members who live on a farm; for this wave, we set housing wealth equal to zero for farmers. Total household income is collected by approximately 50 questions about various underlying income sources for all household members.

We impute missing data for each of the underlying sources using the "predictive mean matching" method (Little 1988), the same method used by the University of Michigan for HRS imputations. This method imputes a missing value for an individual by using an actual outcome value from a "similar" person within the data set, where similarity is based on the prediction from a regression. Our imputations are based on gender, race, education, employment status, age, home ownership, household size, and available income and asset information.

[19] The RHS also collect information on several sources of property wealth, including farms, business, and other real estate. We have not processed these variables.

Appendix Table 1: Mean Characteristics for Value Responders and Bracket Responders, HRS

	Lowest	2	3	4	Highest
A. Value responders					
N	414	150	447	507	158
Share	0.22	0.08	0.27	0.32	0.11
Education	10.5	12.4	13.0	13.6	15.0
Financial wealth	7,504	11,067	20,715	58,354	241,523
Housing wealth	32,954	47,775	57,009	74,039	144,669
Household Income	33,373	47,909	51,079	70,269	152,937
Years until exp. retirement	7.4	7.3	7.5	8.0	9.3
Have you met with anyone?	0.085	0.162	0.235	0.234	0.281
Are you thinking?	0.511	0.635	0.694	0.697	0.597
Looking forward?	0.590	0.672	0.713	0.725	0.642
Living standards increase?	0.527	0.481	0.579	0.651	0.749
Missing expected retirement	0.196	0.066	0.063	0.066	0.102
Missing housing wealth comp.	0.152	0.170	0.199	0.225	0.248
Missing financial wealth comp.	0.066	0.012	0.015	0.021	0.016
Missing income comp.	0.307	0.215	0.239	0.228	0.214
B. Bracket Responders					
N	43	185	422	272	92
Share	0.04	0.17	0.41	0.29	0.10
Education	9.6	11.6	11.9	12.9	14.2
Financial wealth	2,263	6,758	14,731	36,656	93,552
Housing wealth	18,877	37,117	44,958	64,384	113,792
Household Income	27,522	39,136	47,449	56,174	120,683
Years until exp. retirement	7.7	7.8	8.0	8.3	9.2
Have you met with anyone?	0.067	0.133	0.144	0.188	0.276
Are you thinking?	0.408	0.592	0.534	0.609	0.467
Looking forward?	0.542	0.671	0.677	0.709	0.561
Living standards increase?	0.621	0.561	0.591	0.660	0.759
Missing expected retirement	0.240	0.193	0.144	0.150	0.136
Housing wealth	0.210	0.354	0.440	0.625	1.119
Financial wealth	0.035	0.032	0.042	0.053	0.098
Household income	0.419	0.344	0.387	0.477	0.552

Note: All values are reported in nominal dollars.

Appendix Table 2: OLS Regressions to Predict Expected Retirement Savings, HRS and RHS

HRS		RHS	
Age	-799	Age	-3,754
	(4,148)		(2,032)
Education	-3,197	Education	2,949
	(3,934)		(948)
Married	-59,466	Married	28,784
	(30,000)		(14,889)
Savings	0.95	Savings	0.77
	(0.07)		(0.02)
Housing wealth	0.56	Housing wealth	0.72
	(0.11)		(0.07)
Household income	1.73	Household income	0.75
	(0.18)		(0.08)
Years until expected retirement	8,227	Years until expected retirement	-1,095
	(3,163)		(1,545)
Thought about retirement?	-80,800	Talked about retirement?	1,523
	(25,338)		(6,288)
Meeting about retirement?	-5,626		
	(28,646)		
Looking forward to retirement?	24,670	Get along all right?	27,071
	(25,846)		(6,497)
Living standard increase?	43,011	Retirement pleasant?	-8,637
	(22,869)		(7,618)
DK expected retirement age	117,703	DK expected retirement age	22,448
	(46,485)		(10,638)
Share of missing wealth values	314,584	Share of missing wealth values	-57,337
	(83,997)		(32,560)
Share of missing housing values	-19,185	Share of missing housing values	-72,906
	(124,453)		(35,530)
Share of missing income values	-484,433	Share of missing income values	218,325
	(113,914)		(68,843)
Share non-focal probabilistic resp.	22,798		
	(49,322)		
Mean dep. variable	143,318	Mean dep. variable	54,925
R-square	0.402	R-square	0.522
N	1,676	N	3,371

Note: All values are reported in 2004 dollars based on the PCE deflator.

Appendix Table 3: Descriptive Characteristics by End State, HRS

	Retirement observed	Still working	Leave sample
N	829	601	246
Share	0.50	0.36	0.14
A. Household Characteristics			
Age	56.6	54.5	55.4
Education	12.7	13.2	12.4
Married	0.8	0.8	0.8
Financial wealth	54,140	58,157	34,661
Housing wealth	67,025	67,286	58,330
Household income	61,551	68,527	61,927
B. Retirement Planning			
Years until expected retirement | year given	6.12	10.14	8.24
Have you thought about retirement? (1=a lot or some, 0=a little or hardly at all)	0.70	0.58	0.58
Attended any meeting on retirement planning? (1=yes, 0=no)	0.23	0.18	0.13
Are you looking forward to retiring? (1=yes, 0=pro-con or no)	0.73	0.61	0.67
Do you expect your living standard to change? (1=increase or stay the same, 0=decline)	0.58	0.64	0.57
C. Non-Response to Other Questions			
Share not providing expected retirement year	0.08	0.11	0.14
Missing values for 4 wealth components	0.21	0.17	0.25
Missing values for 2 housing components	0.03	0.02	0.04
Missing values for 8 income components	0.22	0.16	0.57

Appendix Table 4: Descriptive Characteristics by End State, RHS

	Retirement observed	Still working	Leave sample
N	2,354	297	720
Share	0.70	0.09	0.21
A. Household Characteristics			
Age	60.2	59.7	60.0
Education	9.7	10.5	10.3
Married	0.89	0.92	0.87
Financial wealth	10,756	18,280	11,182
Housing wealth	10,630	10,266	9,975
Household Income	10,888	11,698	11,395
B. Retirement Planning			
Years until expected retirement | year given	4.05	5.33	4.82
Have you talked with others about retirement? (1=yes, 0=no)	0.42	0.33	0.43
Will you be able to get along all right? (1=yes, 0=financial problems)	0.56	0.56	0.53
"Retirement will be a pleasant time". Agree? (1=agree, 0=disagree)	1.99	2.08	2.04
C. Non-Response to Other Questions			
Share not providing expected retirement year	0.15	0.24	0.20
Missing values for 6 wealth components	0.16	0.13	0.23
Missing values for 2 housing components	0.03	0.02	0.03
Missing values for 24 income components	0.79	0.67	0.92

Appendix Table 5: Deviations between Expected Retirement Savings and Actual Retirement Savings across Various Measures, HRS and RHS

	Percent Deviation			Absolute Percent Deviation		
	Savings 1	Savings 2	Savings 3	Savings 1	Savings 2	Savings 3
HRS						
Mean	1	10	62	110	110	116
5^{th}	-197	-196	-157	0	0	7
10^{th}	-181	-180	-144	7	7	18
25^{th}	-120	-103	-105	44	44	54
50^{th}	0	0	73	113	114	113
75^{th}	111	126	168	186	185	186
90^{th}	200	200	200	200	200	200
95^{th}	200	200	200	200	200	200
RHS						
Mean	55	59		106	106	
5^{th}	-175	-168		0	0	
10^{th}	-126	-107		0	0	
25^{th}	-7	0		30	29	
50^{th}	48	53		100	99	
75^{th}	200	200		200	200	
90^{th}	200	200		200	200	
95^{th}	200	200		200	200	

Notes. Our deviations are listed below. They are constructed to be symmetric between the actual and expected measures. Because the values take on only non-negative values, the percent measure is bounded between -200 and 200 and the absolute value measure is bounded between 0 and 200.

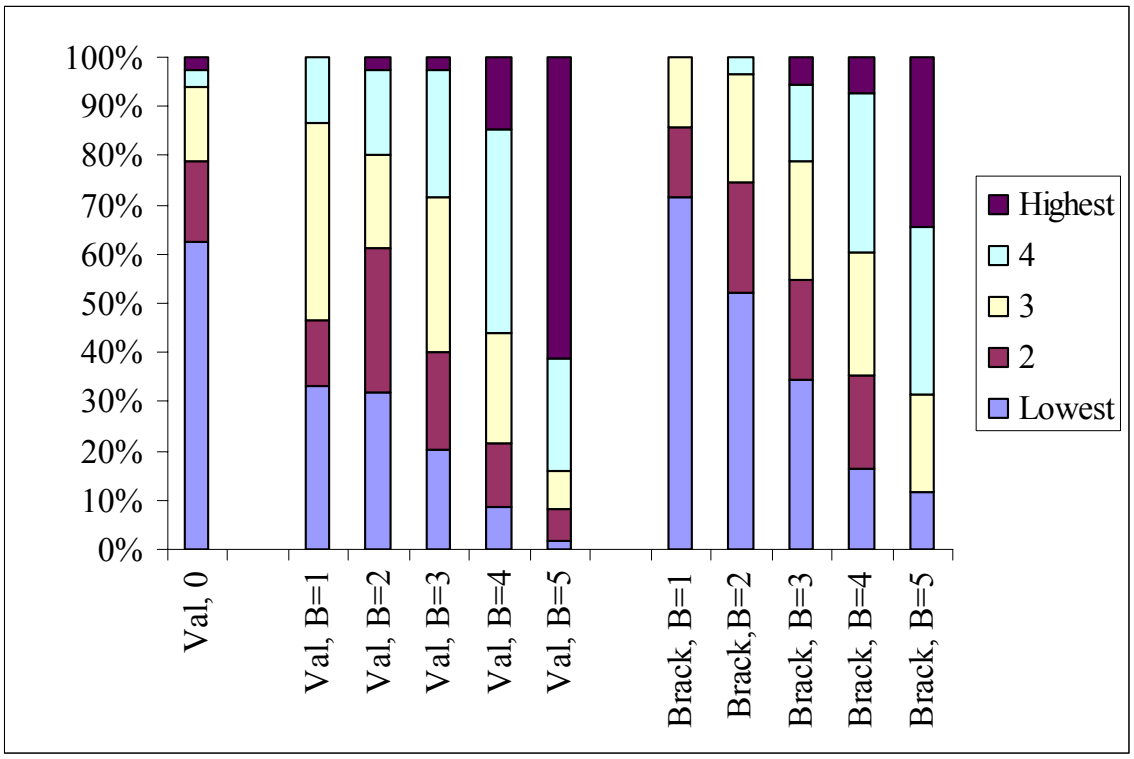
$$(A1) \qquad Percent\ \ Deviation = \sum_{i=1}^{n} \begin{cases} 0 & if\ \ y_i^a = 0\ and\ \ y_i^e = 0 \\ \dfrac{y_i^a - y_i^e}{(y_i^a + y_i^e)/2} \times 100 & else \end{cases}$$

$$(A2) \qquad Absolute\ Percent\ Deviation = \sum_{i=1}^{n} \begin{cases} 0 & if\ \ y_i^a = 0\ and\ \ y_i^e = 0 \\ \left| \dfrac{y_i^a - y_i^e}{(y_i^a + y_i^e)/2} \right| \times 100 & else \end{cases}$$

Appendix Table 6: OLS Regressions to Predict Actual Retirement Savings

	Intercept	Wave 1 Expected Savings	Wave 1 Expected Savings	Includes Additional Characteristics?	R-square
HRS, savings definition 1					
(1)	20,089	0.98			0.417
	(12,900)	(0.04)			
(2)	20,024	0.91	0.14		0.418
	(12,895)	(0.06)	(0.11)		
(3)	577,136	0.97	0.44	Yes	0.455
	(276,390)	(0.07)	(0.12)		
HRS, savings definition 2					
(1)	22,103	1.17			0.480
	(13,573)	(0.04)			
(2)	21,981	1.16	0.02		0.480
	(13,591)	(0.07)	(0.10)		
(3)	428,011	1.24	0.15	Yes	0.513
	(291,685)	(0.07)	(0.11)		
HRS, savings definition 3					
(1)	67,635	1.42			0.466
	(16,960)	(0.05)			
(2)	62,423	1.06	0.34		0.480
	(16,792)	(0.09)	(0.07)		
(3)	483,352	1.20	0.39	Yes	0.516
	(358,634)	(0.10)	(0.08)		
RHS, savings definition 1					
(1)	8,555	0.55			0.312
	(747)	(0.02)			
(2)	6,972	0.38	0.42		0.365
	(732)	(0.03)	(0.04)		
(3)	11,788	0.32	0.34	Yes	0.403
	(23,450)	(0.03)	(0.04)		
RHS, savings definition 2					
(1)	8,615	0.66			0.386
	(760)	(0.02)			
(2)	7,118	0.51	0.37		0.422
	(754)	(0.03)	(0.04)		
(3)	16,128	0.45	0.30	Yes	0.449
	(24,253)	(0.03)	(0.04)		

Appendix Figure 1: Bracketed Actual Savings by Response to Expected Savings Question, HRS



Note: "Val" denotes individuals who responded with a value to the expected retirement savings question, and "Brack" denotes individuals who responded with a bracket. "B=" denotes the bracketed expected savings reported, assigning both value responders and bracket responders into brackets. The brackets are $0–2,500, $2,500–10,000, $10,000– 50,000, $50,000-250,000, and $250,000 and higher. The bars show the distribution of actual retirement savings, divided into the same 5 brackets.