The Joy of Giving or Assisted Living?
Using Strategic Surveys to Separate Public Care Aversion from Bequest Motives

JOHN AMERIKS∗ ANDREW CAPLIN STEVEN LAUFER STIJN VAN NIEUWERBURGH

ABSTRACT

The “annuity puzzle,” conveying the apparently low interest of retirees in longevity insurance, is central to household finance. Two possible explanations are “public care aversion” (PCA), retiree aversion to simultaneously running out of wealth and being in need of long-term care, and an intentional bequest motive. To disentangle the relative importance of PCA and bequest motive, we estimate a structural model of the retirement phase using a novel survey instrument that includes hypothetical questions. We identify PCA as very significant and find bequest motives that spread deep into the middle class. Our results highlight potential interest in annuities that make allowance for long-term care expenses.

∗Ameriks, Vanguard; Caplin, Laufer, and Van Nieuwerburgh, New York University. We thank Campbell Harvey, two anonymous referees, George Akerlof, Orazio Attanasio, Daniel Benjamin, Mariacristina De Nardi, Amy Finkelstein, Eric French, Mark Gertler, Greg Kaplan, Miles Kimball, Kathleen McGarry, Costas Meghir, John Phillips, Jim Poterba, Bob Willis, and Motohiro Yogo for helpful guidance. We especially thank Erik Hurst and Jonathan Skinner for insightful discussions at the 2006 and 2007 AEA meetings in Boston and Chicago. We also thank the participants in seminars at New York University, Princeton University, Harvard University, University of California at Berkeley, MIT, the University of Michigan, University College London, the NBER Summer Institute, and the 2010 Midwest Economics Association for comments. The views expressed herein are those of the authors rather than of their institutions.
In a world without bequest motives and with complete markets, a household should fully annuitize and consume all wealth before death (Yaari 1965). In reality, Dynan, Skinner, and Zeldes (2004) and De Nardi, French, and Jones (2010) show that assets of the old decrease slowly if at all, and many die with significant wealth in the form of housing equity and liquid assets. Similarly, only a small fraction of households annuitize. This “annuity puzzle,” whereby retiree demand for annuities is far lower than economic models predict, has generated much work within the academic community. More broadly, there has been a surge of interest in using portfolio-theoretic models to address questions of retirement financial security.

This paper develops and estimates a model of retiree choice that answers crucial questions concerning potential interest in annuities. The high observed levels of long-term care expenses are a particular focus of our analysis. One possible explanation for the lack of asset run-down and under-annuitization may be aversion to the prospect of having insufficient wealth for private long-term care and therefore needing public care. To capture this, we introduce a “public care aversion” (PCA) parameter into a life-cycle model and estimate its importance. Technically, PCA measures retiree aversion

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2Brown and Finkelstein (2008) apply the medical transition model of Robinson (2002) and find that a 62-year-old man has a 40% chance of entering a nursing home at some future point, while a 62-year-old woman has a 54% chance. The Metlife Mature Market Institute (2006) shows that the national average annual cost of nursing home care in 2006 was $66,800 for a semi-private room. Of that, $57,800 represents out-of-pocket costs, a much higher fraction than in the health sector as a whole (Congressional Budget Office (2004), National Center for Health Statistics (2002)). De Nardi, French, and Jones (2010) show that these expenses increase in wealth: a sick 95-year-old woman at the 80th percentile of the permanent income distribution can expect to spend $16,000 per year on out-of-pocket medical costs, while a sick 95-year-old woman at the 20th percentile expects to spend only $2,700.

3In the United States, public benefits for long-term care are provided via Medicaid. We use the term “public care aversion” rather than “Medicaid aversion” as in early drafts of our paper to emphasize the generality of the phenomenon, as it is not about the Medicaid program per se, but more generally about the desire to avoid becoming a ward of the state as a consequence of poor health in old age in general and a Medicaid dependent in particular.
to simultaneously running out of wealth and needing long-term care. In addition to PCA, bequest motives may contribute to the lack of wealth decumulation and under-annuitization in retirement. In order to disentangle the relative importance of PCA and the bequest motive, we estimate our structural model of the retirement phase using a novel survey instrument.

Our central finding is that PCA is a quantitatively significant driver of precautionary savings. In support of the importance of PCA, subsequent work by Kopecky and Koreshova (2009) shows that saving for late-in-life long-term care expenses impacts aggregate capital accumulation, while Scott, Watson, and Hu (2009) find that the most valuable states of the world to provide insurance to be those that occur late in life, precisely when long-term care expenses are usually incurred. Our analysis indicates that there is a powerful interaction between interest in annuities and the institutions that provide for long-term care, both public and private. Specifically, the high levels of PCA that we identify imply that demand for annuities would be far higher if they included some acceptable form of long-term care insurance.\footnote{Consumer Reports (2003) documents major flaws in the existing long-term care insurance market. After reviewing 47 policies, the central finding was that, for most, the insurance was too risky and too expensive given that the company may no longer be around when reimbursement is needed, and that continued payment of the premium is needed to keep the policy alive.}

We believe that the next wave of annuity design will therefore focus on the interaction with long-term care insurance rather than on the equity premium, which was the focus of the most recent round of innovations.\footnote{Financial engineers designed “flexible” annuities that enabled retirees to take financial risks, and therefore potentially benefit from the equity premium, while providing a consumption floor should the portfolio fall too low in value. Variable life annuities with guaranteed minimum annual withdrawal benefits were the archetype in this regard. Unfortunately, many mistakes in pricing were made in the initial development of these instruments, which has sent financial engineers back to the drawing board.} We believe that the next wave of annuity design will therefore focus on the interaction with long-term care insurance rather than on the equity premium, which was the focus of the most recent round of innovations.\footnote{As a concrete example, Vanguard’s new Managed Payout Funds, which were launched in April 2008, were conceived based on the survey evidence and analysis presented in this paper. Our results were viewed as compelling evidence of the significant demand that would likely exist for a retirement payout product that would provide retired investors regular payments, while emphasizing complete liquidity as well as the potential for growth of invested capital, to meet either precautionary or bequest motives. This family of new funds attracted deposits of close to $200 million in its first three weeks of operation alone.}
The bulk of our research effort is dedicated to resolving the identification problem between PCA and bequest motives. Dynan, Skinner, and Zeldes (2002) highlight the broad identification problem between bequest and precautionary motives, which is important not only for financial design, but also for those interested in the macroeconomic impact of fiscal policies and the intergenerational transmission of wealth inequality:

“A dollar saved today simultaneously serves both a precautionary life-cycle function (guarding against future contingencies such as health shocks or other emergencies) and a bequest function because, in the likely event that the dollar is not absorbed by these contingencies, it will be available to bequeath to children or other worthy causes.” Dynan, Skinner, and Zeldes (2002), p. 274.

We introduce a new survey instrument to resolve this identification problem. We employ a series of hypothetical questions as essential aids in the identification process. These “strategic” survey questions represent natural thought experiments concerning behavior in contingencies selected for their high information content. Survey techniques of this kind may be particularly important in other areas of retirement finance, given the reluctance of many to plan ahead for future adverse events (Brunnermeier, Papakonstantinou, and Parker (2007)) and the associated incompleteness of markets.

While we employ non-standard data, our estimation procedure follows a long tradition in finance of structural estimation of preference parameters. The results of this estimation establish that PCA plays a significant role in explaining the low rate of spending of many middle class retirees. The results are also relevant to ongoing debates...

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7 Similar shortcomings in purely behavioral data motivated earlier survey research aimed explicitly at parameter identification, such as Holland (1969), Ljungqvist (1993), Barsky et al. (1997), Kimball and Shapiro (2003), Ameriks, Caplin, and Leahy (2003), and Kimball, Sahm, and Shapiro (2008). Of these, Kimball and Shapiro (2003) and Kimball, Sahm, and Shapiro (2008) are closest in spirit to our approach.

concerning the extent of the bequest motive. We find these motives to be more prevalent and to spread deeper into the middle class than is generally believed. Moreover, we find significant evidence for heterogeneity in bequest motives: they are minimal for at least a substantial minority of the population, and are higher on average for those with children than for those without children.

Our findings concerning the prevalence of bequest motives is of independent interest, and further illustrates the value of our strategic survey questions. When these questions are ignored, the likelihood function over bequest parameters is essentially flat and PCA cannot be pinned down. Moreover, the actual point estimates imply that almost every marginal dollar of income beyond $12,000 is saved for the bequest, irrespective of wealth. This contradicts evidence of Hurd and Smith (2002) on realized bequests. In contrast, bequest motives are well identified when we incorporate the strategic survey question, and are broadly consistent with the evidence on realized bequests (see Section III).

The rest of the paper is organized as follows. Section I introduces the model. In Section II we introduce the customized survey designed for purposes of model estimation, and to overcome the identification problem between bequest and precautionary motives. Section III presents results of the estimation procedure with strategic survey responses included. Section IV highlights the implications of our findings for the design of financial instruments for retirees.

9While our survey was drawn from an Internet panel of a commercial supplier, we show in an Internet Appendix, available on The Journal of Finance website at http://www.afajof.org/supplements.asp that it is close to representative in terms of household financial characteristics.
I. The Model

A. Preferences

The unit of analysis is the household, which for simplicity consists of a single individual who has just retired. The first period of observation occurs when the individual is \( m \) years old and entering retirement. The model consists of a series of one-year periods, starting at the age of retirement and ending at the year of death, which is restricted to occur by maximum age \( M = 100 \). The maximum length of the retirement period is \( T = M - m \). Periods are indexed by \( t \), the number of years into the retirement period, starting at zero at age \( m \) so that overall \( 0 \leq t \leq T \). There is a health-dependent death rate \( \delta_t \) in year \( t \) of retirement that evolves in a manner defined below.

The agent maximizes a standard time-separable utility function with exponential discounting. In each period of life, agents receive utility from consumption:

\[
  u(c_t) = \frac{c_t^{1-\gamma}}{1-\gamma}.
\]  

Agents also receive end-of-life utility from bequests defined by the function \( v(b) \). Hence, the agent maximizes

\[
  E_0 \sum_{t=0}^{T} \beta^t \left( \prod_{j=0}^{t-1} (1 - \delta_j) \right) \left\{ (1 - \delta_t)u(c_t) + \delta_t v(b_t) \right\}. 
\]

An agent leaving a bequest \( b \) receives direct utility:

\[
  v(b) = \frac{\bar{\omega}}{1-\gamma} \left( \phi + \frac{b}{\bar{\omega}} \right)^{1-\gamma}.
\]
If wealth is negative upon death, the agent is credited with having left a bequest of zero. This method of modeling the utility from the bequest matches the “warm glow” specification of Andreoni (1989), with a risk aversion parameter matching that for consumption. Abel and Warshawsky (1988) show that this warm glow specification is a reduced form for an altruistic bequest motive. With respect to functional form, we follow De Nardi (2004) in parameterizing the bequest utility with two parameters, one to measure the strength of the bequest motive (\( \varpi \)) and one to measure the prevalence in the population of an operative bequest motive (\( \phi \)). Carroll (2000) refers to \( \phi \) as the degree to which bequests are a luxury good.

**B. Technology**

Households enter retirement with wealth \( X_0 \geq 0 \), and wealth at the beginning of time \( t \) is denoted \( X_t \). We assume a deterministic stream of annual after-tax income \( y_t \) for as long as the retiree lives. There is no income in the year of death. Following the literature, we assume that there is a single riskless asset in which the household can invest and that yields a rate of return \( r = \beta^{-1} \). Households are not allowed to take a negative position in assets (no-borrowing constraint).

\(^{10}\)Kopczuk and Lupton (2007) provide reasons for researchers’ preference for direct utility of bequest models over altruistic models, such as the finding by Altonji, Hayashi, and Kotlikoff (1997) that parents do not offset monetary transfers to their children while alive given an increase in their children’s permanent income.

\(^{11}\)In terms of interpretation of these two bequest parameters, Abel and Warshawsky’s derivation shows that \( \phi \) is proportional to the present discounted value of the labor income of all future generations. In Henin and Weitzenblum (2003), \( \phi \) is the expected annual consumption of the heir. Finally, in a simpler model without health risk, spelled out in Appendix A, the optimal policy is to consume \( c^* \) per year and to leave a bequest of \( (c^* - \phi) \) per year for \( \varpi \) years. If wealth is insufficient to cover an annual consumption of at least $\phi$, no bequest is left. Hence, \( \phi \) measures the consumption threshold above which the bequest motive becomes operative, and \( \varpi \) measures its strength, in years (of annual consumption).
C. Health Dynamics and Health Costs

Our treatment of health dynamics and death is crucial to the precautionary motive, given the high expenses associated with bad health. Four health states are modeled. State 1 is a state of good health. State 2 is a state in which there are medical problems but no need for long-term care. State 3 is a state in which long-term care of some form is required, and state 4 is death. In period 0, the individual is in health state \( s_0 \in \{1, 2, 3\} \). The health state follows a Markov chain with age-varying one-period state transition matrix \( P(t) \). In each year \( t \), this is a \( 4 \times 4 \) matrix. Retirees reaching age \( M - 1 \) die with probability one the following year.

The initial health state and the Markov transition matrices \( P(t) \) allow us to compute future probabilities attached to all health states, including death. Given the initial health state \( s_0 \), the transition matrix is applied repeatedly to derive the probability \( \pi_t(s_t) \) that a retiree is in health state \( s \in \{1, 2, 3, 4\} \) at time \( t \geq 1 \). This means that the death probability \( \delta_t \) can be computed as \( \delta_t = \pi_t(4) \). Note that in principle we could have used only one non-long-term care health state rather than two. We introduced two states to enable us to capture survey-revealed differences in current health and the corresponding costs.

Note that we do not include the health state directly in the utility function. Rather, we focus on the costs associated with the various health states. Each live state \( s \in \{1, 2, 3\} \) has associated with it a necessary and deterministic health cost, \( h(s) \). Paying these costs entirely removes any utility penalty that would otherwise be associated with the health state. Death expenses in state 4 are also deterministic, at level \( h(4) \), and are subtracted from the bequest. Unlike Yogo (2009), we abstract from investment in health. While some medical expenses are certainly avoidable through investment, many of them
are not. Appendix C shows that our calibration presents a realistic characterization of observed medical expense risk.

D. Consumption Floor and Public Long-term Care

Given the risk of substantial (non-discretionary) medical expenses that may exceed available wealth, there is need to include a “government welfare” mechanism to guarantee agents a minimal level of consumption. In health states 1 and 2, we model welfare as a “consumption floor,” denoted by $C^f$. We assume that an agent who cannot afford her health costs plus this amount of consumption receives government transfers that bring her consumption up to $C^f$. End-of-period wealth is set to zero. In state 3, the long-term care state, treatment of welfare is related to the institutional reality of Medicaid. An individual going on welfare in the long-term care state forfeits all wealth to the government (end-of-period wealth is zero) and accepts care funded by Medicaid. The government covers the cost of health care and the agent receives the public care level of consumption $C^{PC}$. The public care level of consumption is an important parameter in what follows, since it reflects aversion to publicly provided long-term care. If $C^{PC}$ is low, this will produce a strong incentive for households to retain sufficient wealth to retain the private care option. If instead $C^{PC}$ is closer to annual consumption in the pre-long-term care period, then the incentive will be to run down wealth and use the public care subsidy in place of savings. The value of $C^{PC}$ therefore has a powerful impact on the strength of the precautionary motive.
E. The Optimization Problem

The household enters the period $t$ with health state $s_t$ and wealth $X_t$. The timing of events is as follows:

1. If $s_t = 4$ so that the individual is deceased, no income is received, health costs $h(4)$ are paid, and the bequest $b_t$ equals the remaining net resources, down to a minimum of zero:
   \[
   b_t = \max[X_t - h(4), 0].
   \] (4)

2. If $s_t < 4$, period $t$ income of $y_t$ is accrued, and the health costs $h(s_t)$ are incurred. A consumption decision is made. The agent may choose any level of consumption $c_t$ that exceeds the consumption floor $C^f$ and satisfies the budget constraint
   \[
   X_t + y_t - h(s_t) - c_t > 0. \] (5)
   If no consumption level $c_t > C^f$ satisfies equation (5), the agent must get help from the government. If $s_t = 1$ or 2, welfare means consuming $c_t = C^f$. If $s_t = 3$, the agent must receive public long-term care and $c_t = C^{PC}$.

3. At the end of the period, the agent is left with the unspent portion of assets, which earn a riskless return $r$. If the agent received government help in the current period, wealth in the next period is zero. Letting $I_t^G$ be the indicator variable for government help in period $t$, the following period’s wealth level obeys
   \[
   X_{t+1} = \begin{cases} 
   (X_t + y_t - h(s_t) - c_t)r & \text{if } I_t^G = 0; \\
   0 & \text{if } I_t^G = 1. 
   \end{cases} \] (6)
4. Finally, the new health state $s_{t+1}$ is drawn according to the state transition probabilities $P(s_{t+1}|s_t)$. If $t+1 = T$, the final period, $s_{t+1} = 4$. 

The household maximizes expected utility of the remaining life-time consumption (2) subject to the budget constraint (5) and the government-provided consumption floor. The Bellman equation is

$$V_t(s_t, X_t) = \begin{cases} 
\max_{c_t} \{u(c_t) + \beta E_t V_{t+1}(s_{t+1}, X_{t+1})\} & \text{if } s_t \neq 4 \\
v(b_t) & \text{if } s_t = 4
\end{cases}$$

subject to equations (3), (4), (5), and (6).

To compute optimal policies, we first discretize the state space and the control space. The model is then solved by backwards induction. At time $T$ (age 100), the household dies with probability one. Its value function is the instantaneous utility over bequests, $V_T(s_T, X_T) = v(b_T)$. In every prior period $t$, the Bellman equation (7) is used to solve for $V_t(s_t, X_t)$. We use a fine grid for $X$ and for consumption, and linear interpolation to compute continuation values for points that are not on the grid. The choice variables ruled out by the budget constraint (5) are given large negative values.

**F. Health and Longevity Dynamics**

The role of health costs is central to our analysis, especially the possibility of high costs associated with long-term care. The distribution of these costs in our model is controlled by the medical costs associated with each health state and by the one-period $4 \times 4$ state transition matrix $P(t)$. This matrix is parameterized by 12 parameters, nine that determine the value of $P(0)$ (of the 16 elements, four are fixed by the death
state being absorbing and there are three further restrictions so that each row sums to one) and three that control the flow of probability from greater health to poorer health as age (t) increases. We select values for these parameters to match four age-dependent mortality rates and eight statistics on long-term care utilization from Brown and Finkelstein (2008). We calibrate this matrix separately for men and for women. The latter not only live longer, they also face much higher long-term care risk. This calibration is described in detail in Appendix B and the longevity and long-term care moments that are matched are listed in rows 1 to 12 in Table I. The table shows that the model replicates the various cross-sectional moments of long-term care use and life expectancy during retirement.

Each health state is associated with a (deterministic) medical expense. To calibrate the medical costs associated with non-long-term care states, we identify the mean annual out-of-pocket medical costs for non-institutionalized individuals over 62. French and Jones (2004) find mean household medical costs of $2,800 in the AHEAD survey, whose first wave contains only non-institutionalized individuals. Their numbers therefore exclude most long-term care costs. The corresponding number for single households in $2,000. Using our calibrated health-transition matrix, we find that among the periods our simulated retirees spend out of long-term care (health states 1 and 2), they spend 10% in state 2, so that \( h(1) = 1 \) and \( h(2) = 10 \) produces an average non-long-term care expense of $2,000 in line with the data. For the long-term care state 3, we use Metlife’s estimate that a semi-private room in a private long-term care facility costs $143 per day in 2004. Medicare covered the full cost of long-term care for 20 days each year and the daily costs in excess of $109.50 for an additional 80 days. This leaves an annual out-of-pocket expense of $46.7K for a full year of long-term care for an individual without long-term care insurance. By 2006, this expense had increased to $57.2K. Since our
Table I
Calibration of Health Transition Probability Matrix

The first column shows the moment, the second (fourth) column the target from the data for males (females), and the third (fifth) column our calibrated value at the chosen parameters for males (females). The first eight moments (Panel A) capture aspects related to long-term care; the data are from Brown and Finkelstein (2008) Table 1 for males and females. The next four moments (Panel B) relate to longevity; the data are from the National Center for Health Statistics, Vital Statistics (2006), Table 2 for males and Table 3 for females (2003 Life Tables). The last five moments (Panel C) show features of the distribution of medical costs in thousands of dollars ($K). They are cross-sectional moments of lifetime present discounted medical expenses, calculated using a 3% discount rate, which takes into account the mortality dynamics. These are total medical expenses, regardless of whether they are paid out-of-pocket by the household or by the government. These moments of medical expenses are not used in the calibration. All moments for the model are obtained from simulating 100,000 men and 100,000 women, in good health, from age 62 onward, for a maximum number of 39 years. Details of the calibration exercise are in Appendix B.

| Moment | Males | | Females | |
|---|---|---|---|
| Probability ever use LTC (%) | 40.0 | 38.9 | 54.0 | 52.3 |
| Average age of first use (among users) | 80.0 | 78.2 | 82.0 | 80.1 |
| Cond. Avg. years spent in care | 2.9 | 3.4 | 4.2 | 4.6 |
| Cond. Prob. use more than 1 year (%) | 77.0 | 72.5 | 85.0 | 80.3 |
| Cond. Prob. use more than 3 year (%) | 37.0 | 36.6 | 53.0 | 50.3 |
| Cond. Prob. use more than 5 year (%) | 17.0 | 18.0 | 31.0 | 30.8 |
| Cond. Prob. ever exit to non-death state (%) | 33.0 | 35.4 | 35.0 | 34.8 |
| Cond. Avg. number of spells | 1.2 | 1.2 | 1.3 | 1.2 |
| Life expectancy at age 62 | 18.9 | 18.3 | 22.1 | 22.0 |
| Life expectancy at age 75 | 10.5 | 9.9 | 12.6 | 12.4 |
| Life expectancy at age 85 | 6.0 | 6.0 | 7.2 | 7.4 |
| Life expectancy at age 95 | 3.2 | 3.2 | 3.7 | 3.7 |
| Mean lifetime medical expenses ($K) | 64.5 | 96.6 |
| Median lifetime medical expenses ($K) | 32.3 | 54.4 |
| Prob lifetime medical expenses > $50K (%) | 38.1 | 52.2 |
| Prob lifetime medical expenses > $100K (%) | 21.2 | 33.5 |
| Prob lifetime medical expenses > $250K (%) | 3.8 | 9.2 |
survey data pertain to 2005, we take a value in the middle: \( h(3) = 50 \). We ignore costs associated with death by setting \( h(4) = 0 \).

Combining health costs and health and longevity dynamics, Rows 13 to 17 of Table I report various cross-sectional moments of life-time discounted medical expenses. For each simulation, we calculate the present discounted value of all future medical expenses as of age 62, discounted at a riskless rate of 3% and taking into account mortality. The median value for life-time medical expenses is $32.3K for men ($54.4K for women), while the mean is $64.5K ($96.6K). Long-term care costs dominate our model, making up 62% (71%) of all medical expenses. For the 61% of males (47% of females) who do not enter long-term care, the mean discounted life-time health cost in retirement is $21K ($25K). In the right tail of the medical expense distribution, men (women) face a 21% (34%) chance of facing health costs greater than $100K and a 4% (9%) chance of costs greater than $250K. These calculations measure all expenses, not just out-of-pocket medical expenses. Appendix C discusses the results of a simulation that takes into account government contributions to medical expenses. It compares the model's medical expenses to the data and finds consistency in pattern and magnitude. It also studies two other testable implications of the model: the public care utilization rate and the realized bequest distribution. While the model was not calibrated to explain these data, it matches them reasonably well.

G. Nonlinearity in Savings Motives

A key feature of the model is that the incentive to save is particularly high for those with intermediate wealth and income levels. Figure 1 illustrates this for a hypothetical healthy 62-year-old woman. The horizontal axis represents this individual’s economic
status, as measured by income, and by variation in wealth consistent with the observed joint wealth-income distribution (not shown). The vertical axis illustrates the saving rate out of income. Note that the model-implied saving rate is hump-shaped in income. The saving rate is highest for the “middle class.” The reason is that both the precautionary and the bequest motives are operative in full force for this group. Different lines in the figure indicate different degrees of PCA. The lower the \( C_{PC} \), the stronger the PCA, the stronger the precautionary savings motive, and the larger the saving rate (top line).

In sum, disentangling motives for savings is most relevant for the middle class. High wealth individuals are not at risk of needing to resort to public long-term care, while poor individuals cannot afford private long-term care, no matter how much they save.

**Figure 1.** Middle-class precautionary savings.

The figure plots the saving rate, defined as consumption over income (on the vertical axis) against income (on the horizontal axis). The figure is for a hypothetical single female, age 62, in good health. As we vary income, we simultaneously vary wealth to capture the positive cross-sectional correlation between income and wealth. The various lines are for different public care aversion parameters, \( C_{PC} \), with the strongest precautionary motive being the highest line.
II. The Survey

A. The Sample

Our survey was conducted in September 2006 by Greenfield Online, a major provider of web-based surveys. Any respondent living without a partner was ruled out if: born before 1917 and after 1951; working full-time or looking for work; having total household income from work in 2005 of more than $25,000; needing long-term care; or having children at home. For respondents living with partners, we added the conditions that the partner could not be working full time or looking for work, born before 1917 or after 1966, or in long-term care. We imposed sampling restrictions on various demographic and wealth groups to obtain a somewhat representative sample. After screening out first-order response errors, we obtained a sample of 938 respondents. With respect to household status, almost 55% comprise single households and 45% are couples. Because our estimation exercise focuses on the sample of singles, we discuss their characteristics here and defer a description of the full sample to the Internet Appendix.

Table II lists summary statistics for our singles sample and compares them to the singles sample in nationally representative surveys. Panel A contains some demographic variables. The mean and median age of respondents was 64, with 90% in the 55-77 range. Nearly three-quarters of single respondents were female. Almost three-quarters were retired. Given that the current state of health is a state variable in our model, we asked questions directly to identify which of the three model-permitted states of health characterized each respondent; 56% of respondents were in good health. There is wide

\[ \text{The Internet Appendix provides background information on our internet survey methodology, on} \]
\[ \text{Greenfield Online, on an earlier pilot survey, on sampling restrictions we imposed on various demo-} \]
\[ \text{graphics to obtain a reasonably representative sample, and on a preliminary screening for first-order} \]
\[ \text{response errors. It also contains more details on the comparison with the Survey of Consumer Finance} \]
\[ \text{and the Consumer Expenditure Survey. It concludes with the actual survey questions themselves.} \]

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dispersion in the number of children and grandchildren, with a substantial minority in each case having none, and another substantial group having four or more. Finally, 62% of single respondents were homeowners.

A key premise of the model is that many individuals face high private costs of long-term care. We set the costs of private care at $50K as a fixed parameter in the model. In a sensitivity analysis, we also explore a higher value of $70K. In fitting with the low level of use in the general population, only 10% of singles in our sample have taken out a long-term care insurance policy that would provide benefits or reimbursement for long-term care expenses. When we explicitly ask respondents to think of the costs of one year of private long-term care absent any long-term care insurance coverage, the median estimate among singles is $25K, and 10% of respondents think a one-year stay would cost $100K or more. The claim that private long-term care is seen by many as involving high private costs appears warranted.

**B. Wealth**

We asked respondents for measures of assets and debts in 2005, and as with all other numerical dollar values, we asked respondents to first answer questions concerning the range of values in which the corresponding variable lay, and then asked them to make a precise estimate within this range. Panel B of Table II reports various wealth categories. Retirement assets held in tax-favored dedicated retirement accounts (such as 401(k), IRA, 403(b), or other accounts) have an interquartile range (IQR) of $0 to $40K. Financial wealth (bank accounts, money market accounts, stocks and shares, bonds, etc. excluding any assets held in dedicated retirement accounts) has an IQR of $0 to $52K. The median self-reported home value among homeowners is $100K, with an IQR of $48K.
## Table II
### Summary Statistics

The left panel contains summary statistics for the 498 single retirees from our 2006 survey. The right panel contains statistics from the 2004 Survey of Consumer Finance (SCF). Using the SCF, we select a sample of singles that satisfies the same pre-screening criteria as our own sample: we exclude respondents below the age of 54, those who work full-time or expect to work full-time, those with income from work above $25K, and those with children at home. This guarantees we are comparing mostly retirees to a sample of mostly retirees. The resulting SCF sample consists of 887 single individuals. The summary statistics are computed using the SCF weighting scheme. In Panel F, starred items are computed from 4,107 observations of 1,943 single respondents from the Consumer Expenditure Survey (CEX) who meet the same selection criteria as described above. We use the 2003 to 2004 data from Krueger and Perri (2005).

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<th>Moment</th>
<th>Our 2006 Survey</th>
<th>SCF/CEX 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Demographics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Number of grandchildren</td>
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<tr>
<td><strong>Panel B: Wealth (× $1000)</strong></td>
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<td></td>
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<tr>
<td>Retirement assets</td>
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<td>0</td>
</tr>
<tr>
<td>Liquid financial assets</td>
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</tr>
<tr>
<td>Primary home</td>
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<tr>
<td>Other assets</td>
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<tr>
<td>Total assets</td>
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<tr>
<td><strong>Panel C: Debt (× $1000)</strong></td>
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<td>Primary mortgage</td>
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<tr>
<td>Credit card</td>
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<td>Total liabilities</td>
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<td><strong>Panel D: Net Worth (× $1000)</strong></td>
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<td>Total net worth</td>
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<td><strong>Panel E: Income (× $1000)</strong></td>
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<td><strong>Panel F: Spending (× $1000)</strong></td>
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<td>Maintenance and Rent *</td>
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<td>Durables *</td>
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<td>Housing consumption *</td>
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<td>NDS consumption *</td>
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<td>8</td>
</tr>
<tr>
<td>Total consumption *</td>
<td>5</td>
<td>9</td>
</tr>
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</table>
to $189K. For 53% of single homeowners, the primary mortgage is fully paid off. The IQR for mortgage debt among homeowners is $0 to $35K. The table instead reports home values, mortgage debt, and home equity for the entire population, including renters. The median level of “other assets” (e.g., secondary home, cars, boats, art, private business assets) is $10K, with an IQR of $1K to $30K, and 10% own more than $270K. On the debt side (Panel C), more than half of the respondents have no credit card debt and the same is true for “other debt beside primary mortgage and credit card.” Among the credit card debt holders, the median debt is $2K, while among those with other debt, the median debt is $1K. The median net worth in our sample (Panel D) is $88K with an IQR of $5 to $290K; 5% of our singles have a net worth of more than one million dollars.

To estimate our model, we need a total wealth measure for all respondents, taking care to keep the number of state variables to a minimum. While liquid wealth, retirement wealth, and free standing debt categories largely speak for themselves, there are tricky issues associated with housing and durable assets. With respect to housing, the historical real price appreciation (ex-dividend return) is approximately zero per annum (Shiller (2006)). Our model calls for the cum-dividend return on housing, which includes the rent-price ratio. We use a rent-price ratio of 4%. Thus, the cum-dividend return on housing is 4%, somewhat above the 3% average return we assume on the riskless asset. Because of the difference in returns, aggregation at current value would understate the contribution of housing to net worth. To account for its higher return, we increase the contribution of housing wealth to total wealth to the degree appropriate given the longevity of each respondent. Note that implicitly this treats the house as an asset that will be used late in life, which is empirically accurate. Venti and Wise (1990) show that

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13 The rent-price ratio in 2005 was equal to 4% nationwide, where rents are measured based on the rental price index of the Bureau of Labor Statistics and house prices are based on the repeat-sales index of the Office of Federal Housing Enterprise Oversight. Since we do not have geographic information on our respondents, we use the nationwide number.
there is little run down in housing assets except at the very end of life, while Walker (2004) shows that, quite often, there is rapid run-down at the end of life often associated with declining health.\(^{14}\)

**C. Income, Spending, and Current Health**

The survey also gathered data on 2005 and (expected) 2010 income from Social Security, government pensions, and regular employer pensions. The median respondent has $12K in 2005 retirement income and the IQR is $8 to $16K. Labor income is set to zero when the respondent indicates not working. The distribution of total income, defined as the sum of labor income and pension income, has a median of $16K and an IQR of $10 to 24K; see Panel E of Table II. The model calls for a measure of permanent income, for which we use after-tax expected 2010 income. We use the reported tax rate to calculate after-tax income.\(^{15}\)

Finally, we asked respondents for total spending in 2005, and also for a breakdown into six categories: (a) all mortgage and debt payments except credit card payments; (b) maintenance, improvement, and taxes on owned real estate or rent; (c) purchases of major durable goods such as cars, boats, etc; (d) out-of-pocket health care expenses; (e) income or other taxes other than real estate taxes; (f) all other living expenses.\(^{16}\) Panel F reports the distribution of these expenses in our sample. We are interested in constructing a value for total consumption that excludes health care spending to be consistent

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\(^{14}\) More precisely, we use a simple procedure in which we associate with each individual an expected longevity and compute the value of the house at that date assuming that it grows at 4% per annum. The increased housing wealth we obtain is such that, when it grows at 3%, it results in the same future value as the observed housing wealth under a 4% growth rate.

\(^{15}\) We compute the individual-specific tax rate based on 2005 reports on taxes paid and on taxable income, which we define as earnings from labor income plus financial income. Consistent with the model, financial income is measured as 3% of financial wealth.

\(^{16}\) A check was applied to ensure that category responses added up to within 10% of total expenses.
with the model, yet includes consumption of housing services. For renters, housing consumption is given by their rent. For homeowners, we set the housing consumption equal to the “imputed rent,” the self-reported home value times the 4% rent-price ratio, which we also used in the housing return.\footnote{We also computed an alternative “user cost” of housing as the sum of the mortgage payment, maintenance and home improvement costs, and property taxes. The user cost and imputed rent have a 40% correlation, which is measured precisely.} Nondurable and services (NDS) consumption is then defined as the sum of all other living expenses and housing services consumption: the median is $11K per year, the average is $14K, and the IQR is $8 to $17K. We measure durable consumption as 25% of durable assets, a typical depreciation rate for vehicles and electronics. We define total consumption as the sum of NDS consumption, durable consumption, and housing services from any secondary home. When so defined, consumption has a median of $13K, and average of $17K, and an IQR of $9 to $19K. Since durable consumption and housing services from any secondary home are imputed, we use NDS consumption (which includes housing services from the primary home) as our main measure to be used in the model. Hence, the wealth and consumption measure we use in the model both include the primary home and exclude durables.

The right columns of Table II contain data from the Survey of Consumer Finance (SCF; Panels A to E) and from the Consumer Expenditure Survey (CEX; Panel F) for singles. A comparison with our survey suggests that our wealth, income, and consumption distributions are quite similar to those in the nationally representative samples. For example, total net worth has an IQR of $5 to $290K in our sample and $25 to $306K in the SCF. Likewise, total income has the same IQR of $10 to $24K in both our sample and the SCF. Finally, total consumption has an IQR of $9 to $19K in our sample and $12 to $25K in the CEX. A more detailed comparison between our data and the SCF, CEX, and the health and Retirement Survey (HRS), including a comparison of wealth
and consumption profiles, is relegated to the Internet Appendix.

Since Table II combines respondents of different ages and since our sample is somewhat younger than the SCF and CEX samples, it is instructive to break down wealth, income, and consumption by age. Table III reports net worth, total income before taxes, and total consumption categories for the age groups 54-59, 60-64, 65-69, 70-74, and older than 74. Results from other age groupings are similar. Comparing the left panel (our survey) to the right panel (SCF or CEX surveys) shows that, holding constant age, the moments of wealth, income, and consumption are quite similar. For example, wealth (net worth) is typically negative in the fifth percentile in both surveys. As another example, for the age group 60-65, our survey shows wealth of -$8K, $5K, $70K, $315K, and $979K at the 5th, 25th, 50th, 75th, and 95th percentiles of wealth, respectively. The corresponding numbers in the SCF are -$2K, $5K, $70K, $344K, and $1,039K. Also, median income and consumption are similar across surveys, as are the IQRs.

We now turn to the strategic survey questions, which the following section shows are instrumental in separating bequest and precautionary motives.

D. Strategic Survey Questions

We posed two distinct types of strategic survey questions, differing in when the proposed contingency would play out. Our first question was to play out “immediately following survey completion,” as in Barsky et al. (1997) and Kimball and Shapiro (2003). The interpretation of the response to this question depends on wealth, income, health status, age, and gender. A fixed survey response will have entirely different interpretation in terms of model parameters depending on the other data that describe this respondent. Our second question placed respondents close to the end of life when the motives come
Table III
Wealth, Income, and Consumption By Age Group

This table reports wealth, income, and consumption for singles in five age groups, which are listed in the first column. Wealth is measured as net worth, income as total before-tax income, and consumption as total expenditures. See the main text for definitions. The second column reports the number of observations in each age group for our 2006 survey. Columns 3 to 7 report the $5^{th}$, $25^{th}$, $50^{th}$, $75^{th}$, and $95^{th}$ percentiles of the wealth, income, or consumption distribution in our sample. Columns 8 to 12 report the corresponding moments in the 2004 Survey of Consumer Finance (SCF) or 2003 to 2004 Consumption Expenditure Survey (CEX). Selection criteria for the SCF and CEX samples are described in Table II.

| Age | observ. | 5  | 25 | 50 | 75 | 95 | 5  | 25 | 50 | 75 | 95 |
|-----|---------|----|----|----|----|----|----|----|----|----|----|---|
| Panel A1: Wealth in our survey | Panel A2: Wealth in SCF | | | | | | | | | | | |
| 54-59 | [177] | -9 | 2 | 55 | 266 | 1,092 | -1 | 1 | 8 | 182 | 971 | |
| 60-64 | [116] | -5 | 3 | 104 | 327 | 825 | -1 | 9 | 125 | 320 | 1,880 | |
| 65-69 | [108] | -8 | 5 | 70 | 315 | 979 | -2 | 5 | 70 | 344 | 1,039 | |
| 70-74 | [58] | -6 | 41 | 126 | 333 | 1,315 | 2 | 50 | 115 | 381 | 1,325 | |
| >74 | [39] | -3 | 10 | 226 | 360 | 1,405 | 0 | 36 | 135 | 281 | 1,083 | |
| Panel B1: Income in our survey | Panel B2: Income in SCF | | | | | | | | | | | |
| 54-59 | [177] | 0 | 8 | 14 | 21 | 35 | 5 | 7 | 10 | 16 | 73 | |
| 60-64 | [116] | 5 | 12 | 18 | 25 | 50 | 0 | 8 | 14 | 24 | 42 | |
| 65-69 | [108] | 5 | 11 | 16 | 24 | 39 | 7 | 9 | 14 | 25 | 50 | |
| 70-74 | [58] | 10 | 14 | 19 | 29 | 62 | 7 | 11 | 18 | 30 | 60 | |
| >74 | [39] | 10 | 13 | 16 | 24 | 50 | 6 | 11 | 15 | 22 | 40 | |
| Panel C1: Consumption in our survey | Panel C2: Consumption in CEX | | | | | | | | | | | |
| 54-59 | [177] | 5 | 9 | 13 | 18 | 38 | 5 | 9 | 15 | 24 | 48 | |
| 60-64 | [116] | 4 | 9 | 14 | 22 | 42 | 6 | 9 | 14 | 21 | 53 | |
| 65-69 | [108] | 5 | 9 | 13 | 21 | 48 | 5 | 9 | 14 | 21 | 59 | |
| 70-74 | [58] | 6 | 10 | 16 | 25 | 60 | 5 | 10 | 14 | 22 | 50 | |
| >74 | [39] | 10 | 13 | 17 | 24 | 50 | 5 | 8 | 12 | 18 | 40 | |

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into play. Interpretation of these answers in terms of model parameters is the same for all respondents, since they were placed in the same hypothetical situation. The differences between the questions allow each question to generate information of independent value in the final estimation.

D.1. The Immediate Prize Question

Our immediate prize scenario involved the respondent winning a prize (either $100K or $250K) that had to be divided between a bequest locked box and a long-term care locked box, where the idea of using the lock boxes was to provide a commitment device. More precisely, we specified that money placed in the bequest box could not be accessed over the individual’s life-time, but would be passed on in whole to beneficiaries (who could not be told of this) upon death. Money in the long-term care box could be accessed only to pay for private long-term care (stated as costing $50K a year) for the respondent (and partner if applicable), and would not be available to bequeath. The point of this question was to overcome the identification problem associated with wealth that is fungible between these uses.

Figure 2 shows that the single largest group of respondents would split the money 50-50. If the prize is $100K (two years of long-term care), then 33% would split it evenly; if the prize is $250K (five years of long-term care) only 17% percent would split it evenly. The second most common answer is a polar answer of 0% or 100%, but there is nontrivial probability mass on all other answers. This is the first evidence suggestive of our basic finding, which is that both PCA and bequest motives are important for a significant set of retirees. The second question with a $250K prize has a more even distribution across answers than the first; it is more discriminating. There is a large positive correlation between the two questions: the correlation between the $100K answer and the $250K
answer is 0.8. Forty-five single respondents answer 0% to both questions (9% of sample), 65 answer 50% to both (13%), and 70 answer 100% to both questions (14%).

![Histogram of responses to survey question 18b.](image)

**Figure 2.** Trading off long-term care and bequests at the current moment.
The figure shows a histogram of responses to survey question 18b. The question asks what fraction of a $250K prize the respondent would devote to a long-term care lock box. The complementary fraction would go to the bequest lock box. The sample consists of all 498 single respondents.

### D.2. The End-of-Life Question

In posing the end-of-life question, we asked all respondents to place themselves in a hypothetical situation in which they were: of age 85 and the sole surviving member of their household; in need of long-term care yet had absolutely no long-term care insurance; knew that they had exactly one year left to live and would need to spend it in a long-term care facility; and had sold their home and had total available wealth that is worth $200K at today’s prices and final-year income net of taxes worth $25K in terms of

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18 We experimented with randomizing the order of the answers to the survey questions to detect anchoring effects. We found that the answers from the group that was presented the “100% in long-term care” answer first were no different from the answers given by the group that was presented the “0% in long-term care” answer first.
current prices. They were then offered the choice between long-term care that was privately financed and government-provided long-term care that is financed through the government (Medicaid). This choice was described as impacting their long-term care options and the bequest that they would leave as follows:

1. **Option A**: Use Medicaid funded long-term care. The government will pay for your long-term care, allowing you to leave all $200,000 as a bequest. However, using Medicaid restricts your choice of facility, on average results in inferior care, and requires you to surrender all income to the government.

2. **Option B**: Use private long-term care. Pay $50,000 for private long-term care. You would only leave $150,000 as a bequest but would have your choice of facility and would have your income available for spending as you wish during that year (unspent income would be forfeited).

Note that our question asserts directly that Medicaid on average results in inferior care, which we see as uncontroversial “folk wisdom,” to frame the question appropriately. There is no evidence suggesting that this framing had any effect. First, respondents had all answered the lock-box question (which made no comments on Medicaid quality) before seeing this second question. Second, the answers to this question suggest a lower PCA than do the responses to the earlier lock-box questions.19

The response to the qualitative question was clear-cut. An overwhelming majority (85%) of single respondents preferred to go to a private facility if the cost is a reduction in bequest of $50K. This is strong evidence for PCA, the key driver of the precautionary savings motive in our model. Yet there is also evidence that many attach great

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19 An estimation that uses consumption data and the end-of-life survey question data, but without the lock-box question data, results in a lower PCA estimate. The results are discussed in Section III.D.
importance to bequests. Following the above yes/no question, we followed up with a quantitative question designed to pin down how much of the $200,000 would be willingly forgone to stay in a private long-term care facility rather than use government-funded long-term care. The median response was $50K, with an IQR of $20 to 100K. As an indication of coherence in responses, the median willingness to pay was only $3K for the 15% respondents who chose government funding in the first part of the question, while it was $50K for the other remaining respondents. Figure 3 plots the distribution of willingness to pay for a private facility for the 421 singles who prefer to avoid Medicaid.

Figure 3. Trading off long-term care and bequests at the end of life.
This graph shows a histogram of responses to survey question 20b. The question asks what fraction of $200K in remaining wealth the respondent would forgo to avoid government-funded long-term care if long-term care in his/her last year of life were unavoidable. The figure plots the answers for the 421 single respondents (out of a total of 498) who indicate that they prefer private long-term care to Medicaid in a preliminary qualitative question.

Section E of the Internet Appendix investigates the plausibility of the answers we obtained to the strategic survey questions. The analysis suggests that the questions were taken seriously and answered in a fashion that is internally consistent with other parts of the survey as well as consistent with intuition. Section C of the Internet Appendix
details the quality controls we implemented to obtain meaningful answers. Despite our best efforts, the usual caveats to survey work apply. There may be a difference in what respondents do and what they say they will do, when put in a hypothetical scenario that does not necessarily describe their current state. Ultimately, we think of our strategic survey questions as another potentially useful tool (as the next section will show) with its own shortcomings.

III. Estimation

The central issue faced in estimation is how to separately identify the $C^f$ and $C^{PC}$ parameters that control precautionary savings and the bequest motive, governed by $\varpi$ and $\phi$, respectively. This section estimates these four parameters using a maximum likelihood estimation procedure. Section A uses only consumption data to estimate parameters. These data turn out to be insufficient to separately identify the precautionary savings and bequest motives. In response, Section B adds the end-of-life and lock box survey questions from the previous section, and shows that the identification problem disappears. For parsimony, both estimation exercises assume that the parameters $\theta \equiv \{C^{PC}, \phi, \varpi, C^f\}$ are common across the population. Finally, Section C adds a limited amount of parameter heterogeneity by introducing two types that differ in the strength of their bequest motive $\varpi$. Evidence from the survey supports such heterogeneity. In our estimation, we follow De Nardi, French, and Jones (2010) and focus on single respondents due to the many additional intricacies involved in simulating end-of-life spending of those with partners. Our sample includes all $N = 498$ single respondents.
A. Consumption Only

For a given set of parameter values $\Theta \equiv (\theta, \beta, \gamma)$, the model of Section I predicts an optimal current consumption choice $c(\Gamma_i; \Theta)$ for each demographic type $\Gamma_i = \{m, sex, s_0, X_0, y_0\}$, which lists age, sex, health, wealth, and income of respondent $i$ at the time of the survey. We postulate the following data-generating process for each respondent:

$$\log c_i = \log c(\Gamma_i, \Theta) + \varepsilon_{ci}, \text{ where } \varepsilon_{ci} \sim i.i.d. N(0, \sigma^2_c),$$

where $\varepsilon_{ci}$ is an idiosyncratic shock that represents classical measurement error in consumption levels. Our survey provides data on the demographics $\Gamma_i$ and on consumption $c_i$. We are interested in estimating the parameters of the model, $\theta$, alongside the measurement error standard deviation, $\sigma_c$. Under regularity conditions, the maximum likelihood estimator $\hat{\theta}$ is consistent and asymptotically efficient. The likelihood of an individual consumption response given demographics and parameters is given by

$$L(c_i|\Gamma_i, \Theta, \sigma_c) = \frac{1}{\sigma_c} \Phi \left( \frac{\log c_i - \log c(\Gamma_i, \Theta)}{\sigma_c} \right),$$

where $\Phi(\cdot)$ denotes the standard normal pdf (to avoid confusion with the bequest parameter $\phi$). The log-likelihood for the entire sample is the sum of the logs of the individual likelihoods. We use a Nelder-Mead simplex algorithm to find the maximum likelihood estimate $\hat{\theta}$:

$$(\hat{\theta}, \hat{\sigma}_c) = \arg \max_{\theta, \sigma_c} \sum_{i=1}^{N} \log L(c_i|\Gamma_i, \Theta, \sigma_c).$$

This approach addresses one further complication. The parameters $\beta$ and $\gamma$ are not identified separately from the parameters in $\theta$. Intuitively, changes in the subjective time discount factor induce saving behavior that is difficult to distinguish from that
arising from other savings motives in the model. This leads us to fix $\beta = r^{-1} = 0.97$, corresponding to a conventional choice of 3% for the riskless rate. A similar logic leads us to fix the risk aversion coefficient $\gamma$ at a conventional choice of 3. The precautionary savings motives are driven by $u'(C_f)$ and $u'(C_{PC})$, which are not only functions of $C_f$ and $C_{PC}$ but also of risk aversion $\gamma$, and the desire to avoid a zero bequest leads to a marginal value $v'(0) = \phi^{-\gamma}$, which depends on both $\phi$ and $\gamma$. Changing $\gamma$ and shifting $C_f$, $C_{PC}$, and $\phi$ in response delivers an equally good fit.

The model predicts that the poorest retirees should consume at the consumption floor. In the data, we see a number of such respondents and their observed consumption helps identify a value of $C_f = 5.75(0.29)$; asymptotic standard errors are in parentheses. This value of $5,750 for the consumption floor is consistent with average Social Security payments. The estimate for our PCA coefficient, the consumption equivalent of Medicaid, is $C_{PC} = 2.20(0.12)$, less than half the consumption floor in the first two health states. This parameter is largely identified from the savings rate of (less wealthy) respondents who consume too little to be affected by the bequest motive, and suggests strong PCA. Our estimate for the luxury bequest parameter $\phi$ is $12.06 (0.65)$; this means that the intentional bequest motive only kicks in when consumption is above $12,060 per year. This value indicates that 60% of our respondents consume too little to be affected by the bequest motive. Among the (wealthy) respondents consuming above this thresh-

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20 As a robustness check, we also solved the model for a stochastic return with mean 3% and volatility 6.8%, the historical mean and volatility of the return on a portfolio of 30% stocks and 70% bonds. The 70-30 mix approximates the average share of equity in the portfolios of retirees in the SCF and agrees with common recommendations of financial planners. The findings are similar and omitted for brevity. We also confirmed the robustness of our results to choices of $r$ of 1.02 and 1.04, but omit them in the interest of brevity.

21 Gourinchas and Parker (2002) estimate values of around 1.5 from pre-retirement consumption and income data of various educational groups. Some research argues that older investors are more risk averse (Morin and Suarez 1983), but there is debate about these findings (Wang and Hanna (1997) and Bajtelsmit and Bernasek (2001)). Asset pricing studies routinely use values much higher than 3. The choice of 3 is a compromise between these two strands of the literature. We investigate the robustness of our results to choices of $\gamma$ of 2, 5, and 10 below.
old, we estimate a very high value for $\bar{\omega} = 93.7(7.4)$. This value implies little sensitivity of consumption to wealth, consistent with an explanation that additional wealth is being saved for a bequest. In the limit as $\bar{\omega} \rightarrow \infty$, the marginal value of additional assets bequeathed becomes constant at value $u'(\phi)$, that is, the bequest function $v(b)$ becomes linear. All additional consumption above $\phi$ is forgone in favor of saving the additional funds as a bequest. Our estimation shows that the data approach this limiting case. As we show below, the estimates imply an implausible realized bequest distribution. Finally, the log consumption measurement error standard deviation is estimated to be $\sigma_c = 0.526$, or 52.6%. Taken together, these estimates suggest that bequests are not that prevalent, but that for the wealthy they are a very strong motive. PCA is a significant saving motive for the rest of the population.

The estimation results with only consumption data suffer from an important identification problem. While the likelihood function exhibits a maximum at the above parameter values, there is a ridge in the parameter space along which the likelihood changes very little. Figure 4 illustrates the identification problem in the estimation with only consumption data. Each panel shows the log-likelihood contours for all combinations of the parameters $\bar{\omega}$ and $C^{PC}$, and for a given value for the parameter $\phi$. The latter is listed in the caption of the panel alongside the maximum likelihood value for that panel. As we move across panels in the direction of increasing $\phi$ and $C^{PC}$ and decreasing $\bar{\omega}$ all the way to parameter values ($\phi = 8.2, \bar{\omega} = 68.0, C^{PC} = 4.5$), the log likelihood is essentially flat. Not only does this imply that we cannot identify the prevalence of the bequest motive, governed by $\phi$, from the strength of the bequest motive, governed by $\bar{\omega}$, but also that we cannot identify the strength of public care aversion $C^{PC}$. Likelihood ratio tests confirm that we cannot distinguish a PCA of 4.5 (with $\phi = 8.2$ and $\bar{\omega} = 68.0$) from our point estimate of 2.2 at the 95% level and a PCA value
of 9.0 (with $\phi = 7.4$ and $\varpi = 60.3$) from 2.2 at the 99% level. Values of 4.5 and 9 imply no particular aversion to public long-term care, in the sense that they are close to the regular subsistence level of consumption of 5.75. All savings beyond normal precautionary savings is explained by bequests. Our point estimate of 2.2, on the other hand, does imply strong aversion to public long-term care and no bequest motive for a substantial fraction of the population. Hence, there is no identification from an economic point of view. From a statistical point of view, the standard errors with only consumption are larger than those for our benchmark results reported below, in particular for the bequest parameters $\phi$ and $\varpi$. Yet, because they are calculated as second-order approximations near the maximum, the standard errors understate the actual degree of estimation uncertainty when the likelihood function is steep locally but much flatter globally. Figure A suggests that this is indeed the case. Thus, the main conclusion is that identification is poor with consumption data alone, even when all respondents are assumed to have common parameters.

We use model simulations to investigate whether other variables, such as the expected consumption over the next five years or realized bequests, are helpful in recovering the true preference parameter $\theta$. These alternatives do not solve the identification problem either. This is what leads us to turn to the survey questions of Section II.D as an additional source of data that is particularly well suited to identify motives.

B. With Strategic Survey Questions

The model not only predicts an optimal consumption policy, conditional on parameters $\Theta$ and demographics $\Gamma_i$, it also predicts an optimal answer to the two survey questions spelled out in Section II.D. With the optimal policies in hand, we can formally
Figure 4. Likelihood function with consumption data alone.
This figure plots likelihood function contours in \((\omega, C^{PC})\) space. Each panel is drawn for a different value of \(\phi\), mentioned in the caption of each panel. That same caption also states the maximum likelihood value and the point estimates for which that maximum value is achieved. Only consumption data are used in the estimation. The sample comprises all 498 single respondents.
incorporate data from these questions in the estimation.

For given parameters, the end-of-life survey question has a simple closed-form answer inside the model. Its answer $Z_{EOL}^*$ satisfies:

$$u(25) + \beta v(200 - Z_{EOL}^*) = u(C^{PC}) + \beta v(200),$$

where the left-hand side describes Scenario A, consuming $25K and paying $Z_{EOL}^*$ dollars from the $200K estate for private long-term care, and the right-hand side describes Scenario B, leaving all $200K as a bequest and receiving care in a government-funded facility, which gives utility $u(C^{PC})$. The value $Z_{EOL}^*(\Theta)$ makes the respondent indifferent between the two scenarios, given model parameters $\Theta$. The optimal answer to the end-of-life question does not depend on $\Gamma_i$, because the question controls for demographics. As we did for consumption data, we model individual response data to this question as a true answer $Z_{EOL}^*(\Theta)$ plus an idiosyncratic measurement error $\varepsilon_{EOL,i} \sim iidN(0, \sigma_{EOL}^2)$, as in Kimball, Sahm, and Shapiro (2008).

The solution to the lock-box question is slightly more difficult. To accommodate the scenario described, the model is modified to include funds in a bequest box ($Z_B$) and a long-term care box ($Z_{LTC}$). When an agent in period $t$ reaches the long-term care health state $s = 3$ with $Z_{LTC,t} > 0$, she uses funds from the lock box to reduce her medical costs to $\max(h(3) - Z_{LTC,t}, 0)$, leaving her with $Z_{LTC,t+1} = \max(Z_{LTC,t} - h(3), 0)$ in the long-term care lock box. In other health states, the box is not used and $Z_{LTC,t+1} = Z_{LTC,t}$. The value of $Z_B$ does not change over time and therefore does not need a time index. An agent who dies with $Z_B$ in the bequest box and other assets $b$ simply receives value $v(b + Z_B)$ from the total bequest. In this augmented version of the model, an agent in state $X_t$ with money in the lock boxes has a value function $V_t(X_t, Z_B, Z_{LTC,t})$. The respondent
in the model optimally chooses the controls \((Z_B, Z_{LTC,t})\) to maximize \(V_t(X_t, Z_B, Z_{LTC,t})\) subject to \(Z_B + Z_{LTC} = 250\) and \(Z_B, Z_{LTC,t} > 0\).\(^{22}\) Again, we model the individual response data as a true answer \(Z_{BOX}^*(X_{it}, \theta)\) plus an idiosyncratic measurement error \(\varepsilon_{BOX,i} \sim iidN(0, \sigma_{BOX}^2)\). For simplicity, we assume that the error terms on the two survey questions are uncorrelated with each other and with \(\varepsilon_{ci}\).

Our estimation asks which parameter vector \((\theta, \Sigma)\), where \(\Sigma = \{\sigma_c, \sigma_{EOL}, \sigma_{BOX}\}\) collects the measurement error standard deviations, most likely generated the respondents’ consumption and survey answers. The likelihood function for a given respondent with demographics \(\Gamma_i\) is

\[
\mathcal{L}(c_i, Z_{EOL}^i, Z_{BOX}^i | \Gamma_i, \Theta, \Sigma) = \frac{1}{\sigma_c} \Phi \left( \frac{\log c_i - \log c(\Gamma_i, \Theta)}{\sigma_c} \right) \times \frac{1}{\sigma_{EOL}} \Phi \left( \frac{Z_{EOL}^i - Z_{EOL}^*(\Theta)}{\sigma_{EOL}} \right) \times \frac{1}{\sigma_{BOX}} \Phi \left( \frac{Z_{BOX}^i - Z_{BOX}^*(\Gamma_i, \Theta)}{\sigma_{BOX}} \right).
\]

We find the maximum likelihood estimates \(\hat{\theta}\) and \(\hat{\Sigma}\) by maximizing

\[
\sum_{i=1}^{N} \log \mathcal{L}(c_i, Z_{EOL}^i, Z_{BOX}^i | \Gamma_i, \Theta, \Sigma).
\]

As before, we hold \(\beta = 0.97\) and \(\gamma = 3\) fixed, and we conduct sensitivity analysis below.

Our estimates of the key parameters of interest, using both survey questions in addition to the consumption data, are (with standard errors in parentheses): \(C^f = 5.77\) (0.28), \(C^{PC} = 2.80\) (0.14), \(\phi = 7.28\) (0.36), and \(\varpi = 47.6\) (1.5). Also, we estimate \(\sigma_c = 0.53\) (0.02), \(\sigma_{EOL} = 31.2\) (1.0), and \(\sigma_{BOX} = 49.4\) (1.6). The point estimates and standard errors are summarized in the second row of Table IV. Several remarks

\(^{22}\)The lock-box question adds substantial computational burden because it has two additional state variables. We solve for the augmented value function for each \(X_t\) state on a discrete grid of \((Z_B, Z_{LTC})\) combinations and find the maximum value.
are in order. First, the value of $\phi$ is considerably lower than in the estimation without survey questions (7 versus 12). This value for $\phi$ corresponds to the 23\textsuperscript{rd} percentile of our consumption distribution. Thus, we estimate that bequests are less of a luxury good once the survey data are included. The reason is that respondents throughout the consumption (and wealth) distribution indicate the importance of leaving a bequest through their survey responses. Figure 5 shows that there is little difference across wealth groups in the fraction of the $250K lock box dedicated to long-term care ($pctltc$) and the fraction of $200K dedicated to avoid public care at the end of life ($pctpca$). Hence, our estimation suggests that the folk wisdom that bequest motives are minimal for the vast majority of households holds up only when consumption data are used in estimation. Our survey results provide no support for this view.

Second, we now estimate a smaller value for $\varpi$ of 48. To interpret the meaning of this estimate, consider a simple special case with no discounting, no returns on assets, and no uncertainty. In such a world, consider a single retiree of age 65 with $200K in wealth and $30K in annual income, who will live a known 18 years, and face $100K in long-term care expenses at the end of life. With $\varpi = 40$, the optimal bequest is around $350K or 22 years of optimal retirement consumption. This is a strong bequest motive.

Third, with a more prevalent bequest motive, savings of the relatively less wealthy are partially explained through their bequest motive and we estimate a smaller desire to save in order to avoid public care, that is, a larger value for $C^{PC}$. Nevertheless, its value of 2.8 suggests that publicly provided long-term care has a consumption equivalent of only $2,800 per year, which is only half the value of the estimated non-long-term care consumption floor of $5,770. This indicates strong PCA, consistent with the fact that 83\% of our survey respondents preferred to go to a private long-term care facility if the cost is a reduction in bequest of $50K.
Figure 5. Survey questions for single respondents.

This figure plots the survey answers to the lock-box question (pctltc) and the end-of-life question (pctpca) by net worth decile (from low wealth on the left to high wealth on the right). The variable pctltc measures the fraction of the $250K lock box dedicated to long-term care and the variable pctpca the fraction of $200K dedicated to avoid public care at the end-of-life. The net worth deciles are the same in both panels and the decile cutoffs are based on all 498 singles. The first panel is for those with children (347); the second panel for those without children (151). The singles without children tend to be wealthier on average, so that relatively more of them are present in the higher wealth deciles.
Fourth, the measurement error standard deviation on the survey questions is relatively high because of the concentration of answers at 0% and 100% allocations (recall Figures 2 and 3). We come back to this below.

Fifth, and most importantly, all parameters in $\theta$ are well identified. Figure 6 shows that the likelihood function is now much steeper in all directions. For a given $\phi$, which is held fixed at a different value in each panel, we obtain a well-identified maximum in the $(\varpi, C^{PC})$ space. As we move across panels and consider different values of $\phi$, the maximum first increases as we approach the global maximum at $\phi = 7.3$ and then decreases again. The standard error for $\phi$ has decreased by a factor of two compared to the estimation with consumption only and the standard error for $\varpi$ by a factor of five. Likelihood ratio tests also confirm that the parameters are well identified. Hence, adding the strategic survey questions enables us to separately identify the bequest and PCA parameters of interest.

**C. Adding Heterogeneity**

So far, we have assumed that all respondents share the same parameters $\theta$. However, responses to the strategic survey questions display heterogeneity not captured by the model thus far. Comparing the top and bottom panels of Figure 5 shows that respondents with children dedicate a much smaller fraction of their extra resources to long-term care and to the avoidance of public care than those without children, consistent with a stronger bequest motive. In this section, we estimate a version of the model that accommodates limited heterogeneity in the bequest motive along this dimension.

Specifically, we postulate that the population is made of two types that differ only in the strength of their bequest motive: $\varpi_1 > \varpi_2$. We denote the parameter vectors $\Theta_1$
Figure 6. No more identification problem with strategic survey questions. This figure plots likelihood function contours in (ω, C_{PC}) space. Each panel is drawn for a different value of φ, mentioned in the caption of each panel. That same caption also states the maximum likelihood value and the point estimates for which that maximum value is achieved. Both consumption and survey response data are used.
and $\Theta_2$, in the understanding that only the value for $\varpi$ differs. The probability that a respondent is of a particular type is modeled to depend on whether she has children through the following logit:

$$Pr(\Theta = \theta_2|\text{kids}_i) = \frac{\exp\{\lambda_0 + \lambda_1(\text{kids}_i - \text{kids})\}}{1 + \exp\{\lambda_0 + \lambda_1(\text{kids}_i - \text{kids})\}}.$$

Of course, $Pr(\Theta = \Theta_1|\text{kids}_i) = 1 - Pr(\Theta = \Theta_2|\text{kids}_i)$. The parameter $\lambda_0$ controls the total fraction of people of each bequest type and $\lambda_1$ governs the change in likelihood of being in one group or the other because of having kids. We define the vector of logit coefficients $\Lambda = (\lambda_0, \lambda_1)$. In our sample of 498 singles, 70% have children. We add the $\text{kids}_i$ dummy to the list of characteristics $\Gamma_i$.

With only the consumption data, the likelihood function of a given individual respondent is

$$L(c_i|\Gamma_i, \Theta, \sigma_c, \Lambda) = \sum_{j=1,2} Pr(\theta = \Theta_j|\text{kids}_i, \Lambda) \frac{1}{\sigma_c} \Phi\left(\frac{\log c_i - \log c(\Gamma_i, \theta_j)}{\sigma_c}\right).$$

When we add the survey data, the likelihood becomes

$$L(c_i, Z_i^{EOL}, Z_i^{BOX}|\Gamma_i, \Theta, \Sigma, \Lambda) = \sum_{j=1,2} Pr(\Theta = \Theta_j|\text{kids}_i, \Lambda) \times L(c_i, Z_i^{EOL}, Z_i^{BOX}|\Gamma_i, \Theta_j, \Sigma).$$

We estimate parameters by maximizing the sum of log likelihood values across all 498 single respondents.

Using only the consumption data, introducing heterogeneity does not improve the model fit in any significant way. The estimation allowing for heterogeneity continues to support a single high value for the bequest motive parameter $\varpi$: it simply puts all the weight on the one high value $\varpi_1$ and ignores the other value $\varpi_2$. As a result,
there is no difference with the common parameter case, and there is no improvement in the likelihood function value. In other words, not only does the identification problem remain, but consumption data alone provide no evidence for preference heterogeneity.

In contrast, when we add heterogeneity to the estimation with the survey questions, we obtain a large improvement in model fit. The likelihood increases by 84.3% compared to the common parameter model. A different way of quantifying the improvement is as a decline in the measurement error standard deviation. The parameter $\sigma_{EOL}$ goes down by half, from 31.2 to 16.9; the other two measurement error standard deviation estimates remain about the same as in the common parameter model. A final way to quantify the improvement is to ask at what statistical significance level we can reject the null hypothesis of common parameters. We use a likelihood ratio test of the null hypothesis that $\varpi_1 = \varpi_2$ by comparing the log likelihood of the restricted and unrestricted models. Two times the change in log likelihood has a $\chi^2$ distribution with one degree of freedom. The test statistic is 168 with a probability value of 0.000. Hence, there is strong evidence against the null of one common bequest parameter.

The improvement in fit arises because the model is now able to better match the heterogeneity in the survey responses and in particular the differential responses of those with and without children. Of our two estimated values for the bequest motive, one is close to the previous estimate ($\varpi_1 = 47.5$) and one is substantially lower ($\varpi_2 = 8.33$). For respondents with children, we estimate a 86% probability of being the high type. For respondents without children, the probability is only 72%. The logit parameters $\Lambda$, as well as the $\theta$ parameters, are well identified. The point estimates and standard errors are reported in the last row of Table IV. A stronger bequest motive for those with children is consistent both with intuition and with our survey response analysis of the lock-box questions (recall Figure 5). Figure 7 illustrates the improvement in the model’s fit to
the end-of-life survey question, which is responsible for the overall improvement in fit. The dashed line plots the model’s prediction for the answer to the end-of-life question under preference heterogeneity; the solid line is for the model with homogenous bequest motive. The histogram plots the actual survey responses in our sample. The model with heterogeneity is a closer fit to the empirical distribution of the survey answers thanks to its two mass points at low and high responses. Unlike the analysis using only the consumption data, the survey data provide strong evidence of heterogeneity in the bequest motive and, in particular, suggest differences between those with and without children.

![Figure 7](image)

**Figure 7. Improvement in fit for heterogeneous bequest model.** This figure plots the model’s fit to the end-of-life strategic survey question under the assumptions of homogeneity and heterogeneity in the bequest motive. The bars overlay the observed survey answers.

Hurd (1987) identifies similar spending patterns of otherwise similar retired households with and without children. This finding has generally been interpreted as evidence against bequest motives. While we find a similar pattern of spending in our respondents, our final estimates suggest possible differences in motivation. Those without children appear more motivated to save for precautionary reasons than for bequest reasons, relative
D. Sensitivity Analysis

As a first robustness check, we repeat the estimation of the model with common preference parameters based on both consumption and survey data, but holding the risk aversion fixed at different values from their benchmark. In the model, the risk aversion coefficient $\gamma$ governs risk aversion over both consumption and bequests. We consider $\gamma = 2, 5, 10$. The third through fifth rows of Table IV contain the results. As risk aversion goes up, the standard precautionary savings motive goes up, ceteris paribus. As a result, the consumption floor $C^f$, which also affects precautionary savings, does not have to be as low. Our point estimate goes up from $C^f = 5.70 (0.37)$ for $\gamma = 2$ to $6.62 (0.18)$ for $\gamma = 10$. The luxury bequest parameter $\phi$ remains largely unchanged, but the strength of bequest parameter $\varpi$ decreases from $51.2 (2.5)$ for $\gamma = 2$ to $27.1 (1.5)$ for $\gamma = 10$. The marginal value of a bequest depends not only on the parameters $\varpi$ and $\phi$, but also on the risk aversion $\gamma$. When risk aversion is higher, a lower $\varpi$ is necessary to make the same bequest strategy optimal. As risk aversion increases, $C^{PC}$ increases from $1.43 (0.05)$ for $\gamma = 2$ to $8.94 (0.22)$ for $\gamma = 10$. Despite the increases in the point estimate of $C^{PC}$, the strength of PCA is about the same as for our benchmark case. As with bequests, a given PCA corresponds to a higher consumption equivalent of public long-term care if the curvature parameter $\gamma$ of the utility function is higher. The following equivalence calculation illustrates. Consider an agent with consumption of $\$17K$ (the 75th percentile of our distribution) and ask how much consumption she would forgo to avoid a lottery that grants her consumption $\$17K$ with probability 0.95.

---

23Stronger precautionary saving motives for those without children possibly reflect the lack of a safety net (implicit insurance) from the family. The broader question of how family relations interact with the power of bequest and precautionary motives is an interesting avenue for future research.
and consumption $C^{PC}$ with probability 0.05. At our baseline estimates of risk aversion and $C^{PC}$, we find she would sacrifice $6.8K. At our estimates with $\gamma = 2$, the answer is $6.0K, at \gamma = 5$ it is $5.7K, and at \gamma = 10$ it is $8.9K. The latter number is, if anything, higher than in the benchmark, suggesting a somewhat stronger PCA motive.

In conclusion, the strength of PCA (precautionary savings) is driven by both $C^{PC}$ and risk aversion and is estimated to be similar for different values of risk aversion.

### Table IV

**Summary Table of Estimates**

The table reports maximum likelihood estimates of the structural parameters of the model under different specifications. Asymptotic standard errors are in parentheses, next to the point estimate. The first row uses only consumption data in the estimation. All other rows use both consumption and survey data in estimation. The second row is our benchmark estimation. The third through eighth rows report sensitivity analysis. The last row reports the heterogeneity case, where the bequest motive takes on one of two values.

<table>
<thead>
<tr>
<th></th>
<th>$C^f$</th>
<th>$\phi$</th>
<th>$\omega$</th>
<th>$C^{PC}$</th>
<th>$\sigma_c$</th>
<th>$\sigma_{BOX}$</th>
<th>$\sigma_{EOL}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cons. only</strong></td>
<td>5.75</td>
<td>.29</td>
<td>12.06</td>
<td>93.7</td>
<td>2.20</td>
<td>.526 (.017)</td>
<td></td>
</tr>
<tr>
<td><strong>Benchmark</strong></td>
<td>5.77</td>
<td>.28</td>
<td>7.28</td>
<td>47.6</td>
<td>2.80</td>
<td>.532 (.017)</td>
<td>49.4 (1.6)</td>
</tr>
<tr>
<td>$\gamma = 2$</td>
<td>5.70</td>
<td>.37</td>
<td>7.34</td>
<td>51.2</td>
<td>1.43</td>
<td>.535 (.017)</td>
<td>51.4 (1.6)</td>
</tr>
<tr>
<td>$\gamma = 5$</td>
<td>4.63</td>
<td>.15</td>
<td>7.55</td>
<td>32.3</td>
<td>5.64</td>
<td>.553 (.018)</td>
<td>44.7 (1.4)</td>
</tr>
<tr>
<td>$\gamma = 10$</td>
<td>6.62</td>
<td>.18</td>
<td>7.69</td>
<td>27.1</td>
<td>8.94</td>
<td>.542 (.017)</td>
<td>41.3 (1.3)</td>
</tr>
<tr>
<td><strong>long-term care=70k</strong></td>
<td>5.41</td>
<td>.38</td>
<td>5.87</td>
<td>28.2</td>
<td>3.06</td>
<td>.547 (.018)</td>
<td>46.7 (1.6)</td>
</tr>
<tr>
<td><strong>lock box only</strong></td>
<td>5.81</td>
<td>.30</td>
<td>5.10</td>
<td>19.7</td>
<td>2.32</td>
<td>.568 (.018)</td>
<td>43.1 (1.4)</td>
</tr>
<tr>
<td><strong>EOL only</strong></td>
<td>5.70</td>
<td>.30</td>
<td>8.67</td>
<td>69.4</td>
<td>3.16</td>
<td>.528 (.017)</td>
<td></td>
</tr>
<tr>
<td><strong>Heterogeneity</strong></td>
<td>5.75</td>
<td>.28</td>
<td>6.69</td>
<td>47.5</td>
<td>3.46</td>
<td>.554 (.018)</td>
<td>48.9 (1.5)</td>
</tr>
<tr>
<td></td>
<td>$\omega_1$</td>
<td>47.5</td>
<td>(2.7)</td>
<td>3.46</td>
<td>(1.2)</td>
<td>.554 (.018)</td>
<td>48.9 (1.5)</td>
</tr>
<tr>
<td></td>
<td>$\sigma_c$</td>
<td>3.46</td>
<td>(1.2)</td>
<td>3.46</td>
<td>(1.2)</td>
<td>.554 (.018)</td>
<td>48.9 (1.5)</td>
</tr>
<tr>
<td></td>
<td>$\sigma_{BOX}$</td>
<td>48.9</td>
<td>(1.5)</td>
<td>48.9</td>
<td>(1.5)</td>
<td>.554 (.018)</td>
<td>48.9 (1.5)</td>
</tr>
<tr>
<td></td>
<td>$\sigma_{EOL}$</td>
<td>16.9</td>
<td>(.59)</td>
<td>16.9</td>
<td>(.59)</td>
<td>.554 (.018)</td>
<td>48.9 (1.5)</td>
</tr>
</tbody>
</table>

As a second check, we estimate the model with a lower and higher interest rate ($r = 1.02$ and $1.04$) and find estimates similar to the baseline results.

As a third check, we increase the out-of-pocket costs of long-term care from $50K per year to $70K per year to consider an expensive scenario. Recall that some of our respondents (10%) estimate the cost of a private long-term care facility to be high (above $100K per year). The sixth row of Table IV shows that our measure of PCA remains virtually unchanged, and the bequest motive becomes slightly more prevalent, although
weaker for those for whom it is operative (lower $\varpi$). With higher long-term care costs, the likelihood of leaving a (smaller) bequest is smaller (higher). Therefore, for the same consumption and savings data to be optimal, the bequest motive must be weaker, and this is indeed what we find.

As a final robustness check, we estimate the model using the two survey questions individually, as opposed to jointly. The results are in the seventh row for the lock-box question and in the eighth row for the end-of-life question. The end-of-life question pushes our estimates for $\phi$, $\varpi$, and $C^{PC}$ up, while the lock-box question suggests lower estimates for these parameters. This is a direct consequence of the fact that many survey respondents set aside a substantial amount of the lock box towards long-term care, more so than for the end-of-life question. Hence, the estimation with the lock-box question suggests stronger PCA than the one with the end-of-life question.

E. The Distribution of Bequests

While the introduction and estimation of PCA is our main focus, our work also sheds light on the strength and prevalence of the bequest motive. In this section, we investigate whether our model implies a plausible distribution of realized bequests.

Specifically, we compare simulated bequests using our model and our 2005 sample with realized bequests from Hurd and Smith (2002), based on the AHEAD sample. In so doing, we make two adjustments necessary to make the two data samples comparable. First, we multiply the AHEAD data by 1.32 to account for inflation between 1993 and 2005. Second, we make adjustments related to cohort effects. Following the research of

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24The Hurd and Smith sample uses respondents born before 1924 and who died between 1993 and 1995. The IQR for age in our 2006 sample is age 58 to 68, corresponding to birth years 1938 to 1948. Most of our respondents are from the Health and Retirement Survey cohort (born between 1931 and 1941) and from the two subsequent cohorts (“War Babies,” 1942 to 1947 and 1948 to 1953): 35%, 29%,

44
Bosworth and Smart (2009), we conclude that because of cohort differences, our sample is 2.16 times wealthier than the AHEAD sample.\textsuperscript{25,26}

Table V compares the simulated bequest distribution for singles in our model with the Hurd and Smith (H&S) data. The first column reports the moments of the realized bequest distribution we are studying. The second column reports the raw H&S data for singles from the AHEAD cohort. The third column adjusts the H&S numbers for inflation and for cohort effects in wealth, effectively making the data comparable to the predictions from our model. The fourth column reports the model predictions for realized bequests (of singles), as implied by the benchmark parameter estimates, listed in the second row of Table IV. The fifth column reports the percentage distance between the benchmark model and the (adjusted) data.

As in the data, the model delivers a sizeable fraction of zero bequests, and a very skewed and fat-tailed distribution because of sizeable bequests by the wealthy. Thus, it captures the salient features of the observed bequest distribution. More precisely, simulations indicate that 29% of realized bequests are zero in the model, similar to the 25% in the AHEAD data. Second, the mean and median of the realized bequest distribution are about 10% higher than those in the data. Third, the model generates the right amount of skewness, as measured by the ratio of the mean to the median, which is 2.01 in the model and 2.05 in the data. Fourth, the model generates a fat right tail

\textsuperscript{25}They calculate an average wealth among respondents age 60-69 in the 2003 to 2005 PSID (roughly the same cohort as our sample) of approximately $410,000. In the 1984 PSID, households with heads ages 60-69 (birth year 1915 to 1924, roughly corresponding to the AHEAD sample) had slightly less than half this amount of wealth, with mean approximately $190,000. The PSID wealth adjustment factor for the AHEAD cohort is 410/190 = 2.16.

\textsuperscript{26}Related to this, Hurd and Smith (2002) also document that subjective bequest probabilities are much higher for the later cohorts than for the earlier ones. The increase between the 1942 to 1947 and the pre-1923 cohort in the subjective probability of leaving a bequest that is greater than either $10,000 or $100,000 is more than eight percentage points: 74.6% versus 66.2% and 46.4% versus 38.3%, respectively (see their Table 4).
The first column reports the moments of the realized bequest distribution we are studying. The second column reports the raw Hurd and Smith (2002) data for singles from the AHEAD cohort (H&S). The third column adjusts the H&S numbers for inflation and for cohort effects in wealth, effectively making the data comparable to our model. The inflation adjustment factor is 1.32 and the cohort adjustment factor for wealth is 410/190=2.16. The fourth column reports the model predictions for realized bequests for singles (our model is only for singles), as implied by the benchmark parameter estimates listed in the second row of Table III. The fifth column reports the percentage distance between the benchmark model and the (adjusted) data. The sixth column reports the realized bequests from the model estimated on consumption data only; the estimates are listed in the first row of Table III. The seventh column reports the percentage distance between the consumption-only model and (adjusted) data.

<table>
<thead>
<tr>
<th>Moment</th>
<th>Data</th>
<th>Data Adjusted</th>
<th>Model Benchmark</th>
<th>Model - Data %error</th>
<th>Model Cons only</th>
<th>Model - Data %error</th>
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<tbody>
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<td>Mean</td>
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<td>234</td>
<td>257</td>
<td>10%</td>
<td>382</td>
<td>64%</td>
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<tr>
<td>Median</td>
<td>40</td>
<td>114</td>
<td>128</td>
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<td>143</td>
<td>26%</td>
</tr>
<tr>
<td>70</td>
<td>80</td>
<td>228</td>
<td>310</td>
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<td>391</td>
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<tr>
<td>90</td>
<td>188</td>
<td>536</td>
<td>688</td>
<td>28%</td>
<td>1166</td>
<td>118%</td>
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<tr>
<td>95</td>
<td>250</td>
<td>712</td>
<td>955</td>
<td>34%</td>
<td>1686</td>
<td>137%</td>
</tr>
<tr>
<td>98</td>
<td>600</td>
<td>1709</td>
<td>1238</td>
<td>-28%</td>
<td>2350</td>
<td>38%</td>
</tr>
</tbody>
</table>

of the actual bequest distribution, over-predicting the 70th, 90th, and 95th percentiles by about 30%, and under-predicting bequests at the 98th percentile by about 30%. We conclude that our benchmark parameter estimates imply a reasonable description of the observed bequest distribution. They corroborate our claim that bequest motives may be more prevalent than usually thought.²⁷

In contrast, the model estimated from consumption data alone (using the estimates listed in the first row of Table IV) implies a realized bequest distribution that is a worse match to the observed bequest distribution than the benchmark model that adds the survey questions in estimation. Columns 6 and 7 of Table V indicate an average

²⁷Based on the same AHEAD data, Fink and Redaelli (2005) reach a similar conclusion: “As to the data, the overall picture is quite clear: about 50% of the population in the sample indicate to be certain to leave some bequests, which does not only show that intentional bequest motives are operative, but also that bequests matter for a significantly large part of the population.” Their and our findings are also in line with McGarry (1999) and Laitner and Ohlsson (2001).
bequest of $382K and a median bequest of $143K, 64% and 26% higher than in the data, respectively. Furthermore, the model without survey questions implies a bequest distribution that is too skewed. It has a ratio of mean to median of 2.67 compared to 2.05 in the data. Finally, the right tail of the bequest distribution becomes too thick. The 70\textsuperscript{th} to 95\textsuperscript{th} percentiles are 72 to 137\% above the numbers observed in the data, with the 98\textsuperscript{th} percentile still 38\% too high.

As a related check on the plausibility of the model predictions, we compare the model-implied and observed consumption and wealth profiles by cohort (see Section D.4 of the Internet Appendix). As in the data, the consumption profiles in the model simulations do not display the downward trend in consumption that would be expected in a standard life-cycle model. Also as in the data, we see little evidence of a run-down in wealth late in life. The model’s main drawback is too much consumption and too little wealth accumulation for healthy and wealth elderly households. Several extensions of our model may be able to improve on this dimension. First, one could allow for different mortality rates at different wealth levels, as in De Nardi, French, and Jones (2010). Second, one could generalize the bequest function, for example, by allowing for a different curvature parameter over bequests than over consumption while alive. A lower curvature parameter over bequests would imply a stronger bequest motive for the wealthy.

**IV. Product Innovation in Retirement Finance**

We conclude with a brief illustration of the value of our estimation exercise for product design in the market for retirement finance. As discussed in the introduction, actual take-up rates for existing annuity products are low. Both PCA and bequest motives
may explain such low take-up. Our previous estimation quantifies the importance of both motives, and hence enables a precise evaluation of the willingness to pay for new products. Given the strong PCA we estimate, in this section we explore an annuity product that has additional pay-outs in the long-term care state.

The idea of a long-term care-annuity combination first emerged in Pauly (1990). The mechanics of the policy are straightforward. Assuming actuarial fairness and complete information, suppose that a long-term care policy paying $X$ dollars per month in the long-term care state costs $Y$ dollars per month. Assume also that a standard life annuity paying $A$ dollars per month costs $B$ dollars under the same assumptions. Purchasing the combination policy consists of paying $B$ dollars to obtain a life annuity, then using $Y$ dollars of the annuity payments to obtain long-term care benefits $X$. Hence, the combination product pays a monthly benefit of $(A-Y)$ in non-long-term care, non-death states, and $(A+X)$ dollars in the long-term care state (assuming premiums cease once the individual claims long-term care benefits), and nothing at death. Furthermore, the combination product may be cheaper because it alleviates potential adverse selection problems in both the long-term care and the standard annuity component: people who enter in long-term care typically live less long.

Figure 8 plots the willingness to pay (WTP), as a fraction of fair market value, for two annuity products. The WTP is calculated for a healthy 62-year-old woman with annual income of $22K and wealth of $300K. This person roughly corresponds

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28The most detailed suggestions to date for a life annuity long-term care combination product are provided in Murtaugh, Spillman, and Warshawsky (2001, 2003). The product idea is a straightforward combination of a life annuity with a disability type “pop up” benefit triggered by long-term care needs. The particular product that they outline combines a life-time immediate annuity of $1,000 (nominal) per month, with an additional payment of $2,000 monthly for annuitants with two activities of daily living (ADL) impairments or severe cognitive impairment, plus another $1,000 monthly if the annuitant had four ADL impairments. Ameriks et al. (2008) calculate the value of several other products, using the estimation results of (a previous version of) this paper.

29Murtaugh, Spillman, and Warshawsky (2001) estimate that their combination product would be roughly 3% cheaper than if the two products were purchased separately.
to the 75th percentile of our respondent distribution. The first product is a standard life annuity that makes an annual (real) payment of $5,000 (left panel). The second product is a combination policy that pays $5,000 every year in which the buyer is alive and not in long-term care (health states 1 or 2) and $15,000 when the buyer is in the long-term care state (right panel). The fair value of the combination policy is $98.7K, while the fair value of the standard annuity is $85.7K. All parameters are at the baseline estimates of Section III.B. At this baseline, we obtain a WTP of 0.94 for the standard annuity, recovering the lack of interest in standard annuities, but a WTP of 1.10 for the combination product. That is, this person would be willing to pay a 10% premium over the zero-load cost for the combination product. The figure further investigates how the WTP varies with the strength of PCA (the parameter $C^{PC}$ is on the vertical axis) and the strength of the bequest motive (the parameter $\alpha$ is on the horizontal axis). For the standard annuity, the WTP decreases with the bequest motive and increases with PCA (decreases with $C^{PC}$). It never exceeds the zero-load value of one over the range of parameters plotted. For the combination product, the WTP also decreases with the bequest motive and increases with PCA. In the same range of parameters, the WTP reaches 50% above the zero-load cost. Intuitively, for the retiree with no PCA, long-term care insurance is undesirable because it consumes resources and delivers benefits in states that are not of great concern. However, in the neighborhood of our parameter estimates, we predict that there should be a substantial demand for long-term care insurance, even if offered at loads as high as 50%. For those who dislike public long-term care (or fear the depletion of their bequest), the long-term care insurance component of the policy provides insurance against the risk that most strongly threatens their financial security.

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30Such a combination product should be even more valuable for couples than for the singles we considered in the estimation. Modeling the intricacies of household dynamics in the context of retirement planning is a task we leave for future research.
The clear conclusion of this exercise is that both PCA and bequest motives contribute to the lack of demand for standard annuities. Our estimation suggests that PCA is significant, resulting in considerable demand for long-term care insurance products. Any attempt to bring a credible long-term care insurance product to the market, either alone or coupled with an annuity, would be tremendously valuable and should receive great interest in the market.

V. Conclusion

Lack of wealth decumulation and under-annuitization in retirement are two pervasive puzzles in household finance. Two potential explanations for these puzzles are bequest motives and public care aversion (PCA), the desire to avoid simultaneously running out of wealth and needing long-term care, and hence having to rely on publicly provided long-term care pop-up.
term care at the end-of-life. This paper develops a life-cycle model of retiree choice and identifies the importance of PCA. In order to disentangle the relative importance of PCA and the bequest motive, we estimate our structural model of the retirement phase using a novel survey instrument. We find that PCA is a crucial driver of precautionary savings. We also find that bequest motives are more prevalent than previously thought. By formulating and estimating the structural parameters of a retirement savings model, we provide important ingredients for the design of new financial products. Our estimation results suggest a strong demand for annuity products with long-term care insurance features. On the normative side, further progress in the design of new products is of high practical interest, given that 75 million baby boomers are about to retire in the U.S. alone. On the positive side, future work could enrich the model’s bequest function and mortality risk dynamics with a view towards improving the fit of consumption and wealth profiles.
Appendix A. Bequest Motive

To understand the motivation for our choice of \( v(b) \), consider a simple model in which an agent starts with wealth \( X \) dollars at retirement. There is no uncertainty with respect to health nor mortality: the agent is in good health with zero medical expenses for exactly \( n \) years and then dies. The real rate of return on wealth is zero and on labor income is zero. In each year of life, the agent consumes \( c \) dollars, deriving annual utility \( u(c) = c^{1-\gamma}/(1-\gamma) \). Upon death, the agent bequeaths the remaining \( b = X - nc \), receiving the utility specified by equation (3). The agent’s problem is to choose the optimal annual consumption level \( c \) that maximizes total utility. The first-order condition shows that the solution is to choose an annual consumption \( c^* \) such that bequest satisfies \( b^* \equiv X - nc^* = \varpi(c^* - \phi) \). In other words, the agent leaves an inheritance to cover \( \varpi \) years of spending at an annual expenditure level \( (c^* - \phi) \), the amount by which his own optimal annual consumption exceeds the threshold \( \phi \). If \( X \) is insufficient to allow the agent to consume more than \( \phi \) dollars each year, no bequest is left.

Appendix B. Health Transition Calibration

The distribution of medical costs in our model is controlled by the medical costs associated with each health state and by the one-period \( 4 \times 4 \) state transition matrix \( P(a) \), where \( a \) denotes age in excess of 62. This matrix is parameterized by 12 parameters, nine that determine the value of \( P(0) \) (of the 16 elements, four are fixed by the death state being absorbing and there are three further restrictions so that each row sums to one) and three that control the flow of probability from greater health to poorer health as age increases. We calibrate these 12 parameters to match eight moments related to long-term care utilization and four moments related to longevity. Table I shows the moments we match, their target value, and our best fit. The last four rows show some features of the distribution of medical costs. More precisely,
the one-period-ahead transition matrix at age 62 + a is given by $P(a) =$

$$\begin{bmatrix}
p_{11} & p_{12} & p_{13} & 1 - p_{11} - p_{12} - p_{13} \\
p_{21} & p_{22} & p_{23} & 1 - p_{21} - p_{22} - p_{23} \\
p_{31} & p_{32} & p_{33} & 1 - p_{31} - p_{32} - p_{33} \\
0 & 0 & 0 & 1
\end{bmatrix} \begin{bmatrix}
1 - c_1 a^e & c_1 a^e \left( \frac{c_2 c_3}{1 + c_2 + c_3 c_2} \right) & c_1 a^e \left( \frac{c_3}{1 + c_2 + c_3 c_2} \right) & c_1 a^e \left( \frac{1}{1 + c_2 + c_3 c_2} \right) \\
0 & 1 - c_1 a^e & c_1 a^e \left( \frac{c_2}{1 + c_2} \right) & c_1 a^e \left( \frac{1}{1 + c_2} \right) \\
0 & 0 & 1 - c_1 a^e & c_1 a^e \\
0 & 0 & 0 & 1
\end{bmatrix}.$$ 

The second matrix is the age adjustment. It shifts probability mass from the left (better health states) towards the right (worse health states and death), relative to the transition matrix at age 62, $P(0)$. The three parameters $c_1$, $c_2$, and $c_3$ control how fast this shifting occurs. Loosely speaking, the parameter $c_1$ controls the transition from long-term care to death as age increases; $c_2$ determines how much more likely death is relative to long-term care when in health state 1 or 2; and $c_3$ determines how much more likely state 2 is when in good health. The exponent $e$ allows for faster than linear probability shifting as the agent becomes older, and is held fixed at $e = 1.5$. We note that there is no unique solution to the system of 12 equations and 12 parameters because the system is highly nonlinear. We use a nonlinear least squares procedure to obtain the best fit. For males, we find the following transition probabilities (multiplied by 100): $p_{11} = 96.3945$, $p_{12} = 3.3547$, $p_{13} = 0.0020$, $p_{14} = 0.2489$, $p_{21} = 33.6005$, $p_{22} = 56.0655$, $p_{23} = 6.5959$, $p_{24} = 3.7381$, $p_{31} = 2.4812$, $p_{32} = 13.6231$, $p_{33} = 74.6274$, $p_{34} = 9.2683$, and scale parameters $c_1 = 0.001441$, $c_2 = 0.8966$, and $c_3 = 0.5643$. For females, we use the following transition probabilities (multiplied by 100): $p_{11} = 97.2199$, $p_{12} = 2.778$, $p_{13} = 0.003$, $p_{14} = 0.000$, $p_{21} = 34.0$, $p_{22} = 56.0$, $p_{23} = 6.0$, $p_{24} = 4.0$, $p_{31} = 0.5$, $p_{32} = 12.0$, $p_{33} = 85.0$, $p_{34} = 2.5$, and scale parameters $c_1 = 0.001347$, $c_2 = 1.3$, and $c_3 = 1.1$. To scale the moments to the same units, and to attach more importance to matching some moments than others, we use the following weights on the 12 moments: 100, 5, 10, 100, 100, 100, 100, 1, 4, 5, 6, and 7. Finally, since the data on long-term care usage pertain to individuals 62 or older, we assume that the health status stays constant for individuals aged 55-62.
Appendix C. Additional Testable Implications

In this appendix, we compare several other quantitative predictions of our model to the data: average and extreme medical expenditures and public long-term care usage. A related discussion on realized bequests is located in Section III.E. To compute these statistics in the model, we take all the single respondents in our survey who are younger than 62, and record their reported health state, income, and wealth. We then simulate 250 sample paths for each one, where sample paths differ by the realized health shocks (including mortality). The simulation uses the parameter estimates of the model with common parameters where consumption and survey data are used; see Section III.B.

Average Medical Spending First, we compute out-of-pocket (OOP) medical expenditures in the model simulation, averaged by age and income groups among those that are alive. These are actually incurred health costs, that is, OOP medical expenditures of those not declaring bankruptcy and not going on public long-term care (Medicaid). Panel A of Table A.I tabulates this average OOP spending. The model predicts medical expenses that rise with age, and much more so in the higher income percentiles. The difference in medical spending between the high- and low-income groups is a result of the poor being more likely to go bankrupt when hit by a health shock, in which case they rely on publicly provided medical care rather than paying expenses out-of-pocket. Most of the increase in out-of-pocket medical spending by age arises from the increased likelihood of long-term care (health state 3). But there is also a slight increase in the likelihood of being in the poor health state (state 2) by age. This is consistent with the conclusion of Stewart (2004), who shows that out-of-pocket medical expenses increase only slightly in age when long-term care expenditures are excluded, but increase dramatically once long-term care is included.

In more detail, we find that average medical expenses start around $3.7K at age 65, climb to $4.4K by age 75, to $8.0K at 85, and to $11.8K at 95. If we exclude all long-term care expenses, the corresponding numbers at age 65, 75, 85, and 95 are $2.6K, $1.9K, $2.5K, and
Table A.1
Additional Testable Implications

Panel A reports average out-of-pocket (OOP) medical expenses in thousands of dollars and Panel B reports public long-term care (Medicaid) utilization rates. The left columns report the values that arise from simulating the model under the benchmark parametrization. In particular, for each respondent under age 62 in our sample, we simulate 250 sample paths with randomly drawn health shocks. We start of each respondent with his or her reported income, wealth, and health status. For each sample path, we keep track of OOP medical expenses and Medicaid usage, defined as being in the long-term care state and unable to afford private long-term care. The right columns report the values for the data. The data are from wave 5 (2004) of the Health and Retirement Survey. The population of respondents include those who answered either Yes or No for having Medicaid Insurance with nonmissing household income in 2000. Using long-term care is defined as having used nursing home care or home care in the previous two years. The income cutoffs that define the income percentiles are the same in model and data.

<table>
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<th>Income %</th>
<th>&lt;10</th>
<th>10-30</th>
<th>30-50</th>
<th>50-70</th>
<th>70-90</th>
<th>&gt;90</th>
<th>&lt;10</th>
<th>10-30</th>
<th>30-50</th>
<th>50-70</th>
<th>70-90</th>
<th>&gt;90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 65</td>
<td>2.7</td>
<td>3.5</td>
<td>4.2</td>
<td>5.0</td>
<td>3.5</td>
<td>1.5</td>
<td>1.6</td>
<td>2.1</td>
<td>2.2</td>
<td>2.2</td>
<td>2.1</td>
<td>2.7</td>
</tr>
<tr>
<td>Age 75</td>
<td>2.2</td>
<td>3.9</td>
<td>5.1</td>
<td>6.3</td>
<td>6.6</td>
<td>5.6</td>
<td>1.2</td>
<td>2.8</td>
<td>2.4</td>
<td>2.4</td>
<td>2.5</td>
<td>3.1</td>
</tr>
<tr>
<td>Age 85</td>
<td>3.1</td>
<td>7.1</td>
<td>10.4</td>
<td>11.0</td>
<td>10.6</td>
<td>13.9</td>
<td>2.7</td>
<td>3.9</td>
<td>3.4</td>
<td>4.7</td>
<td>5.0</td>
<td>7.3</td>
</tr>
<tr>
<td>Age 95</td>
<td>3.7</td>
<td>10.3</td>
<td>15.9</td>
<td>17.8</td>
<td>16.9</td>
<td>14.6</td>
<td>4.7</td>
<td>11.3</td>
<td>13.0</td>
<td>29.9</td>
<td>18.7</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Panel B: Medicaid Usage

| Age 65    | 4.3  | 3.5   | .1    | .0    | 11.0  | 2.9 | .4   | .2   | .1   | .2   |
| Age 75    | 7.1  | 5.3   | .2    | .5    | .0    | 13.9| 5.0  | .4   | .5   | .0   |
| Age 85    | 14.7 | 9.0   | 2.6   | .4    | .0    | 22.9| 5.6  | 2.1  | .0   | .0   |
| Age 95    | 25.3 | 14.8  | 3.9   | .3    | .0    | 32.1| 15.2 | 1.1  | .0   | .0   |

$3.2K. Overall, for the entire population over 65, the mean annual cost is $5.5K with long-term care expenses and $2.1K without them. The out-of-pocket expenses conditional on age are similar for men and women (not reported), consistent with the findings of French and Jones (2004).

Based on data from waves 2 through 5 of the Health and Retirement Survey (HRS), French and Jones (2004) report average annual expenses of $2.8K for those over 65 in 2000. Since these surveys start out with a sample of the non-institutionalized population in wave 1, their waves 2 through 5 contain some but far from all long-term care expenses. Even wave 5 has an average number of nights per year in nursing homes that is still 22% below the nationwide average. Hence, the $2.8K average expense they find is slightly above the actual non-long-term care average expense. In fact, our health costs in states 1 and 2 were calibrated to match a $2K average non-long-term care cost, which is the HRS average for single households. Our health costs in long-term care state 3 were calibrated to match the observed out-of-pocket
costs of a semi-private room in a nursing home in 2005. To further compare model to data, we collected data from the 2004 HRS (wave 5) ourselves. We sorted the 10,039 respondents into six income groups and four age groups (five-year buckets centered around ages 65, 75, 85, and 95) and calculated average OOP medical expenses for each cell. They are reported in the right columns of Panel A in Table A.I. The income group cutoffs in the model are set equal to those in the data. The magnitudes and age/income patterns are broadly consistent between model and data. The model has slightly higher expenditures because we have a smaller fraction of respondents below age 65 that report being in good health than in the population at large. We also have slightly higher expenditures at age 85, presumably because the HRS misses a fair share of long-term care costs especially for this age group. Finally, we generate about the right amount of medical expenditures at age 95. We conclude that our (simple) model does a good job matching observed average out-of-pocket medical expenses.

**Catastrophic Expenditures** An interesting question is whether the model generates the right amount of out-of-pocket medical expense risk. One important feature of that risk is the probability of a disastrous health outcome. Underestimating such tail risk may lead the model to underestimate the strength of the precautionary savings motive (and overestimate the strength of the bequest motive). We show that this is not the case for our calibration. To quantify the tail risk, we calculate the present discounted value of future out-of-pocket medical expenses at age 62, based on the same simulation used to compute average expenditures. Following French and Jones (2004), we use a 3% discount rate and take into account survival when discounting. For men, our model generates a median out-of-pocket cost of $36.3K and a mean cost of $58.2K. In the right tail, 43% of men incur expenses over $43.5K, 12% over $125K, and 2% over $250K. For women, our model generates a median out-of-pocket cost of $46.2K and a mean cost of $74.8K. In the right tail, 53% of women incur a life-time discounted health shock over $43.5K, 18% over $125K, and 4% over $250K. These numbers make clear that agents in our model face enormous OOP medical expense tail risk. Our estimates are so high because the tail events typically involve long spells of long-term care.
**Medicaid Utilization Rates** Consistent with the rules on Medicaid utilization in the U.S., the model assumes that only households who have run out of resources can use Medicaid to pay for long-term care. Using the same model simulation as for the calculation of average medical expenses, Panel B of Table A.I reports public care utilization rates implied by our benchmark model. The model generates a concentration of utilization in the lowest income groups and an increasing pattern with age.

To compare model to data, we again use the HRS to study Medicaid utilization rates for long-term care. In particular, we calculate the fraction of respondents that have Medicaid and received either nursing home care or home care in the previous two years. The fraction of those in the overall sample is 3.2%. The right columns of the same Panel B show the Medicaid utilization rates in the HRS data. In the lowest income group, where the bulk of the Medicaid-paid long-term care use is concentrated, we find utilization rates of 11% at age 65, 14% at age 75, 23% at age 85, and 32% at age 95.

Medicaid utilization rates for this group in the model are several percentage points lower than the data at each age but rise with age at the same rate. The model’s utilization rates in this lowest group are: 4% at age 65, 7% at age 75, 15% at age 85, and 25% at age 95. The model’s predictions for utilization in the next-lowest income group are in good agreement with the data. At higher incomes, the decreasing rate of Medicaid utilization with income is somewhat slower in the model than in the data.

Finally, the 2003 Medicare Current Beneficiary Survey shows that 44.7% of the $86 billion in aggregate long-term care expenses in 2003 were paid for by Medicaid. In our model simulation, Medicaid covers 41% of all long-term care costs. We conclude that the model implies public long-term care usage that fits the data well.
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A. Why Online?

The paper illustrates that survey research is essential for our purpose of parameter identification. We spent some time considering our options in terms of survey mode. One possibility would have been to place the strategic survey questions on a standard survey, such as the Health and Retirement Survey, henceforth HRS, or the Consumer Expenditure Survey, henceforth CEX. In practical terms, this would have required a supplemental survey rather than being placed directly onto the body of the main survey. The second would have been to design a custom survey of Vanguard customers. The final possibility, and the one selected, involved use of a well-respected supplier of internet survey services.

Inserting questions into large-scale, well-known surveys is a strategy that has proven successful for researchers such as Johnson, Parker, and Souleles (2006) (using the CEX) and Barsky, Juster, Kimball, and Shapiro (1997) (using the HRS). On the one hand, this approach has advantages in that the data set is well known in terms of its sampling properties (demographic and socioeconomic make-up) and data quality. On the other hand, the drawback of going the large-scale survey route


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is that one has a very tight space constraint due to the high cost of conducting such surveys. The nature of our research question, separating bequest and precautionary motives, required a highly specific and rich economic and demographic context. We needed to collect information on consumption, income, and wealth, health states, health costs, as well as attitudes towards Medicaid and towards planning for a bequest. This need was the primary motivation for choosing the internet survey route.

A secondary motivation to custom design was methodological, namely, to further our understanding of how best to design surveys over the internet. There is increasing evidence that such surveys have potentially great value to add. As Schonlau et al. (2006) write:

Internet interviewing and experimentation open up unique new possibilities for empirical research in the social sciences. It creates opportunities to measure new or complex concepts (e.g., preferences, attitudes, expectations and subjective probabilities) that are hard to measure with other interview modes and to design better measurement methods for existing “standard” concepts (e.g., income, wealth). Moreover, all this can be achieved in much shorter time frames than is customary in more traditional survey research. Usually, empirical researchers in the social sciences have to use data collected by others or, if they want to collect data themselves, face time lags of often several years between a first draft of a questionnaire and the actual delivery of the data. Internet interviewing can reduce this time lag. This alone changes the opportunities for empirical research in the social sciences dramatically.

Despite the promise, one well-documented drawback of internet surveys is sample selection bias. Schonlau et al. (2006) conduct an internet-based survey on a subsample of existing respondents of the 2002 wave of the HRS who are 55 years of age or older. Participation in the web-based survey requires an internet connection and was voluntary. The authors end up with 10% of the HRS sample, and study the differences in demographic and socioeconomic make-up. Not surprisingly, they find that the odds ratio of participating in the web survey declines with age, increases with educational attainment, increases with income and stock market participation, decreases with health status, and is higher for Whites than other races. Given that the internet use is not particularly prevalent in elderly populations, the selection issue is bigger for any retirement study.

Being aware of this selection issue, we took great care in specifying pre-selection criteria that would effectively undo the selection bias. We detail these criteria below. A pilot survey was instrumental to getting this right. In addition, we knew that Vanguard itself had a specific trusted internet survey company, Greenfield Online, that it had used with success in past work on retirees. This prior experience as well as the pilot survey convinced us that Greenfield Online was able to collect a large enough sample of data from retirees across the economic and demographic spectrum.

B. Greenfield Online and Our Interaction with Them

B.1. Greenfield Online Information and General Procedures

Founded in 1994, Greenfield Online is a global interactive media and services company and the leading online survey company. It is active in 10 offices in eight countries and has 780 employees. They have sampled more than 60 million consumer opinions since 1999 and every major marketing company in the world is a customer of Greenfield Online. Their management team includes the founder of the internet survey solutions industry.
The Greenfield Online panel is managed in a very active and detailed manner. They have approximately 600,000 active panelists in the U.S., which is the number of persons who have started a survey within the past six months or joined the panel and activated their account in that time period. A series of checks of identity ensure that no one is signing up for multiple accounts. They standardize addresses, and all addresses are matched against the Unites States Postal Service database in order to verify address information. Any fraudulent or incorrect address records result in a rejection of the panelist registration. Further, addresses are used as incentive fulfilment and as a supplemental check. They experience an average of 2% attrition per month. They offset this by a recruitment strategy aimed at maintaining broad economic and demographic representation.

They have several checkpoints in place to monitor quality of survey responses. The demographics are validated against the information they store in their panel database. They also have the ability to track individual behavior in answering the survey by tracking click patterns, as well as answer times on specific questions and for the whole questionnaire.

B.2. How Greenfield Contacts and Rewards Respondents

Greenfield notifies, via email, a pre-screened random sample of its online panel of members whenever a survey is ready for their response. Each invitation and participation (be it successful survey participation or termination or quota-full) is registered in their database. Panelists complete no more than four invited surveys a month, with an average panelist completing one or two surveys per month. For invitations, their rule is to allow up to one invitation per day. Panelist may also elect to take surveys that they qualify for (by meeting pre-screening characteristics) by visiting and logging onto the Greenfield web site.

Incentives are offered to panel members in the form of credits called “dollars” or “incentives,” which are credited to an account maintained by Greenfield Online. Panel participants may redeem their “dollars” for cash by notifying Greenfield of their desire to do so via an online account payment request form. Upon receipt and verification of the form, Greenfield Online forwards the account balance available for withdrawal to the panel member within six weeks from the receipt of the request. Details surrounding the compensation rules are disclosed on Greenfield’s web site; see http://www.greenfieldonline.com/TrafficUI/mscul/page.aspx?ptid=17. Greenfield does not disclose its exact schedule of incentives for its surveys in order to maintain some (understandable) degree of confidentiality around its revenue model. However, they have confirmed that individual incentives may be added for particular surveys and are always used to reach low-incidence populations. In addition to any individual incentives that are offered to panelists for participating in a particular survey, those panelists who complete the surveys are entered into a sweepstakes drawing that Greenfield conducts twice a month. While individual incentives for specific surveys can be as little as $1, prizes in the sweepstakes range from $100 to $2,500. See http://www.greenfieldonline.com/community/meet_winners.html.

B.3. Greenfield Online and Vanguard Business Decisions

Vanguard provided the financing for our two surveys (the pilot in 2005, and the final version in 2006). Greenfield Online was chosen for this project in a competitive process from a number of potential providers of online survey research. Greenfield was selected on the basis of a competitive bid, their good reputation in the industry, and Vanguard’s favorable past experience on other projects, particularly around their responsiveness to requests to refine and perfect the survey
instrument. In addition to the surveys used in this research, Vanguard has used Greenfield’s online panel for several other major research projects, including two earlier surveys on the perception of risks in retirement, as well as a current project in the field with Greenfield in 2008, in which panel members are being asked to supply information regarding practical aspects of the process they use when liquidating assets in retirement.

Vanguard has relied on the information obtained in these surveys to inform its strategic planning and product development in the retiree market, and for use in creating educational and informational materials for its shareholder publications and for use on its web site. The Greenfield Online survey evidence and analysis described in this paper was specifically relevant to Vanguard in the development of its new “Managed Payout Funds,” which were launched in April 2008. The Greenfield Online data and analysis conducted by the present authors was viewed by Vanguard’s product design team as compelling evidence of the significant demand that would likely exist for a retirement payout product positioned to provide retired investors regular payments, but emphasizing complete liquidity as well as the potential for growth of invested capital, to meet either precautionary or bequest motives. With little or no marketing beyond a basic description of these features of the product on Vanguard’s web site, this family of new funds has received deposits of close to $200 million in less than three weeks of operation.

C. Quality Control

C.1. Question Design

Given that we were custom designing the survey, we spent considerable effort designing the questions on standard economic and demographic characteristics. Not only did we draw on prior experience (Ameriks, Caplin, and Leahy (2003,2007) and Ameriks, Caplin, Leahy, and Tyler (2007) conducted three surveys at TIAA-CREF), but we also interacted closely with experts at the HRS in coming up with our questions for this particular survey. (Caplin is now on the Steering Committee of the HRS.) This was important in the design of questions to measure quantitative variables, such as the values of various forms of financial assets. Following a procedure that is time tested at the HRS, these questions were designed first to get respondents to provide a broad numerical categorization, and then within that categorization to ask for greater specificity. This procedure is regarded as industry best practice, and also provided us a double check. Any precise answer that lay outside the prior stated range resulted in a prompt for the two questions to be answered again to remove inconsistencies.

In addition to serving as a model for the design of our quantitative questions, the design of our strategic survey questions was also informed by HRS precedents. The HRS has a long history of posing questions relating to the likelihood of various future shocks (e.g., death). More recently, the HRS has added a series of questions concerning hypothetical choices designed to provide insight into preference parameters such as the level of relative risk aversion. Our strategic survey questions are in this tradition of posing hypothetical questions, and were worded in a manner that bears a strong relationship to those that have already been posed on the HRS. Not only did we take care in designing the questions, but we also paid close attention to the advice of psychologists engaged in survey design, by making the questions flow into one another in a manner that was as close to conversational as possible. This again is a design element borrowed from the HRS.
C.2. How a Pilot Survey Informed the Final Survey

We went to great pains to confirm the robustness of our survey. Not only did we begin drafting the survey back in July 2004, but we also completed a full-scale pilot survey in November 2004 that was launched by Greenfield Online in February 2005. We used this pilot survey to refine our questions and our sample selection criteria between October 2005 and July 2006. The final survey was launched in September 2006. During this entire period of interaction, we iterated many times on the survey questions and their relationship to the model with the purpose of delivering a quality product.

The main reason for conducting a pilot survey was to familiarize ourselves with the unique challenges of designing an internet survey, and the particulars of the Greenfield panel. We had previous familiarity in our research with mail surveys, and were aware not only of the additional challenges, but also of the additional possibilities opened up by the internet format. We also needed to understand the economic and demographic make-up of the sample, so that we could understand how response rates differ by gender, age, income, etc. In addition, we wanted to test out our strategic survey questions. Finally, we wanted an opportunity to refocus the survey if needed. This did indeed turn out to be necessary. The pilot survey contained many questions relating to the use of the housing asset, but we decided in the end that we would need the full survey just to dig into bequest and precautionary motives, while using traditional approaches to capture housing wealth. In the end, we believe that the pilot survey was an important step with regard to quality control.

One of the main lessons we learned from the pilot survey concerned the particular filters that we needed to add to ensure that the information from the survey was relevant to the larger population as represented by the HRS. In the pilot survey, all we screened for was that respondents were 55 years of age or older; expected $20,000 or less in earnings from work in the current year and in all future years; had no dependents other than (possibly) a partner living with them; and reported being the primary (or co-primary) financial decision maker in their household. The survey generated significant differences in response times on the basis of marital status and home ownership status. For example, average response time for owners was 24.4 minutes and 17.8 minutes for renters. As a result, the respondents were skewed to renters who have lower assets of all forms than homeowners.

Following the findings in the pilot survey, we changed our selection criteria dramatically for the final survey to ensure that a broader distribution of households responded; see below.

Several of the key findings of the final survey emerged strongly in the pilot survey as well. First, we found a close correspondence between consumption expenditures and income as well as between expected future consumption expenditures and income, implying a lack of actual and expected asset rundown in retirement. Second, we asked respondents about their anticipated need of long-term care and the expected annual cost in today’s dollars. We found an average of 25 months and a cost of $48.3K. These numbers underline the importance of long-term care considerations in retirement. Third, we asked different versions of the strategic survey questions. We also found strong distaste for Medicaid care in the pilot: respondents were willing to reduce their estates by $143K on average in order to receive care at a private facility rather than a Medicaid facility. The interpretation of (a slightly different version) of the lock-box question was potentially compromised by a programming mistake. Still, the answers showed much heterogeneity in the fraction of the lock-box amount respondents commit to long-term care versus bequests. In short, the pilot survey results are consistent with the results from our final survey.
C.3. Sample Selection Criteria for the Final Survey

We specified demographic and socioeconomic selection criteria that would effectively undo likely forms of bias (a "*" indicating a binding constraint). In particular, we allowed no more than 40% of our sample in each of the 1947 to 1951, 1941 to 1946, 1936 to 1940, and 1930 to 1935 cohorts. We allowed no more than 35% to be couples whose children left the home or to be couples with no children in order to end up with sufficient singles. We allowed no more than 40% of respondents to have retirement wealth below $25K (*) and no more than 90% to have such wealth below $75K. Finally, we allowed no more than 40% of respondents to have financial non-retirement wealth below $25K (*) and no more than 90% to have such wealth below $100K (*). Our internet survey contained a first page with questions that allowed us to verify these criteria. If the quota for a certain group was reached, the survey was terminated after the first screen for any subsequent respondent that fell into that same group. We obtained 1,085 responses that passed the sample selection stage.

C.4. Time Spent Taking the Final Survey

According to timer information from the survey, the median respondent in the final survey took 22 minutes. Figure IA.1 shows the entire histogram of response times for the final survey. For comparison, the mean amount of time spent that respondents spent on the pilot survey was also 22 minutes.

![Histogram of Response Times](image)

**Figure IA. 1.** Histogram of final survey response times.

C.5. Final Sample Selection

As a first screen, we took out respondents who took less than nine minutes to complete the survey. In order to further safeguard the quality of our data, we carefully studied all responses,
checking for inconsistencies, mistakes, and implausible answers. We screened out 147 for first-order response errors: 23 reported having no financial wealth whatever and total income of less than $200 a month; 13 reported total spending of $1; 13 reported spending more than the sum of assets and 30 years’ worth of income; 38 reported living expenses less than $500 per year; six reported spending the same amount on all six spending categories; 32 reported owning a home value worse than $10K; nine had mortgage debt more than twice the home value (this was prior to the housing crisis); 57 did not own homes but reported spending nothing on rent; and five switched to diametrically opposite allocations between the $100K long-term care box and the $250K long-term care box questions. This first screen left us with a sample of 938 complete responses, 498 of which are singles.

C.6. Consistency between Data and Model

By having the freedom to ask our respondents whatever we like, we were able to insert a few questions that could provide support for some key modeling assumptions. For example, a key premise of the model is that many face high private costs of long-term care, and we set the costs of private care at $50K as a fixed parameter in the model. In fitting with the low level of use in the general population, in only 14.3% of the households in our sample is there a member that has taken out a long-term care insurance policy that would provide benefits or reimbursement for long-term care expenses. When we explicitly ask respondents to think of the costs of one year of private long-term care, absent any long-term care insurance coverage, the median estimate is $35K, and 10% of respondents think the one-year stay will cost $100K or more. Recall that in the pilot survey the average cost estimate was $48.3K. The claim that private long-term care is seen by many as involving high private costs appears warranted.

C.7. Characteristics of Sample Containing Both Singles and Couples

Table IA.I reports the statistics from our survey and from the SCF for the sample of both singles and couples (all 938 respondents). Table II, located in the main text, reports the moments for the singles sample instead, because that is the sample we use in estimation. We discuss the properties of the full sample here, while all variable definitions and a description of the singles sample can be found in the main text.

Demographics In terms of demographics, the full sample has essentially the same age distribution as the singles sample. Compared to the subsample of 498 singles, the full sample of 938 contains more men (35% versus 26%), more retirees (81% versus 74%), more healthy people (68% versus 56%), slightly more respondents who completed college or better (44% versus 42%), more children (2.3 versus 1.9), more grandchildren (3.9 versus 3.3), and more homeowners (76% versus 62%). In only 14.3% of the households in our sample is there a member that has taken out a long term care insurance policy that would provide benefits or reimbursement for long-term care expenses. When we explicitly ask respondents to think of the costs of one year of private long-term care absent any long-term care insurance coverage, the median estimate is $35K, and 10% of respondents think a one-year stay will cost $100K or more.

Wealth On the asset side, Panel B of Table IA.I shows that median retirement assets held in tax-favored dedicated retirement accounts (such as 401(k), IRA, 403(b), or other accounts) are $14K, with an inter-quartile range (IQR) of $0K to $115K. Median financial wealth (bank accounts, money market accounts, stocks and shares, bonds, etc. excluding any assets held in dedicated retirement accounts) is $15K, with an IQR of $0.5K to $125K. The median self-reported home value among
Table IA.I
Summary Statistics: Singles and Couples

The left panel contains summary statistics for our 2006 survey of 938 retirees; it contains both singles and couples. The right panel contains statistics from the 2004 Survey of Consumer Finance (SCF). In the SCF we selected a sample that satisfies the same pre-screening criteria as our own sample: we exclude respondents below the age of 54, where either spouse works full-time or expects to work full-time, with combined household income from work above $25K, and with children at home. This guarantees we are comparing mostly retirees to a sample of mostly retirees. The resulting SCF sample consists of 3,018 individuals. The summary statistics are computed using the SCF weighting scheme. The spending section in Panel F compares our spending data to those from the Consumer Expenditure Survey (CEX) instead of the SCF. We use the 2003 to 2004 data from Krueger and Perri (2005). The CEX numbers are highlighted in bold.

<table>
<thead>
<tr>
<th>Moment</th>
<th>Our 2006 Survey</th>
<th>SCF 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>25</td>
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<tr>
<td><strong>Panel A: Demographics</strong></td>
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<tr>
<td>Age</td>
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<td>59</td>
</tr>
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</tr>
<tr>
<td>Number of grandchildren</td>
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<td>0</td>
</tr>
<tr>
<td><strong>Panel B: Wealth (× $1000)</strong></td>
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<td></td>
</tr>
<tr>
<td>Retirement assets</td>
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<td>0</td>
</tr>
<tr>
<td>Liquid financial assets</td>
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<td>1</td>
</tr>
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<td>Primary home</td>
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<tr>
<td>Other assets</td>
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<tr>
<td>Total assets</td>
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<td>54</td>
</tr>
<tr>
<td><strong>Panel C: Debt (× $1000)</strong></td>
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<td></td>
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<tr>
<td>Primary mortgage</td>
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</tr>
<tr>
<td>Credit card</td>
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<tr>
<td>Other debt</td>
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<td>Total liabilities</td>
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<td>0</td>
</tr>
<tr>
<td><strong>Panel D: Net Worth (× $1000)</strong></td>
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<td></td>
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<td>Home equity</td>
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<tr>
<td>Total net worth</td>
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<tr>
<td><strong>Panel E: Income (× $1000)</strong></td>
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<tr>
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<tr>
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<tr>
<td>After-tax income</td>
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<td>13</td>
</tr>
<tr>
<td><strong>Panel F: Spending (× $1000)</strong></td>
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<td></td>
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<tr>
<td>Total spending</td>
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<td>Maintenance and Rent</td>
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<td>Health</td>
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<tr>
<td>Income Taxes</td>
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<td>0</td>
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<tr>
<td>Living expenses</td>
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<td>3</td>
</tr>
<tr>
<td>Housing consumption</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>NDS consumption</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Total consumption</td>
<td>5</td>
<td>11</td>
</tr>
</tbody>
</table>

8
homeowners is $160K, with an IQR of $85K to $289K. For 63% of homeowners, the primary mortgage is fully paid off. The 75th percentile of mortgage debt among homeowners is $35K; median home equity is $137K. The table reports home values, mortgage debt, and home equity for the entire population, including renters. The median level of “other assets” (e.g., secondary home, cars, boats, art, private business assets) is $20K, with an IQR of $4K to $70K, and 10% own more than $270K. On the debt side (Panel C of Table IA.I), more than half of the respondents have no credit card debt and the same is true for “other debt beside primary mortgage and credit card.” Among the credit card debt holders, the median debt is $2K, while among those with other debt, the median debt is $1K. The median net worth in our sample of couples and singles (Panel D of Table IA.I) is $225K. Finally, we asked those with partners to specify life insurance receipts due to each partner in event of the other’s death. We do not include these life insurance pay-outs in our wealth measure, given our focus on singles in the estimation.

**Income and Consumption** Panel E of Table IA.I shows that the median respondent has $16K in retirement income and the mean is $24K. The distribution of total income, defined as the sum of labor income and pension income, has a median of $22K, an average of $28K, and an IQR of $14K to $35K; see Panel E of Table IA.I. Non-durable and services (NDS) consumption has a median of $15K per year, an average of $20K, and an IQR of $9 to $26K. Total consumption has a median of $18K, a mean of $24K, and an IQR of $11 to $31K.

**Strategic Survey: Lock-box Question** For the full sample of singles and couples, we continue to find that both public care aversion and bequest motives are important for a significant set of retirees. The single largest group of respondents would split the money 50-50. If the prize is $100K (two years of long-term care), then 32% would split it evenly; if the prize is $250K (five years of long-term care), then only 17% would split it evenly. The second-most common answer is a polar answer: 0% or 100%. The second question with a $250K prize has a more even distribution across answers than the first; it is more discriminating. There is a large positive correlation between the two questions: the correlation between the $100K answer and the $250K answer is 0.8. We find that 126 respondents answer 0% to both questions (13.4%), 124 answer 50% to both, and 120 answer 100% to both questions. The 0% answer (100% to bequests) to the $100K lock-box question is twice as common among couples than among singles (18.4% vs. 9.0% of respective samples).

**Strategic Survey: End-of-life Question** As for the end-of-life question, 83% of all respondents prefer private long-term care to Medicaid if the cost is $50K. On average, the retirees in our sample would be willing to forgo 34% of the $200K prize to stay in a private long-term care facility rather than use government-funded long-term care. The median answer is 25% of $50K, with an IQR of 10% to 50%. We see that 98 respondents (10.5% of the sample) would be willing to give up 100% to avoid Medicaid.

**D. Representativeness**

In this section, we compare properties of our sample to those of nationally representative surveys. Because the main text already discusses the singles sample, most of the ensuing discussion focuses on the full sample of singles and couples.

**D.1. Comparison with Survey of Consumer Finance (SCF)**

We compare our 2005 sample to the 2004 SCF sample in terms of demographics, wealth, and income. The SCF is widely recognized as the gold standard for wealth-related data. To make this
comparison legitimate, we exclude respondents who satisfy one of the following criteria: below the age of 54, either spouse works full-time or expects to work full-time, combined household income from work is above $25K, and with children at home. This guarantees we are comparing mostly retirees to a sample of mostly retirees. The resulting sample consists of 3,018 individuals. Half are married; 81.3% of the SCF sample are homeowners, compared to 76% in our sample.

The right column of Table IA.I reports summary statistics for the SCF that are defined in parallel fashion to those in the same row in the left column (our sample). The reported moments use the SCF weighting scheme. The SCF weighting scheme means that the number of replicates we use is five times the 3,018 observations (15,090). The SCF has a slightly older age distribution. To our surprise, the income and wealth distribution looks remarkably similar to ours. (By comparing our sample to the weighted and non-weighted SCF samples, we are able to conclude that our respondents are somewhat wealthier than the U.S. population as a whole. The SCF is known to oversample the wealthy, relative to other surveys such as the PSID or AHEAD.) The only discrepancy is for the 95th percentile of retirement assets, where our measure is higher than the SCF’s. One potential reason is that some of our sample may still be working part-time and not have converted retirement assets into liquid assets yet. Since we only use the sum of retirement and liquid assets in the analysis, this discrepancy is not material for our results. Total asset distributions look similar in our data and in the SCF data. We conclude that our sample seems broadly representative of the retiree group in terms of income and wealth.

We note a hump-shaped pattern in net worth, roughly between ages 54 and 69 for our survey and SCF respondents alike. Median net worth in our survey is $55K at age 54-59, rises to $104K at age 60-64, then falls to $70K at age 65-69. Similarly, the median net worth in the SCF among respondents who satisfy our low labor income criterion climbs from $8K for those 54-59 to $125K for those 60-64 and then falls back down to $70K for those 65-69. Part of the increase in net worth between the 54-59 and 60-64 age groups is explained by households accumulating savings as they approach retirement. Since we focus on retirees, we exclude those working full-time or those with more than $25K of income per year from work; this excludes many households that are still working and saving for retirement. Since those that are working are often wealthier, this selection effect causes wealth for our 54-59 group to be lower than for the population at large. Indeed, when we do not impose this selection criterion on the SCF, net worth goes from $109K for ages 54-59 up to $174K for ages 60-64 and then down to $79K for ages 65-69. Clearly our focus on retirees exacerbates the hump in wealth across these three age groups.

While SCF spending data are limited, they still allow for a few sanity checks on our data: (i) SCF food spending is lower than our living expenses, (ii) SCF spending on rent and real estate taxes is lower than our category of maintenance, rent, and real estate taxes, and (iii) mortgage payments are on the same order. A much better data set to compare our consumption data is the Consumer Expenditure Survey.

D.2. Comparison with the Consumer Expenditure Survey (CEX)

The CEX is known for having the best consumption data. We used the cleaned-up CEX data file from Krueger and Perri (2005), available on Perri’s web site, and kept the most recent observations observations from 2003 and 2004.Q1. We then implemented a sample selection procedure that mimics the one from our survey: we dropped respondents younger than 55, those who report 35 or more hours worked per week, those with total labor income over $25K, and those with children at home. We then computed statistics for total and nondurable expenditures, as defined by Krueger
and Perri, and housing consumption (rent or imputed rent). We converted all numbers to annual rates and transformed them into current dollars. The numbers are in the right columns of Panel F of Table IA. Despite the table’s “SCF 2004” heading, the numbers in Panel F are from the 2003 to 2004 CEX. Median nondurable consumption expenditures are $11K in the CEX and $15K in our survey. The IQR is $7K to $17K in the CEX and $9K to $26K in our sample. Housing consumption data also look similar. The median is a bit lower than in the CEX, and the 95th percentile is a bit higher. There is some measurement error here due to the calculation of imputed rent. Total consumption expenditures, which includes items such as entertainment and vehicle purchases, looks very much in line with the data, with a median of $15K in our sample versus $16.9K in the CEX. Given the well-known difficulties with accurately measuring consumption at the individual level, this new evidence sheds favorable light on the quality of our data.

D.3. Comparison with the Health and Retirement Survey (HRS)

We go to the HRS to compare the prevalence of long-term care insurance, annual long-term care insurance premia, and the prevalence of a written will. In the 2006 HRS wave, 55% have a written will, 12% have long-term care insurance, and annual long-term care insurance premia have a mean of $2,445, a median of $1,776, and a standard deviation of $8,015. Of our 938 survey respondents, 66% have a written will, 14% have long-term care insurance, and annual long-term care insurance premia have a mean of $2,923, a median of $1,500, and a standard deviation of $8,422. Again, the numbers are close.

D.4. Comparing Wealth and Consumption Profiles in Model and Data

It is instructive to compare wealth and consumption profiles in the model to those observed in the SCF, CEX, and HRS data. Since these moments are not targeted by our estimation, they constitute additional out-of-sample tests of the model.

D.4.1. Wealth by Percentile

Figure IA.2 shows the evolution of the 10th, 50th, and 90th percentiles of the wealth distribution for three different cohorts. It combines data and model in the same figure, as requested. The cohorts are those in the age ranges [62,68], [72,78], and [82,88] in 2001. The horizontal axis tracks the midpoint of each of these brackets. The dashed lines show the the 10th, 50th and 90th percentiles of wealth in the data, expressed in thousands of 2007 dollars. Since the 10th decile of wealth is essentially zero, we cannot take logs of wealth. The sample consists of single retired households of the three cohorts described above, and followed over time in the 2001, 2004, and 2007 waves of the SCF. We compare the resulting empirical wealth profiles to those in the model. Model simulations use the characteristics (demographics) of the 2001 SCF sample as an input. The solid lines are the results of model simulations under our benchmark parameters. Although we do not capture the full pattern of the 90th percentile, which rises and falls across the three waves of the SCF, our predicted distribution after six years looks quite close to the distribution in the data. For the two older cohorts, our model predicts that the profiles should look flat while in reality the data show an increase in wealth for these cohorts. Some of this difference might be explained by differential investment opportunities for the wealthy or by differential mortality rates between rich and poor. Because wealthier people tend to live longer, members of the cohort who survive from one wave to
the next tend to be richer. This effect is abstracted from in our model.

![Wealth Profile](image)

**Figure IA. 2.** Wealth profiles by wealth percentiles: SCF data and model simulations.

### D.4.2. Consumption by Percentile

Figure IA.3 combines consumption profiles in model and in data. The dashed lines show the 10th, 50th, and 90th percentiles of the distribution of consumption from the 1997, 2000, and 2003 waves of the CEX for those who were in the age ranges [62,68], [72,78] and [82,88] in 1997. They are expressed in logs of thousands of 2007 dollars. The solid lines are the consumption profiles from the same set of simulations used in the wealth figure above. The levels of consumption are slightly off: our simulations predict consumption that is too high at the top of the distribution and too low at the bottom of the distribution. However, the time trends in the data are well matched by our simulations. We correctly predict that consumption rises slightly for the youngest cohort over time, possibly because the surviving members of the cohort tend to be the ones who were not hit by large medical shocks. Consumption profiles are flat for the middle cohort and only decline significantly at the bottom of the distribution for the oldest cohort.

### D.4.3. Wealth by Health

We also compare wealth profiles in model and in data, sorted by health state. To do so, we collected additional information from the SCF on the health status of SCF respondents. Fortunately, such health information is available, albeit in slightly different form as in our survey. In particular, health status is on a four point scale (4= excellent, 3 = good, 2 = fair, 1 = poor), while health status in our model is measured on a three-point scale (1 = good, 2 = poor, 3 = in long-term care). In order to compare model to data, we reclassify those in HRS health states 4 and 3 into our health state 1, and HRS health states 2 and 1 into our health state 2. Unfortunately, the SCF has no information on long-term care, so we cannot report data for our health state 3. We thus obtain three cohorts, three dates (2001, 2004, and 2007), and two health states. The median cell size among these 18 groups is 150 observations. The wealth profiles in the model are constructed in the same fashion as in Section D.4.1 above. Figure IA.4 shows the results; solid lines are simulations, dashed
Figure IA. 3. Consumption profiles by consumption percentiles: CEX data and model simulations. The figure shows the tenth, fiftieth, and ninetieth percentiles of the wealth distribution for three cohorts.

lines are data. Health states 1, 2, and 3 have different colors: blue, red, and green, respectively. The model predicts that healthier agents are wealthier, in each cohort. Agents in the long-term care state (state 3, in green) are the poorest and are running down their assets, consistent with the high out-of-pocket expense associated with this health state. For the other two health states, the model predicts intermediate wealth levels for those in poor health (state 2, in red), with an upward-sloping profile for the youngest and oldest cohort. For the middle cohort, wealth is flat. The data are consistent with these patterns: intermediate wealth levels that are increasing over time for the youngest and eldest cohorts, and essentially flat for the middle cohort. For the good health state (state 1, in blue), model and data are close in level and pattern for the youngest cohort, and show wealth decumulation. For the middle and oldest cohorts in good health, the model underpredicts wealth accumulation. Especially the healthiest among the very old (82-88) accumulate more wealth in the data than in the simulations. This discrepancy may simply be a small sample issue (there are about 100 observations in this group in 2004 and 2007), it may arise from our coarse mapping of health states, or it may reflect differential mortality by wealth as mentioned above. Models that allow for endogenous investment in health, such as Yogo (2009) or De Nardi, French, and Jones (2010), may be able to increase the correlation between health and wealth for the very old. Such an extension is beyond the scope of this paper.

D.4.4. Consumption by Health

Finally, we compare consumption profiles, by health state, in model and in data. This turns out to be a substantially more challenging task because the CEX consumption data set we use above has no health status information. The only available data is the Consumption and Activities Mail Survey (CAMS), a bi-annual survey that collects consumption data from a subset of HRS households. The CAMS data are relatively unexplored and are not part of the cleaned-up RAND version of the HRS. The CAMS data consist of four waves (2001, 2003, 2005, and 2007) with sample sizes of 3,866, 3,254, 5,815, and 5,612, respectively. For all four available waves, we form a measure of nondurable and services consumption, which includes housing services but excludes expenditures.
on durables and health, just as in our own survey and in the CEX. We also form total consumption that includes all categories. We exclude households that have nondurable consumption less than $1K and more than $50K in a given year. We then connect the CAMS to the HRS data using the household identifier and person number. One complication here is that the HRS is done in even years, while the CAMS is conducted in odd years. We link the 2001 CAMS to the 2000 HRS, the 2003 CAMS to the 2002 HRS, etc. This matching allows us to only keep single households (throughout all waves) and to obtain the age and health status of the CAMS respondents. As in the rest of our analysis, we exclude individuals younger than 51 years old. We are left with 666 single households for which we have age, health, and four consumption observations. Seven respondents didn’t rate their health in all four waves of the HRS. As was done with the RAND version of the HRS, we simply made their health rating the same as in the previous wave in such instances. An additional difficulty is that the health status in the HRS is measured on a five-point scale (5 = excellent, 4 = good, 3 = average, 2 = below average, 1 = poor), while the health status in our model is measured on a three-point scale (1 = good, 2 = poor, 3 = in long-term care). In order to compare model to data, we reclassify those in HRS health states 5, 4, and 3 into our health state 1, and HRS health states 2 and 1 into our health state 2. We have no readily available long-term care information for these respondents, so we have no health state 3 in the data. The cohorts are defined as in Section D.4.2. This brings the sample to 377 out of 666 individuals. We simulate our model, again following the same procedure as in Section D.4.2. As in the wealth plot above, we show average log consumption in health states 1 and 2 in the data (dashed lines) and log consumption for all three health states in the model (solid lines). Health states 1, 2, and 3 have different colors: blue, red, and green, respectively. Figure IA.5 shows the results. In the model, consumption is higher in good health than in poor health and higher in poor health than in long-term care. The differences between good and poor health are not very large though. The CAMS data also show that average consumption is not so different in good and poor health. Furthermore, in both model and data, consumption is not that different across cohorts. Model simulations are about on target; model-predicted consumption in the good health state (state 1) is a bit higher than in the data and model-predicted consumption growth in poor health (state 2) is a bit lower than in the data. We also capture the decrease in consumption over time for the good health state

Figure IA. 4. Wealth profiles by health status: SCF data and model simulations.
and the (slight) increase over time for the bad health state. The increase in consumption in the poor health state arises because being in the bad health state makes it increasingly likely to go into long-term care state. Every period one stays out of long-term care is like receiving a positive wealth shock. For the good health state, the decrease arises as in the standard life-cycle model, where the consumption profile is downward sloping because the mortality-adjusted discount factor becomes lower than one over the return on assets. While the match is obviously not perfect, given the difficulty in mapping the health state in the model and in the data, we conclude that the model does a reasonably good job matching the CAMS consumption profiles.

![Figure IA. 5.](image)

**Figure IA. 5.** Consumption profiles by health status: CAMS data and model simulations.

Comparing model to data, the model’s main drawback is too much consumption and too little wealth accumulation for healthy and wealthy elderly households. Several extensions of our model may be able to improve on this dimension. First, one could allow for different mortality rates at different wealth levels, as in De Nardi, French, and Jones (2010). Second, one could generalize the bequest function, for example, by allowing for a different curvature parameter over bequests than over consumption while alive. A lower curvature parameter over bequests would imply a stronger bequest motive for the wealthy.

### E. Plausibility of Strategic Survey Questions

In this appendix, we present evidence that our strategic survey questions prompted intuitively plausible responses. This discussion focusses on the full sample of 938 respondents.

#### E.1. Children

In support of the generally sensible nature of the survey responses, we find that respondents with children (80% of the sample) uniformly display greater bequest concerns. The average fraction of the $100K lock box ($250K box) allocated to long-term care, \(p_{\text{ltc1}}\) (\(p_{\text{ltc2}}\)), is 68.5% (64%) for respondents without children, while it is 51.5% (47%) for those with children. The same comparison but for the median fraction is 80% (70%) versus 50% (50%). Likewise, for the end-of-life question, the fraction allocated to avoid public long-term care (and hence allocated towards private long-
term care) is 42.5% for those without children and 31.5% for those with children ($pctltc3$). The null hypotheses that the sample means are the same in the groups with and without children are strongly rejected for all three variables. As an aside, the number of children is also negatively related with the $pctltc$ variables. However, what matters is whether the respondent has children or not. In a regression of the $pctltc$ variables on both the $withkids$ dummy and the discrete $numkid$ variable, the dummy $withkids$ drives out $numkid$. Figure IA.6 shows that there are not only different means and medians for the survey answer distributions, but that the entire distribution looks different. The top panel plots $pctltc2$, the bottom panel $pctltc3$. For example, there is a much higher propensity to allocate everything to long-term care (nothing to bequests) for those without children. Conversely, there is a much higher propensity to allocate nothing to long-term care (everything to bequests) for those with children.

### E.2. Wealth and Income

Table IA.II shows the pairwise correlation matrix between the strategic survey answers, net worth, permanent income, and the number of children. Note that while the two types of survey answers have a positive correlation of 0.27 ($pctltc1$ and $pctltc3$) and 0.28 ($pctltc2$ and $pctltc3$), there is independent information in each question. The most interesting finding in this regard is that assets, net worth, and permanent income are positively correlated with the answer to the lock-box questions, but are negatively correlated with the end-of-life question. It appears that wealthier households allocate more of the locked box to bequests, but they dislike public long-term care more as well. This is intuitively reasonable. Consider a high wealth individual with dominant public care aversion. In answer to the former question on the marginal allocation of a lottery win, such a respondent may elect to use all or most for a bequest. Indeed, the wealthy respondent is not at risk of needing the long-term care money, and allocating the money to the bequest box assures that the heirs will receive the money. However, if pushed to the wall with little wealth left, as in the end-of-life question, they would elect private long-term care. It is a measure of the seriousness with which these questions were taken that responses difference precisely along these lines.

While there are no formal findings to this effect, the “folk wisdom” in the area of bequest motives is that they are minimal for all but the wealthiest households. Our survey results provide no support for this view. If one aggregates across the sample as a whole, there is no systematic relationship whatever between wealth or income and survey responses. Yet such a relationship can be identified if one conditions on whether or not there are children. We ran both OLS regressions and Tobit regressions, which take into account that the dependent variable ($pctltc$) is bounded between zero and one. The right-hand-side variables are net worth and net worth interacted with the $withkids$ dummy. The coefficient on the first regressand is the effect of net worth on the fraction allocated to long-term care for those without children; the coefficient on the second regressand is the same effect but for those with children. The main message from Table IA.III is that respondents without children allocate more money towards long-term care (and less towards bequests) the wealthier they are. The exact opposite is true for respondents with children. The wealthier they are, the more they allocate towards a bequest. Each $10K in income or $100K in net worth increases the fraction allocated to the bequest by 2% to 4% for those with children and reduces that same fraction by about 1% for those without children. The difference between these groups is highly statistically significant.

We also asked our respondents for their willingness to pay for perfect long-term care insurance. We regress the survey answers $pctltc1$, $pctltc2$, and $pctltc3$ on net worth, net worth interacted with
Figure IA. 6. Strategic survey questions for respondents with and without children. The top panel plots the distribution of survey answers to the $250K lock-box question (pctltc2). The answers range from 0% to 100% allocated to the long-term care lock box. The bottom panel plots the answer to the end-of-life survey question (pctltc3). Both panels are based on the entire sample of 938 respondents.
This table presents the correlation between the answers to the strategic survey questions, net worth, assets, permanent income ($inc10$), and number of children ($numkid$) for the 938 respondents in our survey. The survey answers indicate the fraction of the $100K lock box that the respondent would allocate to long-term care ($pctltec1$), that same fraction but for the $250K lock box ($pctltec2$), and the fraction of $200K the respondent would be willing to spend to avoid a public long-term care facility at the end-of-life at the expense of the bequest ($pctltec3$).

<table>
<thead>
<tr>
<th></th>
<th>pctltc1</th>
<th>pctltc2</th>
<th>pctltc3</th>
<th>networth</th>
<th>assets</th>
<th>inc10</th>
<th>numkid</th>
</tr>
</thead>
<tbody>
<tr>
<td>pctltc1</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pctltc2</td>
<td>0.80</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pctltc3</td>
<td>0.27</td>
<td>0.28</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>networth</td>
<td>-0.07</td>
<td>-0.10</td>
<td>0.08</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>assets</td>
<td>-0.07</td>
<td>-0.10</td>
<td>0.08</td>
<td>0.99</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>inc10</td>
<td>-0.14</td>
<td>-0.15</td>
<td>0.06</td>
<td>0.61</td>
<td>0.61</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>numkid</td>
<td>-0.14</td>
<td>-0.14</td>
<td>-0.12</td>
<td>-0.02</td>
<td>-0.02</td>
<td>0.07</td>
<td>1.00</td>
</tr>
</tbody>
</table>

This table presents OLS and Tobit regressions of the survey answers ($pctltec1$, $pctltec2$, $pctltec3$) on net worth or income and their interaction with a dummy measuring whether the respondent has children. The top panel uses net worth, the bottom panel uses permanent income (measured as after tax income in 2010). The left panel reports OLS regression results. *** denotes significance at the 1% level according to robust standard errors. The right panel reports Tobit regressions. Net worth is expressed in units of $100,000. Permanent income is expressed in units of $10,000. Each regression contains 938 observations.

<table>
<thead>
<tr>
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<th>OLS Regressions</th>
<th>Tobit Regressions</th>
</tr>
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<tr>
<td></td>
<td>$pctltec1$</td>
<td>$pctltec2$</td>
</tr>
<tr>
<td>constant</td>
<td>0.567***</td>
<td>0.532***</td>
</tr>
<tr>
<td>networth</td>
<td>0.012***</td>
<td>0.011***</td>
</tr>
<tr>
<td>networth × withkids</td>
<td>-0.029***</td>
<td>-0.021***</td>
</tr>
<tr>
<td>$R^2$</td>
<td>2.91%</td>
<td>4.03%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>OLS Regressions</th>
<th>Tobit Regressions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$inc$</td>
<td>$inc$</td>
</tr>
<tr>
<td>constant</td>
<td>0.604***</td>
<td>0.562***</td>
</tr>
<tr>
<td>income</td>
<td>0.011</td>
<td>0.012</td>
</tr>
<tr>
<td>inc × withkids</td>
<td>-0.038***</td>
<td>-0.037***</td>
</tr>
<tr>
<td>$R^2$</td>
<td>3.68%</td>
<td>4.23%</td>
</tr>
</tbody>
</table>
the \textit{withkids} dummy, and the willingness to pay for perfect long-term care insurance. We find that the results from Table IA.III remain unaffected. In addition, the willingness to pay enters significantly positively. An extra $1,000 willingness to pay increases $\text{ptltc}$ by an additional 1.17% to 1.64%.

\textbf{E.3. Planning-type Questions}

As a further check on the validity of our strategic survey questions and of our inferences, we asked several planning-type questions. We asked the respondents whether they own a long-term care insurance policy; 14.3\% of our respondents do. We find that those with long-term care insurance have a lower propensity to allocate money to the long-term care locked box than those without a policy. At the same time, when faced with a contingency without long-term care at the end-of-life, they are more likely to pay to avoid publicly provided long-term care. We asked the remaining 85.7\% of the sample whether they had seriously considered taking out long-term care insurance. The 27\% of those that had considered it allocate a significantly larger fraction of the lock box to long-term care and do the same at the end-of-life. As mentioned above, we asked all respondents how much they think a year in long-term care would cost out-of-pocket given all the insurance they have in place. We find that the more they think it will cost, the more they allocate to long-term care in the strategic survey questions. We also asked the respondents whether they had (i) written a will, (ii) established a trust, or (iii) consulted with a financial planner. All three variables are significantly negatively correlated with the percent of money allocated to the long-term care lock box. Those with demonstrated intentional bequest motives end up allocating more towards bequests. This planning-type evidence lends further credibility to our more quantitative strategic survey questions.

\textbf{F. Survey Questions}

A complete reproduction of the survey questions is provided at the end of this appendix.
References


Spending and Saving in Retirement

We currently don’t know much about how retirees plan to use their assets in retirement. Yet these plans are of increasing importance as the baby-boom generation approaches retirement. This survey is intended to help us understand what resources you have, and how you anticipate using these resources. The survey should take approximately 20-30 minutes to complete. Note that we ask a number of questions concerning your wealth and income, and you should complete this survey only if you are comfortable answering questions on these subjects. Thank you for your time.

A. Preliminary Questions

1. In what year were you born? [drop-down - Before 1916, 1916, 1917, …………………1950, 1951, After 1951]  [terminate if “after 1951” or “before 1916”]

Quota’s
  ▪ maximum 40% answer 1947-51
  ▪ maximum 40% answer 1941-46
  ▪ maximum 40% answer 1936-40
  ▪ maximum 40% answer 1930-35

2. Which of the following best describes your employment status? (QT-SS)
   a. Employed full time  [terminate]
   b. Employed part time
   c. Not employed but looking for work  [terminate]
   d. Retired
   e. Other (Please specify: _______________)

3. How would you describe the current status of your health? (Select one answer.) (QT-SS)
   a. In need of Long Term Care
      (i.e., care provided on a regular basis, for three months or more, for age related or other chronic conditions)  [terminate]
   b. Not needing Long Term Care, but living with serious medical problems (i.e., conditions that are not debilitating but are persistent and expensive to treat)
   c. Neither in Long Term Care, nor having serious medical problems

4. What is the highest level of formal education that you have completed? (QT-SS)
   a. Did not complete high school
   b. High school diploma
   c. Started but did not complete a post high school (e.g. college) degree
   d. Completed a post high school degree
   e. Started but did not complete post-graduate work (e.g. law school, MBA, PhD)
   f. Completed a post graduate degree

5. What is your gender? (QT-SS)
   a. Male
   b. Female?
6. Which of the following best describes your household? {QT-SS} 
   a. Single with children at home [terminate]
   b. Single – children have left home
   c. Single with no children
   d. Couple with children at home [terminate]
   e. Couple – children have left home
   f. Couple with no children
   g. Other [terminate]

Quotas
- maximum 375 answer Couple – children have left home
- maximum 375 answer Couple with no children

7. [If relevant (Yes to 6e or 6f)]
   b. Is your spouse/partner currently employed full time or looking for full time work? {QT-SS} 
      Yes [terminate if Y]
      No
   c. Is your spouse/partner in need of long term care (care provided on a regular basis for three months or more for age related or other chronic conditions) {QT-SS} 
      Yes [terminate if Y]
      No

Note: * for all best estimate boxes ... please use the range that they selected in the corresponding question.*

Note: for ALL the “best estimate” boxes, if the respondent selects a category with no upper bound, allow up to 9,999,999 dollars in the box.

8. We are interested in your household’s total pre-tax income last year [2005] from all sources, and in your household’s expected income several years in the future [2010]. Please answer all of these questions about future income in terms of today’s prices (i.e. as if prices were to stay unchanged for the next five years).
   a. Which of the following ranges reflect your household’s total income from work in 2005? {QT-SS}
      Zero
      $1-4,999
      $5,000-9,999
      $10,000-14,999
      $15,000-19,999
$20,000-24,999
$25,000+ [terminate]

NOTE – for everything other than zero in Q8a ... allow response in a1. below:

Note: If selected ‘Zero’ allow only zero or blank in best estimate box. Code zero differently from blank in datafile. Please put best estimate boxes on same page.

a1. Please enter your best estimate (in dollars).

b. Which of the following ranges reflect your household’s expected total income from work in 2010? (Please answer this question assuming prices will remain unchanged for the next five years). {QT-SS}

Zero
$1-4,999
$5,000-9,999
$10,000-14,999
$15,000-19,999
$20,000-24,999
$25,000+ [terminate]

NOTE – for everything other than zero in Q8b ... allow response in b1. below:

Note: If selected ‘Zero’ allow only zero or blank in best estimate box. Code zero differently from blank in datafile. Please put best estimate boxes on same page.

b1. Please enter your best estimate (in dollars).

c. Which of the following ranges reflect your household’s total income in 2005 from Social Security, government pensions, and any regular employer pension payments? {QT-SS}

Zero
$1-4,999
$5,000-9,999
$10,000-14,999
$15,000-19,999
$20,000-29,999
$30,000-39,999
$40,000-49,999
$50,000-59,999
$60,000-69,999
$70,000+

NOTE – for everything other than zero in Q8c ... allow response in c1. below:

Note: If selected ‘Zero’ allow only zero or blank in best estimate box. Code zero differently from blank in datafile. Please put best estimate boxes on same page.
c1. Please enter your best estimate (in dollars).

d. Which of the following ranges reflect your household’s expected total income in 2010 from Social Security, government pensions, and any regular employer pension payments? (Please answer this question assuming prices will remain unchanged for the next five years.) (QT-SS)

Zero
$1-4,999
$5,000-9,999
$10,000-14,999
$15,000-19,999
$20,000-29,999
$30,000-39,999
$40,000-49,999
$50,000-59,999
$60,000-69,999
70,000+

NOTE – for everything other than zero in Q8d … allow response in d1. below:

Note: If selected ‘Zero’ allow only zero or blank in best estimate box. Code zero differently from blank in datafile. Please put best estimate boxes on same page.

d1. Please enter your best estimate (in dollars).

9. Please provide us with your best estimate of the current market value of each item that you (and/or your partner, if applicable) own.

a. Roughly how much does your household have in tax-favored dedicated retirement accounts, such as 401(k), IRA, 403(b), or other? (QT-SS)

$0-24,999
$25,000-49,999
$50,000-74,999
$75,000-99,999
$100,000-149,999
$150,000-199,999
$200,000-299,000
$300,000-399,999
$400,000-499,999
$500,000-749,000
$750,000+

[Insert a box to enter numbers and ask below on same page:]

a1 Please enter your best estimate (in dollars).
b. Roughly how much does your household have in liquid financial assets such as bank accounts, money market accounts, stocks and shares, bonds, etc, excluding any assets held in dedicated retirement accounts? {QT-SS}

- $0-9,999
- $10,000-19,999
- $20,000-29,999
- $30,000-39,999
- $40,000-49,999
- $50,000-74,999
- $75,000-99,999
- $100,000-149,999
- $150,000-199,999
- $200,000-299,000
- $300,000-399,999
- $400,000-499,999
- $500,000+

[Insert a box to enter numbers and ask below on same page:]

b1. Please enter your best estimate (in dollars).

c. Do you own the home in which you currently reside? [Y/N] {QT-SS}

- Yes
- No

a. [If Y to 9c] Please provide your best estimate of how much you expect to receive for your home if you were to sell it in the next few months.

- Less than $100,000
- $100,000-149,999
- $150,000-199,999
- $200,000-249,999
- $250,000-299,999
- $300,000-349,999
- $350,000-399,999
- $400,000-499,999
- $500,000-599,999
- $600,000-699,999
- $700,000+

[Insert a box to enter numbers and ask below on same page:]

a1. Please enter your best estimate (in dollars).
d. [If living in couple (6e or 6f)] Please provide your best estimate of any life insurance proceeds payable to your partner upon your death. {QT-SS}
   $ Zero (No insurance on my life)
   $1-24,999
   $25,000-49,999
   $50,000-74,999
   $75,000-99,999
   $100,000-149,999
   $150,000-199,999
   $200,000-299,000
   $300,000-399,999
   $400,000-499,999
   $500,000-749,000
   $750,000+

e. [If living in couple (6e or 6f)] Please provide your best estimate of any life insurance proceeds payable to you upon your partner's death. {QT-SS}
   $ Zero (No insurance on spouse / partner life)
   $1-24,999
   $25,000-49,999
   $50,000-74,999
   $75,000-99,999
   $100,000-149,999
   $150,000-199,999
   $200,000-299,000
   $300,000-399,999
   $400,000-499,999
   $500,000-749,000
   $750,000+

f. Which range reflects the current market value of all of your household's other assets excluding your primary home, liquid financial assets, life insurance, and dedicated retirement accounts? (These assets may include your secondary home, cars, boats, art, private business assets, and the like.) {QT-SS}
   $0-24,999
   $25,000-49,999
   $50,000-74,999
   $75,000-99,999
   $100,000-149,999
   $150,000-199,999
   $200,000-299,000
   $300,000-399,999
   $400,000-499,999
   $500,000-749,000
   $750,000+

[Insert a box to enter numbers and ask below on same page:]

   f1 Please enter your best estimate (in dollars).
Quota:

- Question 9a: maximum 40% Below $25,000
- Question 9b: maximum 90% Below $75,000
- Question 9b: maximum 40% Below $50,000
- Question 9b: maximum 90% Below $100,000
- Question 9c: maximum 30% answer No

You want no more than 40% (or 1500x0.4=600 respondents) below $25,000. However in total, no more than 90% (or 1500x0.9=1350 respondents) can be below $75,000 (INCLUDING those max. 600 people below $25k). YES

Same logic for Q9b.

10. We are interested now in the current level of outstanding debt that you (and/or your partner if applicable) owe.

10. [If Y to 9(c)] How much mortgage debt is currently outstanding on your primary residence? {QT-SS}

Zero
$1-49,999
$50,000-99,999
$100,000-149,999
$150,000-199,999
$200,000-249,999
$250,000-299,999
$300,000-349,999
$350,000-399,999
$400,000 – 499,999
$500,000+

[IF RANGE CHOSEN ABOVE HAVE $5K INTERVALS (that is, ranges starting with $1-4,999): Insert a box to enter numbers and ask below:]

a1 Please enter your best estimate (in dollars).

b. Which range reflects your total unpaid credit card balance after you sent in your last monthly payments? {QT-SS}

Zero
$1-4,999
$5,000-9,999
$10,000-14,999
$15,000-19,999
$20,000-29,999
$30,000-39,999
$40,000-49,999
[IF RANGE CHOSEN ABOVE HAVE $5K INTERVALS (that is, ranges starting with $1-4,999): Insert a box to enter numbers and ask below:]

b1 Please enter your best estimate (in dollars).

c. Which range reflects the value of your household’s other debts beyond mortgages on your primary residence and credit card debts? {QT-SS}
   Zero
   $1-9,999
   $10,000-24999
   $25,000-49,999
   $50,000-74,999
   $75,000-99,999
   $100,000-149,999
   $150,000-199,999
   $200,000-299,000
   $300,000-399,999
   $400,000-499,999
   $500,000+

[IF RANGE CHOSEN ABOVE HAVE $5K INTERVALS (that is, ranges starting with $1-4,999): Insert a box to enter numbers and ask below:]

c1 Please enter your best estimate (in dollars).

11. [Insert drop box with single numbers ranging from zero to five or more. Then ask below:] How many children do you (and your spouse/partner, if applicable) have in total from current and former relationships? {QT-SS}

[If answer above is greater than zero, insert a box to enter numbers and ask below:]

   a. How many of these children are female? {numeric OE} lv-0 hv-10

12. [Insert drop box with single numbers ranging from zero to ten or more. Then ask below:] How many grandchildren do you (and your spouse/partner, if applicable) have in total from current and former relationships? {QT-SS}
13. Do you have a written will? {QT-SS}
   Yes
   No

14. Have you ever established a trust or entered into any other legal or financial arrangements in order to more efficiently transfer assets to your partner, children, heirs, or other worthy causes, upon your death? {QT-SS}
   Yes
   No

15. Have you ever made an appointment with a financial planner, accountant, or lawyer to inquire about how to reduce your possible estate or inheritance tax liability after your death? {QT-SS}
   Yes
   No

16. Has anyone in your household taken out a private Long Term Care (LTC) insurance policy that would provide benefits or reimbursement for your household’s Long Term Care expenses? {QT-SS}
   Yes
   No
   a. [If Yes in 16, insert a box to enter numbers and ask below:]
      What is the annual premium cost in 2005? {numeric OE} lv-1 hv-9999999
   b. (If N in 16) Have you ever given serious consideration to taking out such a policy?
      Yes
      No

Note: please have Q17a and b on same page.

17. Suppose that you were to have a condition that will require long-term care at some point in the future, and were considering the option of going to a private LTC facility to receive this care. Please assume the following:
   • You will need to finance a one year stay in the private LTC facility.
   • The prices of the things that you buy (including Long-Term Care) are the same as the prices for those same things in 2005.

   a. Given all of the insurance that you currently have in place, how much would you expect to pay for this one year stay over and above any amounts paid by insurance? {numeric OE} lv-0 hv-9999999
   b. Suppose you have no medical or LTC insurance. Now what would you expect to be the out of pocket cost to you of this one year stay? {numeric OE} lv-1 hv-9999999

Make sure that the Q17a answer is no greater than the Q17b answer IF Q16=Yes
Hypothetical Scenarios

We now ask three questions concerning what you would choose in hypothetical scenarios. Note that these scenarios are distinct. For each question, you should focus only on the scenario that it poses, treating those that came before as irrelevant.

In the first question, we hypothesize that tomorrow morning you will win a monetary prize that is available for your use only for specific circumstances in later life. In particular, the prize must immediately be divided up between a bequest locked box and a long term care locked box. Money sitting in either of these boxes will keep its current purchasing power over time. You (and your spouse/partner, if applicable) are not to inform or indicate to anyone else that you have won this prize.

- **Bequest Box.** All the money in this box will be passed on to your beneficiaries upon your death. The money has absolutely no impact on the resources that are available to you while alive.

- **Long Term Care Box.** This box can be accessed only to pay for private long term care costs for you and/or your partner. There is no other expense that the prize can be used for.

[Above Text on One Introductory Screen: Question on following screen]

18. The questions we now pose concern how you would divide money between these boxes.

   a. Suppose you had $100,000 to divide up between the two boxes. Assume that each year of LTC costs $50,000 so that the amount you have will be sufficient to cover private LTC costs for one household member for a total of two years. Which of the following options would you most prefer? {QT-SS}

   - Put $100,000 in the bequest box and $0 in the long term care box
   - Put $90,000 in the bequest box and $10,000 in the long term care box
   - Put $80,000 in the bequest box and $20,000 in the long term care box
   - Put $70,000 in the bequest box and $30,000 in the long term care box
   - Put $60,000 in the bequest box and $40,000 in the long term care box
   - Put $50,000 in the bequest box and $50,000 in the long term care box
   - Put $40,000 in the bequest box and $60,000 in the long term care box
   - Put $30,000 in the bequest box and $70,000 in the long term care box
   - Put $20,000 in the bequest box and $80,000 in the long term care box
   - Put $10,000 in the bequest box and $90,000 in the long term care box
   - Put $0 in the bequest box and $100,00 in the long term care box

   **Programming:** Maintain two lists of the above options: One in the order above (high amounts in bequests to low amounts in bequests), one ordered in exactly the reverse order, as follows:

   - Put $100,000 in the long-term care box and $0 in the bequest box
   - Put $90,000 in the long-term care box and $10,000 in the bequest box
   - Put $80,000 in the long-term care box and $20,000 in the bequest box
   - Put $70,000 in the long-term care box and $30,000 in the bequest box
   - Put $60,000 in the long-term care box and $40,000 in the bequest box
   - Put $50,000 in the long-term care box and $50,000 in the bequest box
   - Put $40,000 in the long-term care box and $60,000 in the bequest box
   - Put $30,000 in the long-term care box and $70,000 in the bequest box
   - Put $20,000 in the long-term care box and $80,000 in the bequest box
   - Put $10,000 in the long-term care box and $90,000 in the bequest box
   - Put $0 in the long-term care box and $100,00 in the bequest box
Programming: (high amounts in ltc to low amounts in ltc). Randomly present one of the two lists to respondents.

b. Suppose instead that you had $250,000 to divide up between the two boxes. Assume that each year of LTC costs $50,000, so the amount you have will be sufficient to cover five years of private LTC costs. Which of the following options would you most prefer in this case? (QT-SS)

- Put $250,000 in the bequest box and $0 in the long term care box
- Put $225,000 in the bequest box and $25,000 in the long term care box
- Put $200,000 in the bequest box and $50,000 in the long term care box
- Put $175,000 in the bequest box and $75,000 in the long term care box
- Put $150,000 in the bequest box and $100,000 in the long term care box
- Put $125,000 in the bequest box and $125,000 in the long term care box
- Put $100,000 in the bequest box and $150,000 in the long term care box
- Put $75,000 in the bequest box and $175,000 in the long term care box
- Put $50,000 in the bequest box and $200,000 in the long term care box
- Put $25,000 in the bequest box and $225,000 in the long term care box
- Put $0 in the bequest box and $250,000 in the long term care box

[Programming: – same order as in question 18a.] – Meaning if 18a is high amounts in bequests to low amounts in ltc use the above order, while if 18a is high amounts in ltc to low amounts in ltc, use the precise reverse of the above order, as follows:

- Put $250,000 in the long-term care box and $0 in the bequest box
- Put $225,000 in the long-term care box and $25,000 in the bequest box
- Put $200,000 in the long-term care box and $50,000 in the bequest box
- Put $175,000 in the long-term care box and $75,000 in the bequest box
- Put $150,000 in the long-term care box and $100,000 in the bequest box
- Put $125,000 in the long-term care box and $125,000 in the bequest box
- Put $100,000 in the long-term care box and $150,000 in the bequest box
- Put $75,000 in the long-term care box and $175,000 in the bequest box
- Put $50,000 in the long-term care box and $200,000 in the bequest box
- Put $25,000 in the long-term care box and $225,000 in the bequest box
- Put $0 in the long-term care box and $250,000 in the bequest box

ROTATE: present one of the two lists to respondents.

19. Our second hypothetical question concerns your interest in a hypothetical long term care insurance policy that functions perfectly. To answer this question, please consider a situation in which you were to find out tomorrow that your household had absolutely no coverage for any private long term care expenses. In addition:

- A perfect private long term care insurance policy had become available, in which all such expenses would be paid without exception (i.e., lifetime coverage for the full cost of private LTC with no deductible and full inflation protection).
- The prices of the things that you buy in all future years (including long-term care) are the same as the prices for those same things in 2005.

Assuming that you have no LTC insurance, what is the maximum amount that you would be willing to pay each year in premiums to obtain such a perfect policy? (QT-SS)

$0-249
$250-499
Our final scenario concerns a purely hypothetical situation in which:

- you are of age 85 and are the sole surviving member of your household;
- you are in need of long term care (LTC) yet have absolutely no long term care insurance;
- you know that you have exactly one year left to live and will need to spend it in a long term care facility
- you have sold your home, and you have total available wealth that is worth $200,000 at today's prices.
- Your total income net of taxes that year is $25,000 (again in terms of current prices).

Note all of Q20 on one page.

20. We are interested in your choice between LTC that is privately financed and government provided LTC that is financed through Medicaid. This choice impacts your LTC options and the bequest that you leave to your beneficiaries as follows.

- Option A: Use Medicaid funded LTC. The government will pay for your LTC, allowing you to leave all $200,000 as a bequest. However, using Medicaid restricts your choice of facility, on average results in inferior care, and requires you to surrender all income to the government.

- Option B: Use private LTC. Pay $50,000 for private LTC. You would only leave $150,000 as a bequest but would have your choice of facility and would have your income available for spending as you wish during that year (unspent income would be forfeited).

a. Which of these two options would you choose? [A or B] [QT-SS]
   Option A
   Option B

b. In the same scenario, what is the most of your total of $200,000 that you would be willing pay to get privately funded as opposed to Medicaid Long Term Care (knowing that all such spending will come out of the bequest you leave)?
   [Programmer: for this question display the usual range prompt – Please enter the number in the range of 0-$200,000.] numeric OE
Your Household’s Pattern of Spending

21. Which of the following ranges reflect the total amount of money your household spent on all categories of goods and services in 2005? Include everything you paid for by writing checks, using credit cards, or using cash out of pocket (including mortgage payments, rent, taxes, out of pocket medical expenses, insurance premiums, purchases of major durable goods such as cars, furniture, electrical equipment, heating bills, gas, food at home, food away from home, travel and entertainment, education, personal services, etc.). Please do NOT include additions to your savings or the purchase of investments or real estate as an “expense”. {QT-SS}

- $0-$9,999
- $10,000-19,999
- $20,000-29,999
- $30,000-39,999
- $40,000-49,999
- $50,000-74,999
- $75,000-99,999
- $100,000+

[Insert a box to enter numbers and ask below:]

a. Please enter your best estimate (in dollars). {numeric OE} lv-1 hv-9999999

[Note: All of Q22 on same page.

Start with a zero in each box. Sum up 1-5 at the bottom of the table and display a running total as the boxes are changed.

When they press “next”
First, do not allow #5 to be zero. If it is zero, display “Please enter a positive amount in the “other living expenses” row in the table.”

Then, if the final calculated total isn’t in the range given earlier, give them an error -- "Your estimated total spending is does not fall into the range you indicated earlier. Please adjust the itemized estimates you have provided."
]

You said your total spending was between [pipe in Q21] in total last year. In the boxes below, please do the best you can to categorize your expenses:

Range for all open end lv-0 hv-9999999

22. Please provide your best estimates (in dollars) of the following expenditures in year 2005.

a. All mortgage and debt payments (mortgage, car loan, home equity line, etc.), except credit card payments.
b. Maintenance, improvement, and taxes on real estate you own, or any rent that you pay

{Open Numeric}

c. Purchases of major durable goods such as cars, boats, electrical equipment and computers, furniture, etc.

{Open Numeric}

d. All out of pocket healthcare expenses.

{Open Numeric}

e. Income or other taxes you pay, other than real estate taxes:

{Please include in spreadsheet -- Open numeric, include in total}

f. All other living expenses. This includes food at home, food away from home, travel and entertainment, clothing, recurring transportation expenses, insurance premiums, telephone and other utilities, financial services, advisory or accounting fees, legal services, education, other personal services (haircuts, gardening, housekeeping), etc.

{Open Numeric} -

Looking forward to the year 2010, and assuming that the prices of the things that you buy are the same as the prices for those same things in 2005, would you expect the total amount you spend to be higher, lower, or the same as in 2005?

Higher
Lower
Same

C. [If Higher] Again assuming that all prices are fixed at 2005 levels, what would be the average annual increase in your spending over the next five years? [Drop downmenu in % from 1% up to 10%, then more than 10%].

D. [If Lower] Again assuming that all prices are fixed at 2005 levels, what would you expect to be the average annual decrease in your spending over the next five years? [Drop down menu in % from 1% up to 10%, then more than 10%].
23. Looking forward to 2010, and assuming that the prices of the things that you buy are the same as the prices for those same things in 2005, would you expect your household’s out of pocket healthcare spending to be higher, lower, or the same as in 2005? (QT-SS)

   Higher
   Lower
   Same

   [If they answer "higher", the % range shown should be all positive (0%, 1%,2%........10%,more than 10%)]
   If they answer "same", the follow-up question is skipped
   If they answer "lower", the % range shown should be all negative] (less than -10%, -9%,-8%........-1%,more than -1%)
   a. [If Higher or Lower] Again assuming that all prices are fixed at 2005 levels, what would you expect to be the annual average percentage change in the amount of your out of pocket healthcare spending over the next five years? [Drop down]

24. Looking forward to 2010, and assuming that the prices of the things that you buy are the same as the prices for those same things in 2005, would you expect spending on other living expenses to be higher, lower, or the same as in 2005? (QT-SS)

   Higher
   Lower
   Same

   [If they answer "higher", the % range shown should be all positive (0%, 1%,2%........10%,more than 10%)]
   If they answer "same", the follow-up question is skipped
   If they answer "lower", the % range shown should be all negative] (less than -10%, -9%,-8%........-1%,more than -1%)
   a. [If Higher or Lower] Again assuming that all prices are fixed at 2005 levels, what do you expect to be the annual average percentage change in the amount of your spending on other living expenses over the next five years? [Drop down]
25. Finally, looking forward to 2010, and now without making the assumption that prices will necessarily remain fixed, please tell us if you expect your total spending in dollars on other living expenses to be higher, lower, or the same as in 2005? {QT-SS}

Higher

Lower

Same

[If they answer "higher", the % range shown should be all positive (0%, 1%,2%........10%,more than 10%)

If they answer "same", the follow-up question is skipped

If they answer "lower", the % range shown should be all negative] (less than -10%, -9%,-8%........-1%,more than -1%)

a. [If Higher or Lower] What do you expect to be the annual average percentage change, including the effect of any price changes that might occur, in the amount you spend on other living expenses over the next five years? [Drop down]

26. Do you have any comments on this survey? (Open end text). Do not force an answer....