NBER WORKING PAPER SERIES

ELDERLY ASSET MANAGEMENT AND HEALTH: AN EMPIRICAL ANALYSIS

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Working Paper 7814
http://www.nber.org/papers/w7814

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
July 2000

We thank Jonathan Skinner for his detailed comments ono ur paper at the Brookings - University of Michigan Conference on "Rethinking the Estate and Gift Tax," held in Washington during May of 2000. We also thank Joel Slemrod and Bill Gale for organizing the conference and for their comments, as well as the many other conference participants who gave us valuable comments. The views expressed here are the authors' and do not necessarily reflect those of the National Bureau of Economic Research.

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ABSTRACT

We present models of asset management by the elderly. We focus on saving, spend-down of assets, and gift-giving, and the influence of health on these precesses. We also study the evolution of elderly health and the impact of economic variables on health outcomes. We present results from estimating our models using data from waves one and two of the AHEAD dataset.

Our model of asset management links elderly decisions about saving, spend-down of assets, and gift-giving in a system of equations. We divide households for which head and partner (if present) are in poor health and those for which head and partner are in good health; our specification allows for differences in health to affect both the average level of economic outcomes and the marginal effects of income and wealth on the outcomes. We also include in our model a set of sociodemographic control variables. Our model of health outcomes links health in the preceding period to health in the current period, allowing for three outcomes – good health, poor health, or death. In our models of health outcomes we include variables measuring health in the previous period, wealth, age, education, and control variables.

Our main results are the following. First, results for gift-giving suggest that at least some elderly do plan their estate transfer - those that have established trust funds or for which households assets exceed the estate tax filling threshold have a significantly greater propensity to give gifts. Second, the average level of gift-giving is lower for those in poor health, but the marginal effect of increasing wealth on gift-giving is much greater. This result is important in showing the ways in which health can interact with economic variables in influencing economic decision-making. Third, income is an important determinant of saving and spend-down. Fourth, other things equal, households that save are also more likely to give gifts. Fifth, sudden changes in family structure and health are associated with changing patters of economic behavior - most especially, becoming a widow or widower is associated with a significant increase in the likelihood both of spending out of assets and of making gifts. Finally, variables related to children have less effect on propensity to give gifts than expected - the only variable that has a significant effect is the number of children for which parents cannot provide income information, suggesting that the quality of the relationship between parents and children is important for gift-giving.

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I. Introduction

In the United States approximately one-half of all household assets are owned by households in which the head is aged 62 or above.[1] The fact that much of the nation's assets are owned by older individuals is important because older people are likely to manage their assets differently than younger people. Thus, the factors influencing saving by the elderly are likely to be different than the factors influencing saving by younger people – health is likely to be more important for the elderly, labor earnings for the young. In addition, the pattern of asset allocation may be quite different for the old than for the young – for example, older people may hold a higher percentage of their assets in housing and a lower percentage in the stock market. Further, older people are concerned about transferring their assets to their heirs, an issue that does not arise for the young, and they can manage the transfer of their assets more or less actively – for example, they can choose to transfer some of their assets while they are still alive by giving them away as gifts. Understanding how older people manage their assets is crucial for designing estate tax policy and social security; and because they own such a large fraction of all assets it is also important for understanding overall patterns of savings and asset allocation, patterns that have broad ramifications for investment and growth.

There are many factors that can be expected to influence decision-making by older persons about their assets. Some of these factors are identified in the standard life-cycle theory of household economic behavior. Thus the standard theory predicts that towards the end of their lives individuals should decumulate assets and plan for the transfer of their assets to their heirs, from which it follows that across a cohort of persons all of the same age, those in better health who expect to live longer should on average maintain higher savings than those in poor health. Further, the theory suggests a precautionary motive for savings – older people should maintain higher savings the more uncertain they believe their life expectancy to be and the more they are worried about incurring unexpected expenses, such as medical expenses. The theory also implies that individuals who care about their children should consider their children's well-being in estate planning, influencing both gift-giving and the nature of intended bequests; indeed from the perspective of estate tax planning older individuals with assets above the estate tax threshold should make substantial gifts each year to their heirs, because gifts below a threshold size are not taxed, so giving gifts is a way to reduce total expected tax liability (see Poterba (1998) for a detailed discussion).

But although life-cycle theory and issues of tax planning are helpful for understanding some of the factors that are likely to influence how the elderly manage their assets, these theories have significant limitations. Perhaps most importantly, they do not take

[1] We made this calculation using data from the most recent Survey of Consumer Finances.

into account – or take into account in only in a very limited way – potential sources of interrelationship between economics and health. An elderly person who falls into poor health may find that her preferences regarding asset allocation and her feelings about how much wealth feels "safe" have changed, which in turn can be expected to influence her decisions about saving, spending, and gift-giving. Further, those in ill health or falling into ill health may feel vulnerable, which may influence the nature of their interaction with their children, including around issues of estate planning and gift-giving. In the opposite direction, economic status influences health outcomes – it is well known that individuals of higher wealth have a significantly longer life expectancy in the United States and most countries around the world (for a review see Feinstein (1993)). Like the causal link running from health to economics, the link running from economic status to health has not been well integrated into standard economic theories.

In this paper we present a preliminary analysis of asset management by the elderly and elderly health, considering potential sources of interrelationship among assets, asset management decisions, health, and the evolution of health. We focus on modeling a few key aspects of asset management, and we consider both the influence of health on these processes as well as the influence of economic status on the evolution of health. Our models are not based on the life-cycle theory – they are not derived from an explicit model of utility maximization and do not explicitly include expectations. But they allow for a rich set of interrelationships between economics and health, and are meant to provide a flexible framework for analyzing certain aspects of asset and health dynamics. We have estimated our models using data from waves one and two of the Asset and Health Dynamics Among the Oldest Old (AHEAD) dataset, which provides comprehensive data about U.S. households in which the head was aged 70 or above in 1992. We discuss the AHEAD data and present and interpret results from our estimation later in this paper.

We view our work not as a finished product, but as the first step towards developing a better understanding of how health and economic factors interact and jointly evolve over time among the old. Ultimately we hope to develop a richer and more realistic framework that can be used to predict the dynamics of assets owned by the elderly, including the transfer by the elderly of assets to their heirs, incorporating health and a model of the evolution of health. We envision using this framework both to predict estate tax revenues and to investigate the effects of social security and alternative social security policies.

We present models for three processes – saving and the utilization of assets, gift-giving, and the evolution of health. Our model of saving and asset utilization involves three basic outcomes in each period – saving money, spending down assets to meet household needs, or neither saving nor spending down to any significant extent. We analyze which of these three states a household falls into, as well as the magnitude of savings and asset spend down. Our analysis focuses on total household wealth – we do not analyze specific

asset types and do not analyze patterns of asset allocation, leaving that for future work. We also do not analyze the return on specific assets, leaving that for future work as well.[2] We specify a simple model of gift-giving, focusing on the total value of all gifts reported to have been made by a household in the preceding year. To capture the important influences of health on economic decisions we include variables measuring health states and changes in health in both our model of saving and asset utilization and our model of gift-giving. Finally, we define three distinct health states – good health, poor health, and death, and we model health outcomes as depending upon both health in the preceding period and a host of demographic and socioeconomic variables.

Modeling saving, utilization of assets, and gift-giving jointly allows us to capture some basic features of the economics of aging that have not previously been investigated in much detail. Intuitively, there is likely to be a relationship within a period between a household's level of savings or utilization of assets for its own use and its level of gift-giving – after all, money that the household members spend on their own household is not available for gifts, and conversely, households that suddenly find themselves with a lot of "free cash" may be more likely both to save and give gifts. Our framework allows us to explore these issues. Understanding the link between savings and gift-giving and whether or not older people face a tradeoff between giving gifts and using assets to meet immediate needs is crucial for modeling the transfer of assets across generations and for predicting the behavioral effects induced by estate and gift tax policies.

Surprisingly, there has been little previous work jointly analyzing savings, utilization of assets, and gift-giving. In the literature on gifts gift-giving is generally not considered in relation to either household saving or the spend down of assets by household members to meet their own needs.[3] In the voluminous literature on savings over the life-cycle, including studies of the importance of savings for the elderly, gift-giving is only occasionally mentioned and is not prominent.[4] Implicitly, it seems that in this literature it is assumed that gift-giving is relatively insignificant as compared with saving and dissaving to meet the immediate needs of a household. But although this assumption may be correct for younger persons, it is not true for older persons. In the AHEAD data approximately twenty percent of households report savings, and the average value of savings among those who do save is $19,000; approximately twenty percent report spending out of assets, and the average value of spend down is $9,000; for gifts, a slightly larger percentage, twenty-

[2] Because we restrict our analysis to actions and events that occur within a period that affect a household's assets and do not analyze asset returns, we do not perform a full analysis of changes in asset value from one period to the next; again, we hope to address this issue more fully in future work.

[3] For example, in their interesting work on the factors that influence gift-giving Altonji, Hayashi, and Kotlikoff (1997) do not consider savings behavior. McGarry also does not consider savings and spend down in her interesting recent work on gift-giving by older persons (McGarry (1998)).

[4] Two of the most interesting recent contributions are Deaton, Gourinchas, and Paxson (1999), and Hubbard, Skinner, and Zeldes (1995); gifts are not discussed in either. For recent work, in which again gifts are not discussed, see Dyson, Skinner, and Zeldes (2000).

four percent, report making gifts, and the average total value of all gifts made is $8,500.[5] Thus gifts are slightly more common than either savings or spend down and on average are of about equal size as spend down. And for elderly with children gifts are even more important. The fact that gift-giving, savings, and spend down are all of comparable frequency and magnitude suggests that to understand and predict patterns of asset dynamics among the elderly requires modeling the three processes jointly.

The central variables for our analysis are measures of health and economic status. Our principle variable measuring health status is based on individuals' self-assessment of their own health. Each respondent in AHEAD reports his or her health as excellent, good, fair, or poor, and based on these reports we divide households into two broad groups, good health and poor health.[6] Our principle economic variables are saving, utilization of assets, gifts, wealth, and income. Wealth is an especially important variable for our work – not only is it the basis for estate value, but it is also the crucial determinant of the economic well-being of the elderly. We have done extensive work cleaning the AHEAD wealth data – which we found to be noisy and in some cases not likely to be a reliable measure of wealth – in order to construct as accurate a measure of household wealth as possible; we discuss how we cleaned the data in section III.

We are especially concerned to model interrelationships between health and economic status. In our models of saving, utilization, and gift-giving we include dummy variables referring to summary measures of the health status of the head and his partner, thereby allowing for the estimation of different average levels for these variables across health groups. Further, in each model we also interact each of wealth and income with health, thereby allowing the marginal effects of income and wealth on savings, utilization, and gift-giving to vary with health. As far as we know specifying these kinds of interactions between wealth and health is new – our specification is thus an example of how interactions between health and economics can be incorporated into econometric models. The hypothesis that marginal effects of income and wealth vary according to health status is intuitive; for example, elderly who are relatively wealthy and fall into poor health may follow a very different strategy regarding gift-giving than elderly who remain healthy or elderly who fall into poor health but are relatively poor.

We also model the influence of economic status on the evolution of health. Rec-

[5] All of these figures represent weighted values and therefore should be representative of elderly households in the U.S.

[6] In section III we describe exactly how we aggregate responses in households in which there is both a head and a partner present. In extensions of our basic specification we have drawn upon the rich health information recorded in AHEAD to construct more detailed measures of health. In particular, we have supplemented the basic information about whether a person's health is poor or not poor with information about whether health has worsened and about limitations of daily activities (ADL's) and instrumental daily activities (IADL's), and used this information to divide households into five groups; see Feinstein and Ho (1999) for more information about this. We have also explored the impact of specific health conditions, such as heart disease, on asset dynamics and gift-giving. We do not discuss any of our findings using these richer measures of health in this paper.

ognizing that the impact of wealth on health may be different for lower than for higher values of wealth, we include wealth splines in our model of health outcomes, so that that the marginal effect of wealth on health is allowed to be different for those living in households of low wealth than for those living in higher wealth households.

We discuss the results from estimating our models in detail in section four, but the main results can be summarized as follows. First, the results for gift-giving indicate that the estate tax does indeed influence gift-giving behavior: households for which assets are above the estate tax threshold have a significantly greater propensity to give gifts (there is a jump at this point in the wealth distribution), and the average value of gifts given by these households is approximately $5,000 more than the average value of gifts given by other households. Not surprisingly estate planning and transfer is linked to trust funds – controlling for the effect of wealth on gift-giving, we find that households that have established trust funds have a significantly greater propensity to give gifts.

Second, our results indicate that allowing for interactions between wealth and health is important – the pattern of wealth effects for households whose members are in good health is different than the pattern for households whose members are in poor health. Perhaps the most interesting finding here is that the average propensity to give gifts is lower for those in poor health, but the marginal effect of wealth is more than twice as great. We offer the following interpretation of this finding. Elderly who are in poor health and relatively poor are unwilling to part with assets – perhaps because they are worrying about future medical costs and have a strong precautionary motive to safeguard their assets, perhaps because they feel especially vulnerable, making them even more risk averse. In contrast, elderly in poor health who are relatively wealthy feel less vulnerable and worried about spending down their assets, and become even more concerned about estate transfer than wealthy elderly who remain in good health. Similar results hold for saving and we interpret them similarly.

Third, income is a very important determinant of saving and spend-down. It is not surprising that income is linked with saving, and indeed we find that older persons, especially those in good health, save a relatively large fraction of marginal income – between twenty and fifty percent. The link between income and spend-down is less obvious and we offer a number of possible interpretions: some older persons may lead more active lives than others, and for these active persons the flow of resources both in and out of the household may well be relatively high; alternatively, older persons with high income may expect their high income to continue and therefore be more willing to utilize existing assets.

Fourth, other things equal, households that save are also more likely to make gifts. Further, among those who save, increased saving is associated with increased gift-giving, and similarly among those who spend-down assets increased spend-down is associated with

increased gift-giving.

Fifth, sudden changes in family structure and health seem to be associated with utilization of assets. Especially, we find that being recently widowed is associated with a rapid depletion of assets, both to meet own needs and as gifts, dramatic enough to suggest that widowhood is an important factor to consider in models of estate planning and estate tax projections. We also find that a deterioration in health is associated with a significant increase in the likelihood of spending out of assets.

Sixth, variables related to children have less effect on gift-giving than we expected. Number of children is not associated with a significant increase in the propensity to give gifts; and lower average income of children is actually associated with a decrease in gift-giving – though the effect is not significant – contradicting simple theories of parental altruism. Indeed, the only child variable that has a significant effect on gift-giving is a variable measuring the number of children for which the parents are unable to provide information about income – the more children for which information is missing, the less is the propensity to give gifts, suggesting that the closeness of relationship between parents and children is an important factor influencing parental gifts.

Finally, our results for our models of health outcomes indicate that health in the recent past is the most important factor determining health outcomes over the next two years for this population of elderly. Educational attainment is also a significant factor, with those who have earned a college degree more likely to survive and be in good health. Income and wealth, although known to be important determinants of health over the lifespan, are not important for explaining health outcomes in the immediate future, controlling for education and health.

We hope that our results will contribute to a shift in conventional wisdom about the link between economics and health. The importance of socioeconomic status for health has come to be widely appreciated over the course of the past few decades. While we believe this effect to be important over the long course of life, our results suggest that, at least for the elderly, in the immediate short-term last period health is a far more important determinant of health outcome than income or wealth. In contrast, the importance of health for understanding economic and financial decision-making, especially of older people, has not been as widely recognized; but our results show that it is an important channel of influence. We hope our work will contribute to increasing appreciation for the importance of incorporating health variables into economic models of the household, and will help policy-makers understand how important it is to model the evolution of health and economic status jointly for the elderly.

It is worthy of note that in recent years several other researcher have also used the AHEAD dataset to study elderly health and the economics of aging. In a series

of papers Kathleen McGarry has investigated gift-giving patterns in AHEAD, and has found that parents are more likely to make transfers to children whose current income is low and that they often make transfers only to one child in year or unequal sized transfers (see in particular McGarry (1998)). However, she does not consider the link between gift-giving and savings behavior, and does not report any information about the influence of health on gift-giving.[7] Michael Hurd, Daniel McFadden and Angel Merrill have investigated mortality in AHEAD between waves one and two (see Hurd, McFadden, and Merrill (1998)). They divide households into income and wealth quartiles, and estimate logistic regressions for mortality risk that include as independent variables these measures as well as an extensive battery of health conditions. They report that after controlling for health conditions only one of their economic variables has a significant relationship with mortality, being in the highest income quartile, which is associated with a significant reduction in mortality risk. They also investigate saving, defined as net change in wealth (we defining saving differently) and find that saving is significantly associated with income, as we do, but little effect of a variety of health conditions on saving. They do not investigate asset utilization or gift-giving and do not interact wealth and income with health conditions as we do.[8] Neither set of researchers has tried to link changes in health, savings and spend-down, and gift-giving in an integrated framework.

There have also been several recent papers that study household transfer of assets through gifts as a means of reducing estate tax liability at death. Of particular interest, Jim Poterba has argued that individuals and couples for whom household assets exceed the estate tax filing threshold should give away assets to their heirs towards the end of their lives, in order to reduce expected estate tax liability (see Poterba (1998)). His analysis of data collected in the Survey of Consumer Finances indicates that most are not giving away their assets to the extent that simple tax calculations suggest they should be.[9]

The remainder of our paper is organized as follows. In the next section we present our models of asset dynamics, gift-giving, and health outcomes, and discuss issues related to our specification. In section III we discuss the AHEAD data we use, describing some of the strengths and weaknesses of the data and the work we have done cleaning the data. In section IV we present our results and interpret them. Section V is a brief conclusion,

[7] Kathleen has also investigated intended bequests reported by participants in AHEAD and found that most intend for their estate to be divided equally among their children, a finding that is consistent with the common wisdom about bequests.

[8] Hurd, McFadden, and Merrill also investigate a variety of other health outcomes. In a separate paper they have investigated the link between AHEAD respondents' estimates of their subjective probability of survival and subsequent health outcomes; see Hurd, McFadden, and Merrill (1999).

[9] A separate but related issue is that many gifts may not be being reported and recorded in available data. We have also researched this issue, finding a large discrepancy between taxable gifts reported in both AHEAD and the Health and Retirement Survey and taxable gifts reported to the Internal Revenue Service (gifts to another person or household are taxable if the total of such gifts in a given year are above the gift tax filing threshold, which has for many years been $10,000 for a single person and $20,000 for a married couple) (see Feinstein (1997)).

and in an Appendix we outline an extension of our basic model that allows us to address the possibility that labor income is endogenous.

II. Models

In this section we present our models of saving, asset utilization, gift-giving, and health outcomes. Our models allow both for effects of health on household financial decisions and outcomes, as well as for the impact of economic variables on health outcomes.

In our model of financial decisions and outcomes we measure the health status of a household by combining information about the health of the head of household and his or her partner (if he has a partner), dividing households into two groups, good and poor health. We include in our specifications a dummy variable for health status in each period and for changes in health status over time. We also include interactactions between health status and each of wealth and income, thereby allowing for the possibility that the marginal effects of wealth and income on financial decisions and outcomes are different for households in good health than for households in poor health.

We estimate separate models of health outcomes for males and females, specifying a simple model in which a person who is alive in one period is either in good health or poor health or dead in the next period. We allow for the effects of wealth and income on health to be different for individuals in different conditions of health in the preceding period. In addition, we model the effects of wealth and income using a spline model, so that, within each health category, the marginal effects of increasing wealth and income on health are allowed to be different for those of high wealth or high income than for those of low wealth or low income.

By combining estimates from our economic model with those from our health outcomes model we should be able ultimately to predict health and asset dynamics jointly. In the conclusion we briefly describe how this can be done and mention important limitations of the models as currently specified.

Saving, Asset Utilization, and Gift-Giving

The evolution of household assets is governed by three basic processes. First is the accumulation or decumulation of assets by the household in relation to its own expenses – in any period it can save, use assets to meet current needs, or have expenditures approximately equal to current income. Second, the household gives assets away as gifts; note that gift-giving is separate from the use of assets to meet needs. Third, the household

makes choices about the allocation of its wealth across different kinds of assets, and these decisions affect future returns and therefore future wealth.

In this paper we study the first two processes: we model saving, asset utilization, and gift-giving as a system of four equations. Our model of saving and spend-down has three equations. The first is an ordered probit with three outcomes: spend-down of assets; neither spend-down nor savings; and savings. The remaining two equations condition on the outcome for the first equation: conditional on spend-down, we specify a regression model for the magnitude of spend-down; and conditional on saving, we specify a regression model for the magnitude of saving. Our model of gift-giving is a standard tobit model. We do not study household asset allocation, but we note that the AHEAD data provide a reasonably detailed breakdown of assets by type, and we hope to investigate asset allocation in future work.

Only two waves of data from AHEAD are currently available for public use. Our strategy is to use information about assets and health in wave one to establish a baseline condition for each household, and then examine saving, spend-down of assets, and gift-giving reported for the household in wave two. Unfortunately, given the lack of data from a third wave we are unable to estimate a panel model; again, we hope to develop such a model once wave three data becomes available.

Following are our notation and the four expressions that define our model of saving, asset utilization, and gift-giving. The first expression classifies a household into one of three categories – spend-down, no addition or subtraction from assets, or saving.

$$Y_1^* = X_1\beta_1 + \epsilon_1 \qquad (1A).$$

In this expression Y_1^* is a latent variable, X_1 is a vector of independent variables expected to affect household spend-down and savings, β_1 is a parameter vector, and ϵ_1 is a stochastic disturbance. We define a threshold value λ and then define Y_1 to indicate which category applies for the household.

$$Y_1 = -1(\textit{ spend down}) \textit{ if } Y_1^* \leq 0 \qquad (1B)$$

$$Y_1 = 0(\textit{ no significant spend down or savings}) \textit{ if } 0 < Y_1^* \leq \lambda$$

$$Y_1 = 1(\textit{ savings}) \textit{ if } Y_1^* > \lambda$$

Conditional on $Y_1 = -1$ we define the asset utilization equation,

$$Y_2 = X_2\beta_2 + \epsilon_2, \qquad (2)$$

where Y_2 is the amount of assets the household reports having used in the current period, X_2 is a vector of independent variables, β_2 is a vector of parameters, and ϵ_2 is a stochastic disturbance. Conditional on $Y_1 = 1$ we define the savings equation,

$$Y_3 = X_3\beta_3 + \epsilon_3, \tag{3}$$

where Y_3 is the amount of current income the household reports having contributed to savings in the current period, X_3 is a vector of independent variables, β_3 is a vector of parameters, and ϵ_3 is a stochastic disturbance.

The last expression in our model is for gift-giving.

$$Y_4^* = X_4\beta_4 + \epsilon_4 \tag{4}$$

$$Y_4 = 0(no\ gifts)\ if\ Y_4^* \leq 0$$

$$Y_4 = Y_4^*(gifts\ in\ amount\ Y_4^*)\ if\ Y_4^* > 0.$$

In expression (4) Y_4 is the total value of all gifts the household reports having made in the current period, Y_4^* is a latent variable, X_4 is a vector of independent variables, β_4 is a parameter vector to be estimated, and ϵ_4 is a stochastic disturbance.

We assume that the four stochastic disturbances ϵ_1, ϵ_2, ϵ_3, and ϵ_4 are jointly normally distributed, with variances 1 (the variance of ϵ_1 is normalized to this value), σ_2^2, σ_3^2, and σ_4^2. Since a household never saves at the same time that it spends down its assets, at most one of expressions (2) and (3) can apply in each case, and therefore it is not possible to estimate a correlation between ϵ_2 and ϵ_3. But the other five correlations are in principle identifiable.

In our specification the correlation ρ_{14} is of special interest, for it provides one measure of the general nature of the relationship between a household's management of its assets for its own internal use and its use of assets for the purposes of giving gifts. Since gift-giving has not normally been modeled jointly with saving and spend-down of assets, this correlation has not previously been investigated as far as we are aware. Intuitively, a positive value for ρ_{14} indicates that households that are unusually likely to save as compared with other comparable households (households with similar values for observable variables) are also more likely to give gifts. Conversely, a negative value indicates that households that are unusually likely to save are less likely to give gifts, perhaps reflecting a substitution effect in which own saving crowds out gift-giving.

The remaining correlations also have reasonable interpretations. The correlation ρ_{12} controls for selection among the subset of households that spend down. If for example this correlation is positive, that indicates that a household that has an unusually high likelihood of spending down assets is also likely to spend-down more than the amount

spent down by comparable households. Similarly, the correlation ρ_{13} controls for selection among the subset of households that save.

The correlation ρ_{24} measures the correlation between spend-down of assets and gift-giving, among households that spend down. A positive value for this correlation indicates that households that spend down an unusually large amount relative to comparable households that also spend down also tend to give more in gifts than these comparable households. In turn this would indicate that some elderly are exhausting their wealth at a faster rate than others. What might cause this? Some elderly may be pursuing a more aggressive estate planning strategy or be unusually pessimistic about their health and their expected longevity. A negative value for ρ_{24} indicates that households that spend down an unusually large amount relative to comparable households that also spend down tend to give less in gifts, which would suggest a substitution effect, that households that are forced to spend an unusually large amount of their wealth on their own needs give less in gifts.

Lastly, the correlation ρ_{34} measures the correlation between savings and gift-giving among households that save. A positive value for this correlation indicates that households that are able to save an unusually large amount relative to comparable households also tend to give more in gifts. This is a kind of complementarity that might arise if some elderly have unusually low expenditures or simply "feel wealthy." A negative value indicates that elderly who save a lot relative to others of comparable economic status tend to give less in gifts – they may be miserly or simply working hard to build up assets.

As we mentioned in the introduction, our model is not a structural model derived from an explicit model of life-cycle behavior and the maximization of the expectation of current and future utility. In particular, we do not include any explicit measures of expectations, beyond the assessment of own health status, and do not attempt to fit a utility function, for example over total household consumption. However, because we control carefully for baseline health and economic variables, we hope the model can provide reasonable estimates of how the management of assets is influenced by such factors as wealth, current income, and health. Our goal is not to recover a specific form of utility function, but simply to explore the inter-relationships among health and economic variables that determine the economic well-being of the household.

Households fall into six cases: (1) neither spend-down nor saving and no gift-giving, $Y_1 = 0$ and $Y_4 = 0$; (2) neither spend-down nor saving, but gift-giving, $Y_1 = 0$ and $Y_4 > 0$; (3) spend-down and no gift-giving, $Y_1 = -1$ and $Y_4 = 0$; (4) saving and no gift-giving, $Y_1 = 1$ and $Y_4 = 0$; (5) spend-down and gift-giving, $Y_1 = -1$ and $Y_4 > 0$; and (6) saving and gift-giving, $Y_1 = 1$ and $Y_4 > 0$. In the appendix we present the likelihood function associated with each case.

Extensions

We discuss two kinds of extensions of the basic model. First, we allow savings and spend down to enter directly into the expression for gift-giving, so that expression (4) becomes:

$$Y_4^* = X_4\beta_4 + Y_2\gamma_2 + Y_3\gamma_3 + \epsilon_4 \tag{5}$$

Our model is then a recursive system with a likelihood function essentially similar to the one outlined above.[10] It is for this augmented model that we report results.

Second, we consider the possibility that certain kinds of income may be endogenous, determined in part by choices that are themselves influenced by household income or expectations about income. There are two main sources of income that might be endogenous, labor market income and capital gains income, and we discuss each in turn.[11]

There are two reasons why labor income might be endogenous. Approximately twenty percent of the households in AHEAD report working, and presumably the decision about whether or not to work may be influenced by current health status, wealth, other sources of income, and the desire to earn income to give as gifts, to save, or to spend. If the labor supply decision is primarily motivated by considerations of saving, expenditures, or gift-giving then labor income may be endogenous, which would make total income endogenous. We can address this issue by constructing an equation for labor income and estimating labor income jointly with the remaining four expressions in our model. The resulting likelihood has twelve cases instead of six – labor income can be zero or positive – and is slightly more complicated than the likelihood for our basic model. Since the fraction of households that report working is relatively small, and labor income is a relatively small percentage of total income for most households that do report working, we do not expect the endogeneity of labor income to be a large issue for the AHEAD population, and we do not model labor income in this paper.

Capital gains income also might be endogenous, if household decisions to liquidate assets are influenced by the desire to save or give gifts, or anticipated expenditures. AHEAD does not report much information about capital gains, thus it would be difficult to address the endogeneity of capital gains income empirically in our work. The only kind of asset for which capital gains information is reported is primary residence. The data indicate that 4.6% of households in wave 2 report having sold a primary residence in the past two years, and that two-thirds realized a capital gain, with the average gain slightly over $50,000. This is a substantial dollar value, but applies to a relatively small percentage of households, and is unlikely to have a large influence on our results. For other assets, for example stocks, there is some information about inflows and outflows, but not enough

[10] Because the model is recursive the Jacobian of transformation from the stochastic disturbances to the dependent variables is one, so the likelihood form is essentially unchanged.

[11] We thank Joel Slemrod for pointing out that capital gains income might be endogenous.

information about specific transactions to calculate capital gains. In principle, the endogeneity of capital gains can be addressed using a very similar approach to the approach used to correct for endogeneity of labor income. Thus for example it would be possible to estimate a model of sale of primary residence jointly with savings, spend-down, and gift-giving; but we do not pursue this in the present work.

There is an additional potential source of endogeneity in income, arising from the pattern of allocation of assets. Placing a larger share of household wealth in assets that are high risk and high return should on average increase household income. If the asset allocation decision is influenced by likely expenditures or the desire to make gifts, asset returns are likely to be endogenous. This is a very interesting issue, that we hope to address in future work.

Model of Health Outcomes

The second part of our model concerns the health outcomes of the head of household and partner (if present). We are interested not only in mortality but also in the distinction between being in good health as opposed to poor health, because we believe that economic decision-making and outcomes regarding assets, for example the propensities to spend down assets and to give gifts, are likely to be different for households whose members are generally healthy as compared with households whose members are in poor health. We estimate health outcomes with a pair of ordered probit models, one for males and one for females, estimated via maximum likelihood. As an example, the model for males is as follows (the model for females is identical).

$$
\begin{aligned}
Y_M^* &= X_M \beta_M + \epsilon_M \qquad (6)\\
Y_M &= 0(\ death)\ if\ Y_M^* \leq 0\\
Y_M &= 1(\ poor\ health)\ if\ 0 < Y_M^* \leq \mu_M\\
Y_M &= 2(\ good\ health)\ if\ Y_M^* > \mu_M.
\end{aligned}
$$

In this expression μ_M is a threshold that determines the value of the latent variable Y_M^* for which health shifts from poor to good, X_M are independent variables that are expected to influence health, and β_M is a vector of paramters. The stochastic disturbance ϵ_M is assumed to be distributed standard normal.

We include as independent variables in our health outcome models age, marital status, a set of demographic characteristics, several measures of health in the preceding period (baseline health), and a measure of household wealth and income in the preceding period.[12] We interact wealth with age, marital status, and baseline health status, and

[12] For married couples we divide household wealth by 1.5 to make a simple correction for their need to spread their wealth between two individuals.

in each case we model the interaction using a spline, thereby allowing the slope of the relationship to be different for those of relatively low wealth than for those of high wealth, fixing the knot at $200,000. Thus for example we distinguish the effect of wealth on mortality for those who were in poor health in the preceding period from the effect of wealth on health outcomes for those who were in good health, and for each health group we allow the marginal effect of increasing wealth on health outcome to be different for wealth below $200,000 than for wealth values above this value.

We are assuming that there is no correlation between the stochastic disturbances effecting health outcomes of a male and female who live together in a common household. This means we are assuming that to the extent a couple is more likely to share a common health outcome than a random pair of individuals the effect is entirely due to observable variables we are including in our model, like household wealth or similarity of age. Clearly this assumption is imperfect: for example couples who travel together risk dying together in an accident, suggesting that the probability of both dying is larger than the simple multiplication of the probability of one dying times the probability of the other dying. It is a simple matter to address this issue by estimating our models jointly for males and females, and we intend to explore this issue in our final draft.

For now, our health outcomes model is independent of our model of saving, asset utilization, and gift-giving. In particular, the stochastic disturbances in each model are assumed to be independent of all disturbances included in the other model, although of course the two models share almost all of their independent variables in common, including baseline wealth and health status.

In previous work (see Feinstein and Ho (1999)) we estimated a model linking gift-giving in one year with mortality in the following two years, and found a significant correlation between the disturbances in the gift-giving model and the mortality model, suggesting that a household might have information about its future health outcome beyond what is captured in the explanatory variables about health we have access to in the AHEAD dataset. In the present work our model is specified slightly differently, since we are estimating saving, asset utilization, and gift-giving together with health outcomes in the same period, not future health outcomes, conditioning on baseline health and economic conditions. Nonetheless, the earlier finding suggests we should consider correlations between the disturbances included in the different models. We have not done so mainly due to the computational burden associated with estimating such a large model.

III. Data

The data we use to estimate our models is drawn from waves 1 and 2 of the AHEAD dataset. The AHEAD study collects information about a stratified random sample of households for which the head of the household was aged 70 or above in 1993.[13] AHEAD is a longitudinal study which began in 1993 and is interviewing members of participating households every second year. The study collects extensive information about family composition and structure, living arrangements, economic status of the household and extended family, including information about household assets and work history, and information about many different aspects of health of the head of the household and his partner. See Soldo, Hurd, Rodgers, and Wallace (1997) for details about the construction of the sample and design of the survey.

We include in our analysis only households that participated in the survey in both waves, including households that exited the survey due to death (it was a single household and the head died or a couple and both died) but for which surviving relatives answered the exit survey. There are approximately 5,640 households that meet these criteria, containing approximately 7,700 respondents – heads and their partners – of which approximately 750 died between waves 1 and 2. We excluded from our analysis 156 households for which basic sex and age information is missing for either the head or partner, and an additional 180 households for which basic information about savings, income, and health is missing for wave two. As described below, we also deleted approximately 420 households for which asset data was deemed too poor to be useful. After all deletions, we are left with approximately 4,880 households. For estimation of our model of saving, asset utilization, and gift-giving, for which the dependent variables are wave two values, we omitted 356 households that exited the survey due to death, leaving us with 4,515 households. 3,875 of these households report having at least one child and we estimate our models for this subset of households as well as for the full 4,515.

In our empirical estimation we use wealth, demographic and health information from wave 1, and combine it with information about income, gift-giving, savings, spend down, and changes in health (including death) reported in wave 2. Thus our approach is to establish a baseline condition for each household using wave 1 data, and then examine household decision-making and changes in household circumstances between waves 1 and 2, as a function of the baseline conditions. Many of our variables are drawn directly from the AHEAD dataset, but others are constructed.

The AHEAD data we have worked with most extensively is the asset data. AHEAD asks respondents about a variety of kinds of assets, including stocks, bonds, IRA's, business

[13] Information is collected only about households for which the head is not institutionalized.

assets, house value, other real estate, checking and CD accounts, trusts, intangible assets (including cars and jewelery), and other assets. We have found the asset data to be not as reliable as we had hoped and have worked intensively to correct data in cases for which we have been able to make corrections. In our initial work we discovered a possible error in the way in which trust assets were calculated for wave 1, due to a question that was asked that is worded ambiguously, which we believe respondents and the AHEAD staff interpreted differently.[14] In the face of this difficulty, we developed a method for imputing trust assets that we believe is consistent with the most plausible interpretation of respondents' answers.[15]

Many AHEAD respondents do not provide exact answers about specific assets, and their holdings of these assets are imputed either based on answers they give to a series of bracket questions or, if they refuse or can't answer the bracket questions, using a "hot-deck" procedure.[16] In our more recent work, constructing the dataset for this paper, we have scrutinized the imputed asset data with care. For households for which significant asset holdings in wave 1 are based on imputed values, we compared the assets reported in wave 1 to what is reported for the same household in wave 2. We found large discrepancies in many cases. We deleted approximately 280 households for which essentially all asset data is imputed in both waves, believing the data was simply too unreliable to be used. We also deleted approximately 140 households for which wave 1 asset data was deemed too poor to be useful. For approximately 350 households, we used actual asset values from wave 2 to adjust imputed values in wave 1, by adjusting an imputed value – which normally is placed at the midpoint of a bracket interval – to the upper or lower admissible bound of the interval.[17] Lastly, for approximately 20 households, we believe wave 2 asset data

[14] The ambiguous question is v1779, in which the respondent was asked whether he had included trust assets in his previous answers; we believe that a "yes" to this question simply meant the respondent had listed all trust assets in his answer to the previous question, v1778, which asks about trust assets, whereas the AHEAD staff appears to have interpreted a yes as meaning that the assets reported in v1778 had been included in earlier asset figures provided in response to slightly earlier questions in the series.

[15] Our method is as follows. If the respondent answered "no" to v1779 we use the AHEAD total asset measure. If the respondent answered "yes" we apply the following algorithm. First we compute the difference between the answer to v1778, which asks specifically about trust assets, and the AHEAD total asset measure. If this difference is negative, trust assets cannot have been included in the earlier figures and we then add the number reported in v1778 to the total asset measure. If the difference is positive we compute the ratio of the number reported in v1778 to the AHEAD total asset measure. If the ratio is greater than .75, indicating trust assets are a very large proportion of the total assets, we assume trust assets were not included in the total asset number and add the number reported in v1778 to the AHEAD measure of total assets. Conversely, if the ratio is less than .50 we assume trust assets were included and do not modify the AHEAD total asset measure. If the ratio is between .5 and .75 we linearly interpolate, adding to the AHEAD total asset measure a fraction of the number reported in v1778, with the fraction being zero at .5 and one at .75.

[16] A hot-deck procedure involves pairing an observation for which asset information is missing with an observation for which the asset information is present. The matching observation is drawn randomly from a pool consisting of all observations with asset information present for which the values for a set of observable characteristics are identical to those for the observation missing asset information. Unfortunately, the exact hot-deck procedure used in AHEAD is not described in any of the written documentation we have had access to.

[17] For example, if a respondent answers a series of questions indicating his household's holdings of a particular asset are bounded between $250,000 and $750,000, the normal procedure is to impute a value of

to be far more reliable than the wave 1 data and projected the wave 2 asset values back to wave 1, typically multiplying the wave two values by 0.8 or 0.9 (depending on the type of asset).[18] In total, we deleted or made corrections to asset data for approximately 770 households, approximately 20% of the total number of households reporting asset holdings. Even so, there remain many more households for which we have serious concerns about the quality of the reported data. One problem we wish especially to note is that for many assets the bracket intervals are simply too large to be useful for evaluating asset holdings, and especially for modeling asset dynamics – an example of this that recurs for several of the asset types is a bracket between $250,000 and $500,000. Our main asset variable is WEALTH, equal to the total value of all assets in wave one (except assets in trust funds) minus total reported debts.

In contrast to the asset data, we find the data on gift-giving and the saving or use of assets to be relatively clean – the numbers seem reasonable and most households provide actual values, though of course we cannot vouch for their accuracy. Respondents are asked about gifts made to children and others in the preceding year; we sum up the total value of gifts they report, and we use the value reported in wave 2, defining this to be the value of the variable GIFT. Respondents are asked about saving. And they are asked separately about use of assets, specifically excluding gifts – the exact wording of the question is, "[In the past two years] did you (and your husband/and your wife/and your partner/) use any of your investments or savings to pay for expenses, not counting any money or assets that you have given away to (children or) others?" If the respondent reports saving money he is asked how much the household saved, and if he reports having spent out of assets he is asked how much the household utilized. We denote the amount of savings by SAVING (zero or positive) and the value of spend-down by SPEND-DOWN (zero or positive). We use the values for these variables reported in wave 2 and place the household in one of three categories for that wave: savings, spend down of assets, or no significant saving or spending down of assets.

The AHEAD survey collects information about a rich array of health indicators. Respondents are asked to rate their current health as being excellent, good, fair, or poor, and we focus on these self-reports of overall health to construct measures of health status.

$500,000 for that asset. If however an actual value of holdings of that asset is reported for the household in wave 2, we use it to adjust the imputed value in wave 1. If for example the actual holdings in wave 2 are reported as zero, we adjust the imputed value in wave 1 down to $250,000. We make an adjustment only if there is no evidence for shifts in assets between the two waves that might explain why the wave 2 value for a particular asset is very different from the wave 1 imputed value. Overall, our adjustment is a conservative one, in that we do not contradict any answers respondents gave in wave 1, even though in an example like the one we have given it is certainly very possible that the respondent in wave 1 was simply in error and the household does not hold the asset in question.

[18] We used this more radical adjustment only when many different kinds of assets were reported in wave 2, all of which were missing in wave 1. In this situation it seems very unlikely that the discrepancy is due to inheritance or a sudden windfall, since in that case it is unlikely the household would so quickly have diversified its assets into many different categories. Far more likely the respondent in wave 1 simply did not recall the household's assets.

Respondents are also asked whether during the last year or two their health has improved, remained about the same, or worsened, and we use information from their answers to this question as well.[19] Because we are interested in investigating the effects of ill health on asset dynamics and gift-giving, we focus on creating a separate category for households whose members are overall not in good health. For each household we define the variable POORHEALTH to be equal to zero (good health) or one (poor health). If the head of household does not have a partner, POORHEALTH equals one if the head reports being in poor health; if he has a partner, POORHEALTH equals one if both the head and partner report being in poor health or if one reports being in poor health and the other reports being in fair health. We also define the variable HEALTH-CHANGE for wave 2, equal to zero (health the same) or one (health worse). If the head does not have a partner HEALTH-CHANGE equals one if the head reports being in worse health; if he has a partner, HEALTH-CHANGE equals one if both the head and partner report being in worse health or if one reports being in worse health and the other reports that his or her health has remained about the same; if neither of these conditions holds, HEALTH-CHANGE equals one if the household has POORHEALTH equal to zero in wave one and one in wave two. In extensions of our basic models we have constructed more detailed measures of health using information provided in AHEAD about functional limitations – ADL's and IADL's – and specific diseases. We define two dummy variables, HIGH-ADL and HIGH-IADL – HIGH-ADL is equal to one if a respondent is reported to have more than one ADL limitation, and HIGH-IADL is equal to one if he is reported to have more than one IADL limitation. [20] We also explored the impact of illness on economic decision-

[19] In his comments to us Bill Gale suggested that anoher variable that might be useful for measuring the relationship between health and decision-making about assets, including gifts, is the individual's assessment of the likelihood she will enter a nursing home in the foreseeable future. We agree, but do not explore the matter here.

[20] In work beyond what is reported in this paper we have developed a methodology for dividing households into five distinct health groups in each wave. We define HIGH-ADL and HIGH-IADL for a household (if the head does not have a partner we used these variables as set for the head; if the head does have a partner, we set HIGH-ADL for the household equal to one if either the head or partner has ADLH equal to one, and likewise set HIGH-IADL for the household equal to one if either the head or partner has HIGH-IADL equal to one). We also define a variable WORSEHEALTH in wave one – if the head has no partner WORSEHEALTH equals one if the head reports being in worse health, if he has a partner WORSEHEALTH equals one if both head and partner report being in worse health or one reports being in worse health and the other reports no change in health. Combining the four health indicators POORHEALTH, WORSEHEALTH, HIGH-ADL, and HIGH-IADL generates sixteen distinct health cells – each household falls in one of these cells. There are too few observations in certain cells to estimate reliably coefficients for each cell separately. Thus we group certain cells together, creating five distinct groups. The first group includes households for which all four dummies are zero – the majority of households (both of married and not married households) fall in this group. The second group includes households for which just the WORSEHEALTH variable equals one – the members of the household are not in poor health and have no limitations, but apparently feel a sense of deteriorating health. The third group includes households for which POORHEALTH is zero but at least one of ADLH or IADLH is equal to one – the respondents in these households have made relatively optimistic reports about their health but suffer from some limitations in daily living. The fourth group includes households for which POORHEALTH is one and both ADLH and IADLH are zero – the members of the household feel in poor health but do not have limitations in daily living. Lastly, the fifth group includes the remaining households, for which POORHEALTH is one and at least one of ADLH or IADLH is also one. In wave one, about 10% of households fall in group two, 18% in group three, 5% in group 4, and 10% in group five.

making, defining the variable ILLNESS to be a dummy variable equal to one if either head or partner reports having heart disease or cancer.[21]

In addition to the variables defined above, we include several additional economic and demographic variables in our models. We include household income – we define INCOME to be total household income, as recorded in the AHEAD dataset, and we use wave two income in our specification.[22] We include age of the head and partner, defining MALE-AGE for a male respondent to be the maximum of zero and his age minus 64, and FEMALE-AGE for a female respondent to be the maximum of zero and her age minus 64. We define MARRIED to be a dummy variable set to one if the household is a married couple in wave one, WIDOW to be a dummy variable set to one if the head is a widow or widower in wave one, and NEWWIDOW to be a dummy variable set equal to one if one member of a couple dies between waves one and two. We define NON-WHITE to be a dummy variable set to one if either the head of household or his partner is nonwhite. We define SOUTH to be a dummy variable set to one if the household place of residence is a southern state, and URBAN to be a dummy variable set to one if the household place of residence is an urban area. We define two variables related to household finances: TRUST, a dummy variable set to one if the household owns a trust fund; and ESTATE-FILING, a dummy variable set to one if the household's total assets exceed the estate tax filing threshold, assumed to be \$600,00 for single and divorced, and \$1.2 million for married and widowed.[23][24]

Finally, we define a set of variables related to children that we expect to be important factors influencing gift-giving. Our variables related to children are defined using the extensive information about family composition and living arrangements collected in wave one. The AHEAD survey divides children into those who are coresident with their parents and those who live elsewhere. We define CORESIDENT CHILDREN to be the children who live with the head and partner, and NONRESIDENT CHILDREN to be the number of nonresident children; we include both biologic children and step-children of the head and partner, possibly from previous marriages, and we define NOCHILDREN to be a dummy variable equal to one if both CORESIDENT CHILDREN and NONRESIDENT CHILDREN are zero. As discussed earlier, for much of our analysis we restrict attention to households for which NUMCHILDREN is greater than zero, which are 3,875 of the

Our simpler specification just using POORHEALTH combines groups one, two, and three in the category POORHEALTH equal zero and groups four and five in POORHEALTH equal one.

[21] We have also explored the importance of cognitive limitations in economic outcomes, finding only modest effects, which we do not report.

[22] We made imputations for this variable based on the coded answers to a series of bracket questions recorded in the wave two dataset – at the present time the imputations themselves, including hot deck, have not been done for wave two by the AHEAD staff.

[23] Thus we assume that when one spouse dies she or he leaves all of her assets to the other spouse, so that the filing threshold for widows and widowers is \$1.2 million.

[24] We initially included a variable for home ownership but found it was not significant in any of our models and so omit it.

4,515 households in our dataset. We define GRANDCHILDREN to be the total number of grandchildren. We define CHILDREN-AVERAGE-INC to be the average income of children for whom income is reported. We recognize that when a child's income is not reported it may indicate either that the parents feel not as close to the child or the child is doing poorly; to control for such effects, we define CHILDREN-NO-INC-INFO to be equal to the number of children for whom income data is missing.

Tables one, two, and three provide summary statistics about the variables included in our models. Table one summarizes variable definitions. Table two provides information about numbers of zero and nonzero cases and the mean for nonzero cases for our variables; we include separate panels for the entire sample and for the sample of households having at least one child, and provide information both for the unweighted sample and the sample weighted to reflect the U.S. population. Table three provides a more detailed breakdown of the quantile distribution of wealth, both weighted and unweighted, both for the entire sample and the sample having children. In general, summary statistics are similar for the unweighted and weighted samples as well as for the entire sample and the sample of households with children.

TABLE 1
Definition of Variables

A. DEPENDENT VARIABLES

Variable	Definition
GIFT	$ Gift Given reported in WAVE2
SPEND -DOWN	$ ASSETS utilized reported in WAVE2
SAVING	$ Saving reported in WAVE2
ASSET-CHANGE	1=save 0=no change -1=spend down in WAVE 2
HEALTH	2=good health 1=poor health 0=death in WAVE 2

B. INDEPENDENT VARIABLES

Variable	Definition
WEALTH	$ Net Wealth based on assets reported in WAVE1
INCOME	$ Income reported in WAVE2
MARRIED	Married as reported in WAVE1
WIDOWED	Widow or widower as reported in WAVE1
NEWWIDOW	Married in WAVE1 and widowed in WAVE2
SOUTH	Household located in the South as reported in WAVE1
NOCHILDREN	Neither the head nor partner has any children as reported in WAVE1
NON-WHITE	Either the head or partner is non-white as reported in WAVE1
POORHEALTH	Household defined to be in poor health as of WAVE1 (see text for definition)
GOODHEALTH	Household defined to be in good health as of WAVE1 (see text for definition)
POORHEALTH-WAVE2	Household defined to be in poor health as of WAVE2
GOODHEALTH-WAVE2	Household defined to be in good health as of WAVE2
HEALTH-CHANGE	Household defined to be in worse health in WAVE2 (see text for definition)
TRUST	Household that has established trust funds as reported in WAVE1
ESTATE-FILING	Household WEALTH exceeds the estate tax filing threshold
NONRESIENT CHILDREN	Number of children who do not live in the household as reported in WAVE1
CORESIDENT CHILDREN	Number of Children living in the household as reported in WAVE1
GRANDCHILDREN	Number of grandchildren as reported in WAVE1
CHILDREN-NO-INC-INFO	Number of children for whom earnings information is not available as reported in WAVE2
CHILDREN-AVERAGE-INC	Average earning for children whose earning information is available as reported in WAVE2
MALE-AGE	Max[Age of male minus 64, 0] as reported in WAVE1
FEMALE-AGE	Max[Age of female minus 64, 0] as reported in WAVE1
NEGATIVEWEALTH	WEALTH negative
LOWWEALTH	WEALTH less than or equal to $200,000
HIGHWEALTH	WEALTH greater than $200,000
HIGH SCHOOL DIPLOMA	Respondent Earned a high school diploma
COLLEGE	Respondent Attended college
COLLEGE DEGREE	Respondent Earned a college degree
POST-GRADUATE WORK	Respondent Enrolled in a graduate program
ILLNESS	Respondent had heart disease or cancer in WAVE 1
HIGH-ADL	Respondent had multiple ADLs in WAVE 1
HIGH-IADL	Respondent had multiple IADLs in WAVE 1
POORHEALTH	Respondent had poor health in WAVE1
WORSEHEALTH	Respondent reported worse health situation in WAVE 1

TABLE 2

Summary Statistics

A. All Households

Variable	Zero			Non-Zero			
	Number of Household	Unweighted Percentage	Weighted Percentage	Number of Household	Unweighted Percentage	Weighted Percentage	Weighted Mean
GIFT	3,497	77.5%	76.2%	1,018	22.5%	23.8%	$8,465
SPEND-DOWN	3,644	80.7%	79.4%	871	19.3%	20.6%	$9,083
SAVING	3,714	82.3%	80.2%	801	17.7%	19.8%	$19,203
HOLD	1,672	63.0%	59.6%	2,843	37.0%	40.4%	-
WEALTH	-	-	-	4,515	100%	100%	$177,416
INCOME	-	-	-	4,515	100%	100%	$26,095
MARRIED	2,272	61.4%	58.9%	1,743	38.6%	41.4%	-
WIDOWED	2,233	49.5%	51.1%	2,282	50.5%	48.9%	-
NEWWIDOW	4,254	94.2%	94.5%	261	5.8%	5.5%	-
SOUTH	2,768	61.3%	69.1%	1,747	38.7%	30.9%	-
NOCHILDREN	3,814	84.5%	84.7%	701	15.5%	15.3%	-
NON-WHITE	3,780	83.7%	91.1%	735	16.3%	8.9%	-
POORHEALTH	3,916	86.7%	88.4%	599	13.3%	11.6%	-
POORHEALTHWAVE2	3,888	86.1%	87.4%	627	13.9%	12.6%	-
HEALTH-CHANGE	2,752	61.0%	61.5%	1,763	39.0%	38.5%	-
MALE-AGE	-	-		4,515	100%	100%	75.82
FEMALE-AGE	-	-		4,515	100%	100%	76.21

TABLE 2

Summary Statistics

B. Households Having at Least One Child

Variable	Zero			Non-Zero			
	Number of Household	Unweighted Percentage	Weighted Percentage	Number of Household	Unweighted Percentage	Weighted Percentage	Weighted Mean
GIFT	2,814	73.8%	72.4%	1,000	26.2%	27.6%	$8,139
SPEND-DOWN	3,080	80.8%	79.5%	734	19.2%	20.5%	$8,992
SAVING	3,146	82.5%	80.5%	668	17.5%	19.5%	$17,796
HOLD	1,402	63.2%	60.1%	2,412	36.8%	39.9%	-
WEALTH	-	-	-	3,814	100%	100%	$179,734
INCOME	-	-	-	3,814	100%	100%	$26,477
MARRIED	2,208	57.9%	55.1%	1,606	42.1%	44.9%	-
WIDOWED	1,882	49.3%	50.8%	1,932	50.7%	49.2%	-
NEWWIDOW	3,570	93.6%	93.9%	261	6.4%	6.1%	-
SOUTH	2,342	61.4%	69.3%	1,472	38.6%	30.7%	-
NONWHITE	3,244	85.1%	91.9%	570	14.9%	8.1%	-
POORHEALTH	3,302	86.6%	88.4%	512	13.4%	11.6%	-
POORHEALTWAVE2	3,307	80.7%	88.0%	507	13.3%	12.0%	-
HEALTHCHANGE	2,312	60.6%	61.9%	1,502	39.4%	38.9%	-
TRUST	3,502	91.8%	90.8%	312	8.2%	9.2%	-
ESTATE-FILING	3,737	98.0%	97.8%	77	2.0%	2.2%	-
NONRESIDENT CHILDREN	118	3.1%	2.7%	3,696	96.9%	97.3%	-
CORESIDENT CHILDREN	3,120	81.8%	83.0%	694	18.2%	17.0%	-
GRANDCHILDREN	260	6.8%	6.8%	3,554	93.2%	93.2%	-
NO-EARNINGS-INFO	2,459	64.5%	66.3%	1,355	35.5%	33.7%	-
AVERAGE-EARNINGS	509	13.3%	12.4%	3,305	86.7%	87.6%	$41,650
MALE-AGE	-	-	-	3,814	100%	100%	75.71
FEMALE-AGE	-	-	-	3,814	100%	100%	75.88

TABLE 3

Household Wealth Quantile Distribution

A. All Households

Percentile in the Wealth Distribution	$ (Unweighted)	$ (Weighted)
1%	-1,000	-700
5%	0	0
10%	35	600
20%	6,000	12,000
30%	29,000	39,600
40%	50,200	64,400
50%	76,500	90,000
60%	104,000	122,500
70%	149,500	170,126
80%	213,250	243,000
90%	365,000	404,700
95%	580,500	632,400
99%	1,238,000	1,256,000

B. Households Having at Least One Child

Percentile in the Wealth Distribution	$ (Unweighted)	$ (Weighted)
1%	-1,250	-800
5%	0	0
10%	125	1,000
20%	7,515	15,000
30%	31,000	40,700
40%	52,000	66,000
50%	79,102	92,000
60%	108,000	125,100
70%	154,200	175,000
80%	220,250	244,500
90%	367,000	406,700
95%	595,000	632,400
99%	1,240,000	1,261,000

IV. Empirical Results and Discussion

In this section we present our results from estimating our models. We present and discuss first results for our economic model of saving, asset utilization, and gift-giving, which is the model we focus on; at the end we present and briefly discuss results for our model of health outcomes.

The specification of our economic model for which we present results is the recursive model estimated for households that have children. Results are quite similar for two other specifications that that we have estimated but do not present results for: the base model for all households, and the recursive model for households with children. In estimating these models we discovered that neither ρ_{24}, the correlation between the magnitude of saving and gift-giving, nor ρ_{34}, the correlation between the magnitude of spend-down and gift-giving, were significantly different from zero. We also found that it was difficult to identify ρ_{12}, the correlation between overall savings - spend-down and the magnitude of saving, and ρ_{13}, the correlation between the overall savings - spend-down and the magnitude of spend-down, and we therefore set these correlations to zero.[25] With these four correlations set to zero, expressions (2) and (3) can each be estimated by ordinary least squares, separately from the remainder of the model, and that is how we estimated them. We then estimated expressions (1) and (4) jointly, allowing correlation ρ_{14} between the disturbances in these two models. In all of our models ρ_{14} is positive and significant, although small in magnitude, indicating that, other things being equal, households that are more likely to save are also more likely to give gifts.

Results for the recursive model estimated for households with children are presented in table 4. We discuss results for each part of the model separately. Consider first household saving or spend down of assets, presented in panel A of the table. The results indicate that shocks to the household dramatically increase the likelihood of spend down: the coefficients associated with NEWWIDOW and HEALTH-CHANGE are both negative and highly significant. Not surprisingly, higher income is associated with a greater likelihood of saving, but only for those in good health and those who are married, and not for those in poor health. Wealth does not have a significant relationship with saving or spend-down. Age of male is associated with an increased likelihood of saving, which somewhat contradicts the standard life-cycle theory; age of female has no significant effect. The only demographic variable that has a significant impact is living in an urban area, which is associated with a significantly greater likelihood of spend-down.

Next consider results for the magnitude of spend-down (asset utilization) among households that spend down assets, presented in panel B. There is a significant positive

[25] We believe the reason is that we included essentially the same set of variables in expressions (1) as in expressions (2) and (3).

TABLE 4

Saving, Asset Utilization, and Gift-Giving Estimates for Households Having at Least One Child

A. Saving and Asset Utilization Decision

Variable	Parameter Estimate*	Absolute Value of t-statistic
CONSTANT	0.8831 (0.1125)	7.848
MARRIED	-0.0589 (0.1016)	0.579
WIDOWED	-0.0697 (0.0900)	0.774
NON-WHITE	0.0020 (0.0743)	0.027
HEALTH-CHANGE	-0.1826 (0.0443)	4.122
SOUTH	0.0635 (0.0429)	1.480
URBAN	-0.1046 (0.0493).	2.122
MALE-AGE	0.0086 (0.0037)	2.358
FEMALE-AGE	0.0024 (0.0031)	0.771
POORHEALTH	-0.0738 (0.0950)	0.776
WEALTH*GOODHEALTH	0.000039 (0.0001)	0.593
WEALTH*POORHEALTH	-0.0005 (0.0005)	0.991
POORHEALTH-WAVE2	-0.0259 (0.1103)	0.235
INCOME*GOODHEALTH	0.0044 (0.0012)	3.628
INCOME*POORHEALTH	0.0037 (0.0038)	0.950
INCOME*MARRIED	0.0031 (0.0012)	2.611
NEWWIDOW	-0.2635 (0.0838)	3.145
NONRESIDENTCHILDREN	-0.0147 (0.0110)	1.339
CORESIDENTCHILDREN	-0.0229 (0.0464)	0.494
λ threshold value	1.7316 (0.0304)	57.03

*The standard error is in parentheses following the parameter estimate.

TABLE 4

Saving, Asset Utilization, and Gift-Giving Estimates for Households Having at Least One Child

B. Magnitude of Asset Utilization

Variable	Parameter Estimate*	Absolute Value of t-statistic
CONSTANT	-1.1992 (3.0865)	0.389
MARRIED	1.0776 (2.8102)	0.383
WIDOWED	2.5249 (2.6479)	0.954
NON-WHITE	-1.5580 (2.5715)	0.606
HEALTH-CHANGE	-0.2107 (1.2045)	0.175
SOUTH	-0.5050 (1.3020)	0.388
URBAN	0.8755 (1.3169)	0.665
MALE-AGE	0.2521 (0.1114)	2.263
FEMALE-AGE	0.2183 (0.0854)	2.555
POORHEALTH	1.0257 (2.2557)	0.455
WEALTH*GOODHEALTH	0.0128 (0.0030)	4.167
WEALTH*POORHEALTH	0.0054 (0.0095)	0.572
POORHEALTH-WAVE2	1.2460 (2.8939)	0.431
INCOME*GOODHEALTH	0.0869 (0.0233)	3.727
INCOME*POORHEALTH	0.2718 (0.1059)	2.566
NONRESIDENTCHILDREN	-0.2623 (0.2995)	0.876
CORESIDENTCHILDREN	1.1191 (1.2331)	0.908
σ	8.6626(0.0384)	225.2

C. Magnitude of Saving

Variable	Parameter Estimate*	Absolute Value of t-statistic
CONSTANT	-10.9227 (8.2314)	1.327
MARRIED	1.2532 (7.4830)	0.167
WIDOWED	1.0740 (7.0573)	0.152
NON-WHITE	-0.5365 (8.5633)	0.063
HEALTH-CHANGE	2.1448 (3.1364)	0.684
SOUTH	-4.3352 (3.0844)	1.406
URBAN	1.1274 (3.1824)	0.352
MALE-AGE	0.2205 (0.2500)	0.882
FEMALE-AGE	0.4454 (0.2322)	1.918
POORHEALTH	-5.6421 (8.8246)	0.639
WEALTH*GOODHEALTH	0.0286 (0.0108)	2.636
WEALTH*POORHEALTH	0.0631 (0.0290)	2.174
POORHEALTH-WAVE2	9.1150 (7.1519)	1.274
INCOME*GOODHEALTH	0.5104 (0.0511)	9.975
INCOME*POORHEALTH	0.1826 (0.0658)	2.774
WEALTH*MARRIED	0.0098 (0.0121)	0.809
INCOME*MARRIED	-0.3184 (0.0736)	4.322
NONRESIDENTCHILDREN	0.5402 (0.8117)	0.666
CORESIDENTCHILDREN	-2.4670 (3.6112)	0.663
σ	14.0460 (0.0639)	219.8

TABLE 4

Saving, Asset Utilization, and Gift-Giving Estimates for Households Having at Least One Child

D. Gift Giving

Variable	Parameter Estimate*	Absolute Value of t-statistic
CONSTANT	-14.1587 (1.7081)	8.289
MARRIED	1.3562 (1.4439)	0.939
WIDOWED	2,2195 (1.2034)	1.844
NON-WHITE	-2.4755 (1.1774)	2.102
HEALTH-CHANGE	0.8198 (0.7317)	1.120
SOUTH	-0.2600 (0.6654)	0.391
URBAN	1.3654 (0.7600)	1.797
MALE-AGE	0.0718 (0.0533)	1.349
FEMALE-AGE	-0.1594 (0.0523)	3.046
POORHEALTH	-3.7562 (1.4438)	2.602
WEALTH*GOODHEALTH	0.0015 (0.0005)	2.891
WEALTH*POORHEALTH	0.0223 (0.0048)	4.633
POORHEALTH-WAVE2	-0.2413 (1.3874)	0.174
INCOME*GOODHEALTH	0.1435 (0.0061)	23.54
INCOME*POORHEALTH	0.1406 (0.0242)	5.804
INCOME*MARRIED	-0.1033 (0.0145)	7.145
NEWWIDOW	4.3895 (1.3347)	3.289
NONRESIDENTCHILDREN	0.2125 (0.2903)	0.732
CORESIDENTCHILDREN	-0.8992 (0.8378)	1.073
GRANDCHILDREN	-0.1872 (0.0948)	1.698
CHILDREN-AVERAGE-INC	0.0259 (0.0152)	1.975
CHILDREN-NO-INC-INFO	-1.1920 (0.3246)	3.672
TRUST	3.0871 (0.9312)	3.315
ESTATE-FILING	6.1970 (1.4974)	4.139
SPEND-DOWN	0.1024 (0.0287)	3.567
SAVING	0.0279 (0.0065)	4.313
σ	13.781 (0.1502)	91.78
ρ_{14}	0.0671 (0.0256)	2.622
NUMBER OF OBSERVATIONS		3,814
MEAN LOG-LIKELIHOOD		-2.44319

association between the amount of spend down and both age of male and age of female, which is consistent with the standard life-cycle theory. The relationship between wealth and the magnitude of spend-down is positive and significant, but only for households in good health – for households in poor wealth there is no significant relationship. This finding suggests that households in poor health have expenditure needs that must be met and are relatively insensitive to wealth considerations, as compared with households in good health that may be spending down more for luxury goods – for things that they desire, but that they do not perceive to be necessities. Finally, there is a significant positive relationship between income and the amount of spend-down, for both those in good health and those in poor health. This finding is not intuitively obvious; perhaps those earning more income expect to earn more income in the future and therefore are more willing to spend assets, or perhaps they are more active and therefore have more ways to spend money for their own enjoyment.[26]

Consider next the results for the amount of saving, presented in panel C. The coefficient associated with being in poor health in wave one is large and negative, while the coefficient for being in poor health in wave two is very large and positive, but neither is significant, most likely because there are not many in poor health who save.[27] The marginal effect on saving associated with increased levels of wealth is large, positive, and significant, both for those in good health and those in poor health; but the magnitude is more than twice as large for those in poor health. The fact that saving rises with baseline wealth is not surprising – it very likely reflects the fact that certain individuals and couples have a greater propensity to save throughout life, a propensity that persists into old age. Income has a significant positive relationship with saving, as expected; its effect is especially large for those in good health, substantially smaller for those in poor health. But note that the coefficient associated with the interaction between being a married household and income is negative and significant. Combining estimates for the interactions of income with health and marital status, single elders in good health are predicted to save a very large fraction of income – approximately one-half, married in good health and singles in poor health are each predicted to save approximately 20% of income, and married in poor health are predicted to save an amount that is essentially independent of income. No other variables have a statistically significant effect; the only other variable that is close to having a significant effect is age of female, which has a coefficient which is positive and marginally significant.

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[26] It is possible that those with greater spending needs arrange their financial concerns so as to generate more income, perhaps by investing in riskier assets, an issue we hope to investigate in future work; it is also possible that they earn income by working, an issue we will address in the next draft of this paper.

[27] Jonathan Skinner has suggested that some of our results might be sensitive to outliers, and the estimates for these coefficients are an example. But we note that this equation is estimated by ordinary least squares, not maximum likelihood, and therefore the results are not driven by functional form assumptions concerning the error term.

Consider lastly results for our model of gift-giving. In general, our results for gift-giving support the view that tax planning is an important consideration for some elderly, and that health status influences the effects of wealth and income on gift-giving.

Clear evidence in support of estate tax planning is that the dummy variable ESTATE-FILING for having wealth above the estate tax filing threshold is large and positive and very significant; having wealth above the threshold increases the likelihood of gift-giving by nearly one-half of a standard deviation, and increases the average size of gifts by more than $5,000. The dummy variable TRUST is also positive and significant, with a value of approximately 3, indicating that households that plan for estate transfer by establishing trusts are also more actively transferring their assets by gifts.

The results indicate that the marginal propensity to give gifts rises with wealth. But it rises much more rapidly for households in poor health than for households in good health – the coefficients are .0015 and .022, or a difference of more than one order of magnitude; the results imply that among the households whose members are in poor health and who give gifts a $100,000 increase in wealth increases the average value of gifts by approximately $2,200. In addition, the average propensity to give gifts is lower for households in poor health – the coefficients associated with the dummy variable POORHEALTH is negative and significant and rather large at -3.76. Thus among households in low wealth those in poor health have a lower propensity to give gifts than those in good health, but the opposite is the case among households of high wealth – for these households those in poor health have a greater propensity to give gifts. Indeed, there is a crossover, and at the wealth level of approximately $180,000 the propensity to give gifts is estimated to be the same for the two health groups. We note that we found a similar pattern when we investigated gift-giving reported in wave one (see Feinstein and Ho (1999)). The pattern we have discovered is interesting, and shows how important interactions between health and economic variables can be in understanding and ultimately in predicting household decision-making and outcomes.

How are we to interpret our findings about the influence on gift-giving of wealth interacted with health? Elderly in poor health presumably feel quite vulnerable and are very sensitive to the need to maintain at least a minimum level "nest-egg" for their own uncertain future, which may involve high medical costs and also be somewhat frightening and depressing to contemplate, which makes them less willing to give when they have less wealth. Those elderly in poor health with greater resources recognize that they are not likely to exhaust their resources, even if the future does turn out to involve high costs, and so reduce giving less – wealth offers protection, both real and psychological, against vulnerability. Indeed for wealthier individuals who fall into poor health an opposite motivation may become paramount – to give away assets in preparation for their own death. In general, these arguments are consistent with the idea that elderly in poor health become

more risk averse, wishing to hold precautionary savings, and that the degree to which their risk aversion increases declines with increasing wealth.

Returning to our model estimates, income has a significant positive effect on the propensity to give gifts for both households in good health and households in poor health, even after taking into account the fact that the coefficient associated with the variable interacting marital status with income is negative. The marginal effect of income on gift-giving is similar for households in poor health than for those in good health.

One of the strongest effects on gift-giving is being a new widow or widower – new widows and widowers who give gifts on average give about $4,400 more than others of comparable status. This finding is especially important in light of our finding that new widows and widowers are also significantly more likely to spend-down assets for their own use. Together, the two findings depict new widows and widowers rapidly depleting assets, suggesting that new widowhood is an important factor to consider in modeling estate dynamics, including estate tax issues.[28]

Interestingly, total number of children does not have a significant effect on gift-giving. The coefficient associated with the average earnings of children is positive and marginally significant, which goes against the argument that parents give gifts to children who are experiencing "hard times" (made for example by Altonji, Hayashi, and Kotlikoff (1997)); apparently this motivation for gift-giving is not relevant for this population, for whom most children are presumably middle-aged and fully established in life. Interestingly, the variable referring to the status of children and grandchildren that has the most signficant coefficient is the variable CHILDREN-NO-INC-INFO measuring the number of children for whom average earnings are not known by the parents – the larger is this number the lower are gifts. This finding suggests that parents are more likely to make gifts to children they remain in touch with and feel close to than to children with whom they have a more distant relationship.

Several of the demographic variables included in our gift model are also significant. The propensity for giving gifts is larger for married households than for other households and for those living in urban areas, and smaller for nonwhite. Age of females, whether head or partner, has a significant negative relationship with the propsenity to give gifts – younger women have a higher propensity to give gifts; we have not included age of children in our specification and it is possible that in some cases households with younger women are second marriages with younger children.

Finally, both the magnitude of spend-down and the magnitude of saving are pos-

[28] During our presentation at the conference we received several valuable comments related to this issue. Practitioners in the audience mentioned that it is common to observe that new widows and widowers do in fact consciously embark on a program to give away assets as gifts – this was described as a usual part of estate planning. It was also mentioned that new widows or widowers may be suddenly more aware of their own mortality, which may make them decide to deplete assets quickly; indeed their mortality may objectively rise – results for some mortality models indicate that the probability of death rises for an individual for a few years after becoming a widow or widower.

itively and significantly associated with gift-giving, with the coefficient for spend-down especially large. The result for saving is intuitive and suggests that saving and gift-giving are linked, which is consistent with the finding that ρ_{14} is positive. One interpretation is that some of the elderly are more concerned about the future – both their own and their children's – than others. The result for spend-down is less clear – apparently some households, when they do spend, spend freely; as more waves of AHEAD become available it would be interesting to try to determine whether this is a transitory phenomenom – so that a household might make many gifts and spend down assets a lot in one year but not in subsequent years – or one that persists over time for certain households, perhaps again linked to health and life expectancies.

We conclude our discussion of the economic model by mentioning some differences between results from estimating the model only for households with children and results estimating the model for all households. For all households, the model of saving and spend-down now shows greater wealth associated with a significantly greater likelihood of saving for those in good health; this model also shows income associated with a significantly greater likelihood of saving for all households, but the interaction of marital status with income negative and significant, so that the overall effect of income is reduced for those in good health who are married, increased for those in poor health who are not married. In the model of gift-giving we include the variable NOCHILDREN but omit the other more detailed variables related to children, and we find that NOCHILDREN has a very large significant negative coefficient, indicating that individuals with no children have a reduced propensity to give gifts, a finding that is intuitive and consistent with the life-cycle model.

The results for our model of health outcomes is presented in Table 5. In estimating the model for men we found that we could not identify the coefficients associated with negative wealth and negative wealth interacted with age, so we omitted these variables from the specification for men.

Our main finding is that health in wave one is the most important factor effecting health outcomes in wave two. Among men, educational attainment is also a significant factor associated with improved outcomes; but among women, although educational attainment is associated with improved outcomes, the effects are not significant. For men there are not other significant effects. For women, being married is associated with a significantly improved outcome, and so is increasing wealth, both by itself and interacted with age.

It is commonly thought that marital status benefits men more than women in regards health, but our findings are the opposite. It is also thought that the beneficial effect of wealth on health is most important among those of lower economic status – that the marginal effect of wealth on health diminishes with rising wealth; but we find that

TABLE 5

Health Status and Mortality Risk

A. Male Respondents

Variable	Parameter Estimate*	Absolute Value of t-statistic
CONSTANT	1.9816 (0.5670)	3.495
AGE	-0.0176(0.0766)	0.230
AGESQUARE	0.0006 (0.0025)	0.217
LOWWEALTH	-0.0003 (0.0023)	0.131
HIGHWEALTH	-0.0001 (0.0010)	0.079
AGE*LOWWEALTH	-0.0001 (0.0001)	1.037
AGE*HIGHWEALTH	0.0001 (0.0001)	0.356
NON-WHITE	0.0017 (0.1797)	0.009
POORHEALTH	-0.7739 (0.0999)	7.746
WORSEHEALTH	-0.2487 (0.0840)	2.959
ILLNESS	-0.0341 (0.0822)	0.415
HIGH-ADL	-0.4387 (0.2955)	1.484
HIGH-IADL	0.1767 (0.4565)	0.387
MARRIED	-0.0126 (0.5813)	0.022
MARRIED*AGE	0.0043 (0.0805)	0.054
MARRIED*AGESQUARE	-0.0014 (0.0027)	0.506
MARRIED*LOWWEALTH	0.0007 (0.0022)	0.334
MARRIED*HIGHWEALTH	-0.0004 (0.0009)	0.378
MARRIED*HIGH-ADL	0.0812 (0.3164)	0.257
MARRIED*HIGH-IADL	-0.4651 (0.4691)	0.991
HIGH SCHOOL DIPLOMA	0.2345 (0.0883)	2.656
COLLEGE	0.3238 (0.1173)	2.760
COLLEGE DEGREE	0.2832 (0.1699)	1.667
POST-GRADUATE WORK	0.0151 (0.1191)	0.127
λ threshold value	0.3274 (0.0352)	9.303
NUMBER OF OBSERVATIONS		2,274
MEAN LOG-LIKELIHOOD		-0.383514

*The standard error is in parentheses following the parameter estimate

TABLE 5

Health Status and Mortality Risk

B. Female Respondents

Variable	Parameter Estimate*	Absolute Value of t-statistics
CONSTANT	2.8487 (0.2583)	11.027
AGE	-0.0574 (0.0300)	1.914
AGESQUARE	0.0017 (0.0008)	1.948
LOWWEALTH	0.0025 (0.0015)	1.701
HIGHWEALTH	0.0022 (0.0012)	1.896
NEGATIVEWEALTH	0.1402 (0.4191)	0.334
AGE*LOWWEALTH	-0.0001 (0.0001)	0.507
AGE*HIGHWEALTH	-0.0001 (0.0001)	2.556
AGE*NEGATIVEWEALTH	-0.0048 (0.0298)	0.159
NON-WHITE	-0.0380 (0.0945)	0.402
POORHEALTH	-0.6492 (0.0796)	8.160
WORSEHEALTH	-0.3015 (0.0652)	4.623
ILLNESS	-0.1608 (0.0686)	2.344
HIGH-ADL	-0.4328 (0.0952)	4.548
HIGH-IADL	-0.1321 (0.1085)	1.218
MARRIED	-0.5389 (0.2663)	2.023
MARRIED*AGE	0.0322 (0.0363)	0.886
MARRIED*AGESQUARE	-0.0004 (0.0013)	0.289
MARRIED*LOWWEALTH	-0.0006 (0.0013)	0.415
MARRIED*HIGHWEALTH	-0.0002 (0.0008)	0.196
MARRIED*HIGH-ADL	0.2970 (0.1577)	1.883
MARRIED*HIGH-IADL	-0.4504 (0.1746)	2.579
HIGH SCHOOL DIPLOMA	0.1088 (0.0670)	1.623
COLLEGE	0.1352 (0.0910)	1.486
COLLEGE DEGREE	0.0944 (0.1303)	0.724
POST-GRADUATE WORK	0.2461 (0.1630)	1.510
λ threshold value	1.0309 (0.0505)	20.400
NUMBER OF OBSERVATIONS		3,966
MEAN LOG-LIKELIHOOD		-0.375964

*The standard error is in parentheses following the parameter estimate

among women, the group for which there is a significant effect of wealth, the marginal effect of wealth on health is essentially constant over the entire wealth range.

Practically, our finding that health is the most important determinant of health outcomes is important, because it indicates that trajectories of health outcomes for the elderly can be predicted mainly by focusing on health variables, at least in the short-run, with the exception that for women wealth and marital status also matter.

V. Conclusion

In this paper we have presented the results of an initial attempt to estimate integrated models of asset dynamics, gift-giving, and health outcomes among the elderly. Most of our results are intuitive, and we view our efforts as successful, but we recognize that more work must be done to develop models and obtain results useful for prediction and policy analysis.

Our results have several implications for the debate about the estate tax. First, the results suggest that at least some elderly are cognizant of the tax and that it influences their financial decision-making. There is a jump in gift-giving at the wealth level associated with the estate filing threshold – elderly with assets above the threshold give more in gifts than those with assets below the threshold, controlling for many other factors. In addition, many wealthy elderly establish trust funds and those with trust funds give more in gifts. Also, recent widows and widowers seem to alter their behavior, spending down their assets and increasing their level of gift-giving. Since it influences behavior, the estate tax undoubtedly distorts allocations from what they would be absent the tax; for example, elderly may be giving away more of their assets sooner than they would if there were no tax. Such distortions are not necessarily bad, but must be evaluated in a welfare economics framework.

Second, our results indicate that health is an important factor in elderly financial decision-making, and therefore suggest that health influences estate planning and preferences. The fact that the marginal propensity to give gifts rises much faster with wealth for those in ill health suggests that, among the wealthy, elderly in poor health may especially feel pressure to give away more assets than they would absent the estate tax, whereas those in good health may be less effected. If this is true, it is an effect of the tax that is probably not desired by most Americans. If the estate tax is to remain in existence, perhaps elderly need to be educated about estate planning issues earlier, and made aware of the possibility that their attitudes about estate planning and gifts may change once they become sick or are widowed.

Lastly, the fact that elderly may rush to engage in estate planning and accelarate gift-giving toward the end of their life, often when sick, suggests that estate tax policy should be connected with health care policy for the elderly. In particular, it seems likely that an elderly person who becomes sick will make different financial decisions concerning her estate depending on whether or not she expects to bear large medical costs or expects the government to bear those costs.

Over the next year we plan to study asset allocation patterns in the AHEAD data. Integrating asset allocation and asset returns with our current model should provide a reasonably complete framework for analyzing elderly health and economic outcomes. We also hope to compare asset allocations reported by AHEAD respondents with allocations reported by respondents in the Health and Retirement Survey, a cohort of persons approximately twenty years younger than the individuals in AHEAD.

Ultimately, for prediction and policy analysis we believe we must estimate our model using at least three waves of data from AHEAD. In particular, since we are using data in wave one to establish baseline economic and health conditions, we cannot estimate a true panel model with only two waves of data. With three waves we can estimate panel models, the great advantage being that we can then investigate correlations over time in household patterns of asset dynamics and gift-giving. Thus, with panel estimation we should be able to distinguish households that are "savers" (saving year after year) from others that are "spenders," and determine more accurately how many elderly are actively managing their estates, including spend-down and the transfer of assets to their heirs.[29]

[29] Of course we could explore the correlation in gift-giving and saving between waves one and two, but we cannot do that and also establish a baseline for each household, which we believe is important for estimation.

Appendix: Mathematical Likelihood Expressions

Following is the likelihood function associated with our model. There are six separate cases.

Case 1:

$$L_1 = CDFBVN[\lambda - X_1\beta_1, \frac{-X_4\beta_4}{\sigma_4}, \rho_{14}]$$

where CDFBVN is the bivariate normal cumulate distribution function.

Case 2: Define

$$\mu_1' = \frac{\rho_{14}}{\sigma_4}(Y_4 - X_4\beta_4).$$

Then,

$$L_2 = \frac{1}{\sigma_4}\phi(\frac{Y_4 - X_4\beta_4}{\sigma_4})\Big\{\Phi[\frac{\lambda - X_1\beta_1 - \mu_1'}{\sqrt{1-\rho_{14}^2}}] - \Phi[\frac{-X_1\beta_1 - \mu_1'}{\sqrt{1-\rho_{14}^2}}]\Big\}$$

where ϕ and Φ are the standard normal density and cumulative distribution functions respectively.

Case 3: Define

$$\sigma_1' = \sqrt{1-\rho_{12}^2} \quad \sigma_4' = \sigma_4\sqrt{1-\rho_{24}^2}$$

$$\rho_{14}' = \frac{\rho_{14} - \rho_{12}\rho_{24}}{\sqrt{1-\rho_{12}^2}\sqrt{1-\rho_{24}^2}}$$

$$\mu_1' = \frac{\rho_{12}}{\sigma_2}(Y_2 - X_2\beta_2) \quad \mu_4' = \frac{\rho_{24}\sigma_4}{\sigma_2}(Y_2 - X_2\beta_2)$$

Then,

$$L_3 = \frac{1}{\sigma_2}\phi(\frac{Y_2 - X_2\beta_2}{\sigma_2})CDFBVN[\frac{-X_1\beta_1 - \mu_1'}{\sigma_1'}, \frac{-X_4\beta_4 - \mu_4'}{\sigma_4'}, \rho_{14}']$$

Case 4: Define

$$\sigma_1' = \sqrt{1-\rho_{13}^2} \quad \sigma_4' = \sigma_4\sqrt{1-\rho_{34}^2}$$

$$\rho_{14}' = \frac{\rho_{14} - \rho_{13}\rho_{34}}{\sqrt{1-\rho_{13}^2}\sqrt{1-\rho_{34}^2}}$$

$$\mu_1' = \frac{\rho_{13}}{\sigma_3}(Y_3 - X_3\beta_3) \quad \mu_4' = \frac{\rho_{34}\sigma_4}{\sigma_2}(Y_3 - X_3\beta_3)$$

Then,

$$L_4 = \frac{1}{\sigma_3}\phi(\frac{Y_3 - X_3\beta_3}{\sigma_3}))CDFBVN[\frac{-\lambda + X_1\beta_1 + \mu_1'}{\sigma_1'}, \frac{-X_4\beta_4 - \mu_4'}{\sigma_4'}, -\rho_{14}']$$

Case 5: Define

$$\sigma_1' = \sqrt{1-\rho_{12}^2} \qquad \sigma_4' = \sigma_4\sqrt{1-\rho_{24}^2}$$

$$\rho_{14}' = \frac{\rho_{14} - \rho_{12}\rho_{24}}{\sqrt{1-\rho_{12}^2}\sqrt{1-\rho_{24}^2}}$$

$$\mu_1' = \frac{\rho_{12}}{\sigma_2}(Y_2 - X_2\beta_2) \qquad \mu_4' = \frac{\rho_{24}\sigma_4}{\sigma_2}(Y_2 - X_2\beta_2)$$

$$\mu_1'' = \frac{\rho_{14}'\sigma_1'}{\sigma_4'}(Y_4 - X_4\beta_4 - \mu_4') + \mu_1'$$

$$\sigma_1'' = \sigma_1'\sqrt{1-\rho_{14}'^2}$$

Then,

$$L_5 = \frac{1}{\sigma_2}\phi(\frac{Y_2 - X_2\beta_2}{\sigma_2})\frac{1}{\sigma_4'}\phi(\frac{Y_4 - X_4\beta_4 - \mu_4'}{\sigma_4'})\Phi[\frac{-X_1\beta_1 - \mu_1''}{\sigma_1''}]$$

Case 6: Define

$$\sigma_1' = \sqrt{1-\rho_{13}^2} \qquad \sigma_4' = \sigma_4\sqrt{1-\rho_{34}^2}$$

$$\rho_{14}' = \frac{\rho_{14} - \rho_{13}\rho_{34}}{\sqrt{1-\rho_{13}^2}\sqrt{1-\rho_{34}^2}}$$

$$\mu_1' = \frac{\rho_{13}}{\sigma_3}(Y_3 - X_3\beta_3) \qquad \mu_4' = \frac{\rho_{34}\sigma_4}{\sigma_3}(Y_3 - X_3\beta_3)$$

$$\mu_1'' = \frac{\rho_{14}'\sigma_1'}{\sigma_4'}(Y_4 - X_4\beta_4 - \mu_4') + \mu_1'$$

$$\sigma_1'' = \sigma_1'\sqrt{1-\rho_{14}'^2}$$

Then,

$$L_6 = \frac{1}{\sigma_3}\phi(\frac{Y_3 - X_3\beta_3}{\sigma_3})\frac{1}{\sigma_4'}\phi(\frac{Y_4 - X_4\beta_4 - \mu_4'}{\sigma_4'})\Phi[\frac{-\lambda + X_1\beta_1 + \mu_1''}{\sigma_1''}]$$

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