

Annuity Valuation, Long-term Care, and Bequest Motives

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Abstract

Financial security in retirement has traditionally meant having a steady flow of annuity income as long as one lives, a definition enshrined in the Social Security system. Our earlier research has stressed a more holistic approach, which focuses on the match between resources and spending needs. This formulation enables us to estimate annuity values given long term care concerns and bequest motives, where these estimated values are consistent with low observed demand for standard annuities. This chapter uses this model to value non-standard annuities with various security-enhancing features that we believe may be of value to retirees.

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This chapter develops a formal framework for understanding how existing financial instruments impact retirement security and considers new instruments that might be devised to enhance such security. Our framework draws on a model developed by Ameriks *et al.* (2007) which allows for both bequest and precautionary motives. Bequest objectives have to do with the desire to leave some assets to one's heirs. Precautionary motives include the desire to avoid being simultaneously bankrupt and in need of long-term care – which here we term “Medicaid aversion.” The model is used to characterize how households might value stand-alone life-contingent life annuities, where their valuation is seen to depend on household characteristics, including bequest motives and Medicaid aversion. Because such standard life-contingent immediate annuities are shown to be of limited value for most middle class households, we then discuss alternative “contingent” annuity designs that involve delayed payouts to better target longevity risk, and/or contain elements of long term care insurance by including higher payments for those who are losing the ability to conduct one or more “activities of daily living.”¹ Our findings have implications for the design of new financial instruments that permit family concerns to impact bequest and precautionary motives.

Lifetime Annuities and Precautionary Motives

Economists have shown that lifecycle consumers with uncertain lifetimes have strong incentives to annuitize wealth so as to be assured that resources will support an adequate level of lifetime consumption.² In practice, the voluntary usage of immediate annuity products in the

United States is low. For instance, sales of standard annuities involving fixed payments in 2006 amounted to less than \$6 billion of the estimated \$236 billion in deferred and immediate annuity sales in 2006 (LIMRA 2006). The picture changes little even if one includes immediate “variable” life annuities that capture all or part of the equity premium, whose importance is stressed by Milevsky and Young (2007), but for which sales remain low outside the TIAA-CREF retirement system.

A large literature explores reasons for lack of consumer interest in standard fixed immediate annuities. Friedman and Warshawsky (1988,1990); Mitchell, Poterba, Warshawsky, and Brown (1999); and Brown, Mitchell, Poterba, and Warshawsky (2001) examine pricing of immediate annuity contracts in the United States relative to hypothetical zero-cost “actuarially fair” annuity contracts. They document persistent and significant costs of private annuity contracts above such a zero-cost benchmark, as well as significant cross-sectional variation in pricing across insurance providers. Yet their work suggests that insurance loads observed in practice (markups of roughly 7-15 percent relative to the benchmark zero-cost annuity, assuming annuitant mortality) would still result in substantial annuity demand among older individuals in the context of a basic life-cycle model. These findings are moderated by institutional constraints. For instance, the generosity of Social Security benefits is mentioned by Dushi and Webb (2004) as the major reason why voluntary annuitization rates are so low. Another institution important in this regard is the family: Kotlikoff and Spivak (1981) estimate that informal risk pooling of longevity/mortality risk within families can provide half or more of the insurance benefit obtainable in a world with complete annuity markets.

A more fundamental question concerning annuities is whether they address the most important risks retirees believe they face. Research on retiree spending suggests they may not,

since many older households with high retirement assets tend to spend down very slowly in practice (De Nardi, French, and Jones 2006). In other words, such households are relatively immune to longevity risk in the standard sense, because their resources are virtually certain to last long enough to finance normal consumption expenditures in old age. One group of analysts, beginning with Kotlikoff and Summers (1981), contends that households spend little in retirement because of bequest motives; more recently Abel (2003) also suggested that bequest motives may help to explain low demand for annuities. Yet Davidoff, Brown and Diamond (2005) point out that this depends critically on the form of the bequest motive, and in particular how risk averse the retiree is with respect to bequests. Moreover, empirical studies offer no clear evidence of an offset between annuitization and bequest motives; for instance Brown (2001) uses the 1992 Health and Retirement Study (HRS) and finds no significant relationship between peoples' stated desire to leave bequests and their stated intention to annuitize a DC plan upon retirement. Johnson, Burman and Kobes (2004) use the 2000 HRS where they determine that older adults with no children are no more likely to annuitize DC balances than others with children (and presumably stronger bequest motives). Laitner and Juster (1996) also uncover no significant difference in bequest motives among households with and without children, though they do find a relationship between stated desires to leave an estate and the selection of certain immediate annuity refund features.

An alternative reason that people may not annuitize is that they may prefer to keep their assets liquid for precautionary purposes, in case they need the money for health expenses (Hurd, 1987; Palumbo, 1999). To this we turn next.

How Health Expenses and Medicaid Aversion Matter

To further explain how health costs and health preferences influence the demand for annuities, we build on recent studies including French and Jones (2004) and De Nardi, French, and Jones (2006). The issue of how health might influence interest in annuities is unclear; as Davidoff, Brown and Diamond (2005) note, the demand for annuities will depend critically on the timing of health shocks and “the illiquidity of annuities may be relevant if the risk occurs early in life, but not toward the end of life.” Turra and Mitchell (this volume), however, show that relative to the high value of annuities typically found in a basic life-cycle framework, annuities are significantly less valuable for households facing uncertain age- and health-related medical care shocks. Sinclair and Smetters (2004) simulate a rich model of medical costs in later life and also reach a generally negative verdict on interest in annuities. Under the parameterizations outlined in that study, income annuities are avoided by consumers with wealth levels that would be seriously depleted were a medical shock to occur. This is because they see annuities as a “risky asset,” since health shocks simultaneously raise expenses and reduce the value of future annuity payments.

Prior research by Brown and Finkelstein (2004) examines the link between health considerations and demand for annuities, taking as its starting point the crucial role that actual and potential long-term care expenses play for retirees. In the United States, the government pays for some long term care costs under both the Medicare and Medicaid programs. The former does not cover all long-term care (LTC) costs, while the latter is the provider of last resort, being means tested. Currently over 60 percent of LTC expenses are absorbed by Medicaid as provider of last resort, yet those with high wealth must absorb substantial long term care expenses because of the means testing format. As a result, more than one-third of long-term care expenditures are

paid for out of pocket, nearly double the proportion of expenditures in the health sector as a whole covered out of pocket (Congressional Budget Office 2004; National Center for Health Statistics 2002).

The motivation to save for precautionary reasons depends critically on how consumers weigh Medicaid as a substitute for private LTC. If it is perceived as a good substitute, households with a low bequest motive will maintain high old-age consumption levels, and rely on Medicaid to pick up the tab should they need care in later life. Pauly (1990) argues that this is an important behavioral pattern in his explanation of why the long term care insurance market has failed to thrive in the US. Yet many people argue the opposite – indeed the implicit assumption of Sinclair and Smetters (2004) and Turra and Mitchell (this volume) is that Medicaid is actually a very poor substitute for private care. A lack of evidence on this subject motivates our research reported in the next section.

Theoretical Model

Our model posits that the older household consists of a single individual who has just retired at age 65 (following Ameriks *et al.* 2007) and assume that the maximum length of his retirement period is 35 years (to age 100). His stochastic mortality probability evolves over the retirement period in the manner defined below. The individual is assumed to maximize his remaining lifetime utility based on the excess of each period's consumption C over a subsistence level, C_{SUB} (see the Technical Appendix for more model details).³ The consumer also receives an end-of-life utility from a bequest which is comprised of all assets held at death. The parameter ω indicates how strongly the retiree values bequests (and if wealth is negative at death, the bequest is zero). Here, bequests are left solely because of the satisfaction the retiree derives from

leaving assets behind. In particular, our formulation eliminates any motives related to a desire to use the prospect of a bequest at death to influence the behavior of others while alive. It should also be noted that our bequest motive is difficult to distinguish from other explanations for saving (see Carroll, 2007) such as hoarding, or simply “wealth in the utility function.”⁴

With respect to functional form, we follow De Nardi (2004) in parameterizing the bequest utility with two parameters, one (ω) reflecting the strength of the bequest motive, and the other (ϕ) measuring the degree to which bequests are a luxury good (see the Appendix). To simply illustrate how these parameters work, consider a case where the retiree starts with wealth of X dollars, lives for exactly n years, and then dies. In each year of life, the individual would consume c dollars and upon death, bequeaths the remaining $b = X - nc$. In this simple case, the problem is to choose a bequest that maximizes total (non-discounted) utility. Given our functional forms for utility, the individual will optimally leave an inheritance to cover ω years of spending at an annual expenditure level, the amount by which life time consumption exceeds the threshold ϕ . If X proves insufficient to allow the individual to consume such an amount each year, no bequest is left.

More generally, the retiree starts with some non-negative wealth amount and anticipates a constant stream of real annual “Social Security” income each year Y for as long as he lives.⁵ There is posited to be one risk-free asset in which the individual can invest and which yields a constant real rate of interest (the household is not allowed to borrow against future income). The individual may be in one of four health states in our model: State 1 is good health; in State 2 he has medical problems but no need for long term care; in State 3 long term care of some form is required; and State 4 is death. The individual is initially endowed with a health state, and thereafter his health state follows a Markov chain with an age-varying, one-period state transition

matrix. A retiree reaching age 99 dies with probability one the following year.

Together, the initial health state and the Markov transition matrices enable us to compute future probabilities attached to all health states, including death. Rather than include the retiree's health state directly in his utility function, we instead focus on the costs associated with alternative health states. Each state has associated with it a necessary and deterministic health cost. Paying these costs removes any utility penalty that would otherwise be associated with the health state.

In view of the fact that medical expenses might exceed available wealth, we need to include the possibility of bankruptcy in our model. Accordingly, an individual is forced to declare bankruptcy when he cannot afford to pay for medical costs and the subsistence level of consumption. Therefore his consumption and end-of-period wealth in a period of bankruptcy depends on his medical state. In States 1 and 2, an individual who declares bankruptcy is left with sufficient assets to consume at a minimum level $C_{BAN} > C_{SUB}$, with end of period wealth remaining at zero. In the long term care state, treatment of bankruptcy is related to the institutional reality of Medicaid. An individual declaring bankruptcy in the long term care state forfeits all wealth to the government (end of period wealth is zero) and enters a Medicaid facility, receiving in that period the Medicaid level of consumption $C_{MED} > C_{SUB}$. In the period following bankruptcy, the individual's income continues on its deterministic path and there are no further implications of having been previously bankrupt. The Medicaid level of consumption, C_{MED} , has a powerful impact on the strength of the precautionary motive. If C_{MED} is very close to subsistence, there is a strong incentive for households to retain sufficient wealth to retain the private care option. If it is closer to annual consumption in the pre-Medicaid period, then the incentive will be to run down wealth and use the Medicaid subsidy in place of saving.

Model Parameterization. An important goal of our analysis is to illustrate how demand for various financial products varies, as a function of the strength of the precautionary motive and the bequest motive, ω . To this end, we fix all other preference parameters at conventional, calibrated values, with wealth and income numbers derived from survey evidence (c.f. Ameriks *et al.* 2007 and the Appendix).

With these values and the health and longevity dynamics described above, the model generates a median value for lifetime medical expenses of \$18,000 for men (\$56,000 for women), with a mean of \$79,000 (\$137,000). Importantly, long term care costs make up 92 percent of all medical expenses. For the 61 percent of males who never enter long term care, mean lifetime medical costs are only \$7,900. Men (women) face a 26 percent (41 percent) chance of facing lifetime medical costs greater than \$100,000 and a 10 percent (20 percent) chance of costs greater than \$250,000.

Bequest and Medicaid Aversion Parameters. To parameterize retirees' bequest and Medicaid aversion coefficients, we draw from a survey designed to separately identify these two within a narrow range (Ameriks *et al.* 2007). In what follows we provide both point estimates of median values and confidence bands. The median level of Medicaid aversion was around -5 (corresponding to a consumption equivalent of Medicaid of approximately \$10,000) while our best estimate of the population median level of the bequest motive was roughly 26. Yet there is substantial heterogeneity in our estimates: over one-quarter of respondents said they felt Medicaid to be so undesirable that it barely exceeded subsistence income of \$5,000 (by less than \$1,000). Over half of the respondents valued the consumption equivalent of Medicaid at below \$10,000. On the other hand, some 30 percent of respondents display little or no such Medicaid aversion, treating a year in a Medicaid facility as equivalent to an annual consumption flow of

\$20,000 or more. This heterogeneity must be borne in mind when interpreting the figures that follow.

Turning to survey evidence on bequest motives, we again find substantial heterogeneity. More than one-quarter of the sample had strong bequest desires ($\omega > 40$), with a very strong bequest preference ($\omega > 90$) estimated for some 10 percent of the sample. Accordingly, based on our survey questions, it would appear that many individuals do place a high priority on bequests. We also show that wealth is not significantly related to estimated bequest parameters.

Implications for the Demand for Standard Life Annuities

Given this model setup, we next calculate the value of lifetime annuities for various different types of retirees. Our model predicts that the demand for annuities is positively associated with wealth, similar to that reported by Sinclair and Smetters (2004). For a given level of wealth and income, demand for annuities also varies according to the retiree's bequest and precautionary parameters. To quantify these effects, we develop and graph iso-valuation lines that indicate the amount per dollar of actuarially fair value that an individual would be willing to pay to purchase a given insurance contract. The excess of the indicated value above 1 can be interpreted as the maximum "load" that an individual would be willing to pay for the given contract. For example, an iso-valuation of 1.20 means that the individual with the indicated combination of bequest and precautionary motives at that point on the graph would pay at most a 20 percent load to obtain the contract. These calculations are conditional on given wealth and income levels, chosen to represent a hypothetical, "typical" participant in an employer-sponsored pension plan.

To construct the baseline case, we assume the following “median” respondent: female, age 65, in good health, having disposable (real) lifetime income of \$15,000 per year, and initial wealth of \$200,000. Figure 1 shows how much this baseline respondent would be willing to pay for a \$5,000 annual annuity stream (actuarially equivalent to a present value of \$86,000 under our parameterization). The horizontal “Bequest Motive” axis of Figure 1 (and all subsequent figures) is straightforward to interpret. The vertical “Medicaid aversion” axis plots the log of the marginal utility of C_{MED} , a function of C_{MED} that describes the strength of the precautionary motive, so that the precautionary savings motive strengthens from bottom to top. Note that a Medicaid aversion value of zero on this axis corresponds to a low value for C_{MED} of \$6K, or only \$1K above the subsistence level; a value of -5 indicates a value for C_{MED} of just over \$10K; and a value of -10 indicates a value for C_{MED} of some \$30K. The bottom left corner of Figure 1 depicts a retiree with no bequest motive and essentially no aversion to Medicaid. As expected, such an individual has a strong desire for annuities; her willingness to pay for this annuity is 2.2, meaning that the product would be demanded even for a 120 percent load. However, this willingness drops quickly as the strength of either motive increases. At typical values of the bequest motive and Medicaid aversion, the retiree would only purchase the annuity if it were priced at a load of less than 10 percent. At higher levels of Medicaid aversion, the annuity remains attractive only if priced at a load of less than 3 percent. Accordingly, for many retirees, a standard annuity is of minimal value given with typical loads of 7-15 percent.

Figure 1 here

Figure 2 presents the same analysis for a larger annuity: \$10,000 annually instead of \$5,000. The results are similar to Figure 1, though everywhere the retiree is less willing to pay per dollar of cost. The reason such a retiree is willing to pay less per dollar is straightforward:

while the annuity payments are higher, the cost of the annuity is also twice as high (\$172,000 compared to \$86,000 for the \$5,000 annuity in our parameterization), requiring the annuitant to relinquish even more liquid wealth. This leaves her much more exposed to the risk that an LTC shock will force bankruptcy and/or seriously deplete assets remaining for a bequest.

Figure 2 here

Figure 3 presents the willingness-to-pay results for the smaller \$5,000 annuity again, but now we assume that the retiree has less annual income and more liquid wealth. This reinforces the intuition just given above: with greater wealth, the risk subsides of bankruptcy due to LTC costs or depletion of the intended bequest, making the individual more willing to pay for the annuity. Relative to Figure 1, the wealthier retiree of Figure 3 is slightly more willing to pay for the annuity at virtually all combinations of Medicaid aversion and bequest motive.

Figure 3 here

Figure 4 presents the analysis for a retiree with both less income (here only \$10,000 annually) and less wealth than in our baseline case (\$100,000 vs. \$200,000 previously). At all levels of bequest motive and Medicaid aversion, this retiree is significantly less willing to pay for the \$5,000 annuity. Contrary to arguments on the demand or “need” for annuities, our analysis suggests that as wealth decreases, demand decreases as well, as annuitization exposes the less wealthy retirees to a greater risk of ending up on Medicaid or sacrificing their bequests.

Figure 4 here

Figure 5 shows that the shape of the iso-value curves is very different for those with high wealth. This figure is for a woman at age 65, in good health, with disposable income of \$25,000 and total wealth of \$500,000, who roughly corresponds to the 90th percentile of empirical income- and wealth-distributions. Given these parameters, willingness to pay for annuities for

the wealthy increases as Medicaid aversion increases, especially among those with strong bequest motives.

Figure 5 here

We also explore the effect of risk aversion over bequests by changing the standard formulation of the bequest motive to one in which the retiree cares only about the expected value of the bequest and disregards the odds of the ultimate bequest being higher or lower than expected (being “risk-neutral”). This specification of the bequest motive produces results similar to Figure 5, leading us to conclude that our overall analysis is not generally sensitive to whether retirees are described as risk averse or risk neutral over the size of their bequests.

We conclude that the strength of the bequest and precautionary motives are important determinants of interest in annuities. For a retiree who has no bequest motive and regards Medicaid as a good substitute for private LTC, annuities are a valuable form of insurance against longevity. However, as the desire to leave a bequest and avoid government-financed LTC increases, holding liquid assets becomes more important and interest in annuities wanes. This conclusion naturally suggests that we consider alternatives to standard life annuities.

Implications for Alternative Annuity Structures

Next we outline and evaluate three annuity structures that would appear to be better targeted to the retirees we model. The first is a *reversible annuity*, which allows the holder to exchange the future income flow for its current cash value upon entering the LTC state. This is a straightforward response to the concern that purchasing the annuity depletes one’s liquid wealth, which is particularly valuable when the retiree faces the high cost of LTC. The second is a *longevity insurance contract*, in which an individual makes up-front, irreversible payments in

exchange for a promise that an insurer will pay an annual income for life beginning only if and when the annuitant reaches a pre-specified, advanced age. While such a product addresses some of the issues that would seem to limit interest in conventional annuities, we believe it is of limited relevance in the context of our model. What is needed to significantly impact market interest in our framework is the introduction either of long term care insurance features or some form of life insurance features. Because life-insurance contracts and life-annuities are offsetting financial contracts, most interesting for us are arrangements involving explicit tie-ins with LTCI. The third contract we examine is of this form, *combining a standard life-annuity with extra payments in the LTC state*.

Intriguingly, these three are not products currently attracting the interest of households and financial designers. At the end of this section we outline actual developments in annuity markets. Why these changes are taking place and how they differ from the next steps that follow from application of richer life cycle models is a crucial research subject, as outlined in the final section.

Reversible Annuity. The value of flexibility in terms of liquidity is demonstrated in Figure 6, which shows the willingness to pay for a *reversible annuity* of \$5,000 annually. Reversibility here simply means that the annuitant could obtain the present value of any remaining annuity payments (adjusted for current age, mortality, and health status) when she needs LTC. This type of reversibility is not generally a feature of real-world annuity contracts; however, we show that if such a feature could be offered at relatively low additional cost, demand for annuities would increase quite substantially especially among those with strong Medicaid aversion. Compared to the standard annuity, the reversibility option increases the willingness pay by up to 16 percent for the most Medicaid averse retiree depicted. For those with a strong bequest motive, the

reversibility feature adds little to the value of the annuity (which is sensible; being able to reverse the annuity has no value at death, which is the state of greatest relevance to those with high bequest motives).

Figure 6 here

Longevity Insurance. While this product is sometimes deemed an innovation, it is effectively a highly restrictive contingent deferred annuity with a zero surrender/cash value and a constraint on when annuity income payments may begin. Nevertheless, it could potentially be structured such that the premium payments required are individually small and occur over a number of years, rather than as a single lump sum. In a world in which uninsurable, health-related expense shocks can occur and borrowing is costly or impossible, the ability to spread the cost of the annuity out over many periods' future periods may be of some value.

We model this product as a sequence of equal mortality-contingent payments that must be made in order to obtain income benefit beginning at a later date. The contract has no cashable value, but simply provides an annuity benefit late in life at little up-front cost at the point of retirement. Figure 7 illustrates our baseline retiree's willingness to pay for such a contract. Specifically, we consider a policy that pays annual benefits of \$10,000 starting at age 85 in exchange for constant annual payments from the current age of 65 through age 84. Under our parameterization, actuarially fair payments for this contract are \$1,560 per year. Relative to Figure 2 (the standard \$10,000 annuity for the same retiree), we see that this contract structure modestly enhances willingness to pay for those with strong bequest motives and for those with Medicaid aversion in the middle of the range graphed. For those with low levels of both Medicaid aversion and bequest motive, there is actually less willingness to pay for the product,

probably because it ultimately provides less protection against pure longevity risk than the standard annuity.

Figure 7 here

Combining Annuities with LTC Insurance. An LTC/life-annuity combination was discussed by Pauly (1990), and more recently by Murtaugh, Spillman and Warshawsky (2001, 2002, 2003). Here the idea is a straightforward combination of a life annuity with a disability type “pop up” benefit triggered by LTC needs. The specific product proposed by Murtaugh, Spillman and Warshawsky (2001) combines a lifetime immediate annuity of \$1,000 (nominal) per month, with a “pop-up” payment of an additional \$2,000 monthly for annuitants with 2 ADL (Activity of Daily Living or severe cognitive) impairments, plus another \$1,000 monthly if the annuitant had 4 ADL impairments. Those authors argue that this combination product could alleviate adverse selection/pricing problems in both the LTC and annuity markets, and they estimate the cost of such a combination policy at about 3 percent less than if the two products were purchased separately.

The mechanics of such a policy are straightforward. Assuming actuarial fairness and complete information, suppose that a LTC policy which would pay X dollars per month in the LTC state costs Y dollars per month. Assume also a standard immediate life annuity paying A dollars per month costs B dollars under the same assumptions. Purchasing the “combination” policy then consists of paying B dollars to obtain a life annuity, and using Y dollars of the annuity payments to obtain LTC benefits X . Hence the “combination product” pays a monthly benefit of $(A-Y)$ in non-LTC, non-death states, and $(A+X)$ dollars in the LTC state (assuming premiums cease once the individual claims LTC benefits), and nothing at death.

Figure 8 shows demand for the hypothetical LTC/Annuity policy that pays a standard \$5,000 annual annuity and an additional \$10,000 per year of long term care. The fair cost of this policy is \$102,700, of which \$86,300 is used to cover the annuity component and the remaining \$16,400 covers LTC benefits. The figure illustrates that consumer demand for such a product would be expected to be strong and rise with Medicaid aversion, primarily due to the LTC component of the policy. For a retiree with no bequest motive or Medicaid aversion, LTC insurance is undesirable because it consumes resources and delivers benefits in states that are not of great concern. For all other parameter values, our calculations predict that there should be a tremendous demand for LTC insurance, even if offered at very high loads. For the most Medicaid averse, our model predicts that individuals would purchase the LTC component at loads of up to 300 percent! For those who dislike Medicaid or fear the depletion of their bequest, the LTC element offers insurance against the risk that most strongly threatens their security and so is the most appealing product. The reason these tremendous demands do not appear in the willingness to pay for the hybrid product is the annuity component, which consumes most of the premium and remains relatively undesirable as described above. When compared to their willingness to purchase the annuity and LTC components separately, we find that people would be willing to pay only 96-99 percent of the combined value for the hybrid product. Our interpretation for this finding is that the two forms of insurance complement each other, so the combination suffers from simple decreasing returns to scale. In other words, having purchased the annuity component, the LTC element becomes slightly less valuable and vice-versa. Nevertheless, the clear conclusion of this exercise is that any attempt to market a credible LTC insurance product, either alone or coupled with an annuity, should receive great interest among retirees.

Figure 8 here

Innovations in Annuity Design. Many suggestions about annuity and LTC combination products have been circulating among academics and policymakers, and several commercial firms have offered annuities with long-term care riders. To date, these contracts offer LTC coverage paid for by periodic withdrawals from cash surrender values from an associated deferred annuity contract. Because deferred annuity contracts retain significant cash value, we posit that this type of product does not provide the ideal combination of longevity insurance and LTC protection; one product is described by Milliman Consultants (2004). It is possible that the commercial success of such policies may have been hampered by a variety of practical issues. For example, until recently, annuity owners were unable to convert pre-existing accumulations on deferred annuity contracts to a combination type product that offers an insurance rider without triggering a taxable event.

Of course it may be that policies with particular designs, for instance those involving large up-front costs/premiums, are avoided for other psychological reasons. And much product innovation in the annuity area seems to have psychological as much as economic origins. There is increasing awareness on the part of financial service providers concerning the perceived limitations of stand-alone annuities. The basic problem appears to be consumer discomfort with relinquishing large lump sums in exchange for future promises to pay. Given such discomfort, many if not most immediate annuity products are now sold with “refund features” or other options that effectively amount to the addition of a saving/investment vehicle to the insurance product. For example, between two-thirds and three-quarters of the immediate life annuities purchased by retiring TIAA-CREF participants included of some form of “refund” feature at the time of purchase, guaranteeing at least a minimum number of future payments in all states,

regardless of realized longevity (Ameriks 2002). Of course, for insurance to be effectively provided (and for insurers to remain solvent in an equilibrium), resources must be relinquished by the insured in some states or contingencies, so that they can be transferred in some way to provide benefits in other states/contingencies. If consumers are unwilling to “pay premiums” in states where risks do not materialize, there is no scope to provide benefits above those that could be achieved absent insurance in states where risks do materialize.

In recent years, so called “living benefits” riders have become popular in many deferred annuity contracts. For example, some 70 percent of new deferred annuity contracts are issued with riders that provide “guaranteed minimum withdrawal” benefits, where a certain minimum level of income is promised in each year for a specified term (or for life), while the contract holder retains the ability to access a lump sum/cash value at any time during that term. The lifetime versions of such products amount to the remittance of small periodic insurance premiums in exchange for the purchase of contingent lifetime annuity payments received only in states of world in which resources have been exhausted according to a minimum payment schedule and the annuitant is alive. The vast bulk of premiums paid for such contracts are represented by the value of the investments held on the contract; the embedded annuity amounts to a small fraction of the contract’s initial value. These contracts apparently have wide appeal, but they can be quite complicated to analyze and price as illustrated by Milevsky (2006). It remains unclear why products have developed in this domain while remaining so limited in others. There are surely legal and regulatory constraints that make more innovative products costly to bring to market, especially if the innovative firm that finally breaks through the regulatory barrier cannot in some way exclude others from quickly following.

Promising Research Avenues

Next we turn to a brief discussion how research can help in the development of security-enhancing financial instruments for retirees. We do not discuss issues related to the definition of retirement, such as those highlighted by Chan and Huff-Stevens (this volume) concerning returns to work. Rather, we focus on areas in which improved understanding and practice are needed in order for those who are fully retired to face improved prospects.

LTC and Bequests as Family Matters. Our approach has emphasized the critical importance of long-term care costs for retirement security, and we have suggested that insurance against these costs would be of great value to retirees. In practice, however, real-world sales of long-term care insurance products are almost as low as sales of immediate annuities, which suggests that current LTC insurance contracts may be perceived by consumers as failing to provide effective insurance for retirees. More appealing long term care products must respond to the reality that family members today bear the bulk of private long term provision, implying that is vital to understand how families can and do contribute to long term care arrangements for elders. Estimates of the incidence of caregiving within families vary across studies and datasets, but the National Alliance for Caregiving and AARP (2004) estimate that 44.4 million Americans are caregivers and provide that care in 22.9 million households in the United States (21 percent of households). The annual value of the services provided by such caregivers has been estimated at \$257 billion (Arno 2002), which, if correct, would dwarf the value of formal LTC services.

These types of informal care arrangements may be a particularly important manifestation of the various problems that afflict the LTC insurance market (Consumer Reports 2003; Duhigg 2007). Among the most important defects of existing LTC policies is that typical LTC contracts are built on a standard reimbursement model, in which care expenses are incurred and submitted

either by the policyholder or the care provider directly for reimbursement. These contracts hence involve some degree of risk that the insurer may deem some expenses/claims ineligible for coverage. Given the dynamic nature of medical science and treatment standards, in such long-term policies, how can one be assured that technological advances or the emergence of new or alternative treatments will be covered if needed? There is even some risk that the insurer will fail, although Lopes and Michaelides (2007) suggest that this factor alone is insufficient to explain low use of LTC services. However, if all such contracting problems taken together are perceived by retirees as significant, the only possible responses are to conserve resources and to rely in large part on the kindness of others to assist when the time comes.

In some cases, retaining assets may be in part a strategy that enables at least some compensation for informal caregivers who may be more willing to provide care if they do not have to do it “for free.” Norton and Van Houtven (2005) conclude that parents providing inter vivos wealth transfers tend to provide those transfers to children who provide them with care. Clearly, one interpretation is that the transfers are informal, at least partial, payment for care services rendered; the older parent’s transfer of wealth while alive may give care-recipients some degree of control over how resources are spent.

If it is true that informal care arrangements are, in fact, how most of the infirm elderly receive care, it suggests that insurance arrangements better suited to supporting this existing infrastructure would be valuable. Research is needed to better understand how family structure feeds into the care-bequest complex, as this is a vital ingredient not only in financial innovation but also in public policy, where allowing for transfers to family members in exchange for care offers the potential to reduce the burden on the public purse.

The Role of Housing Wealth. Retirees must make many important portfolio decisions, some of which pertain to the general level of risk they bear; annuity products can have an important incentive effect in this regard (Milevsky and Kyrychenko, this volume). Another issue pertains to the use of one's home to finance long term care. Many retired households hold the majority of their wealth in the form of housing, and there is debate on the extent to which this should be treated as available for consumption in case of medical emergencies. In a recent study, Walker (2004) uses three waves of the AHEAD data (1995, 1998, and 2000) to sharpen understanding of the circumstances under which housing equity is released by the elderly. She confirms that there are large declines in ownership rates for both married and single households late in the life cycle. For example, for married households with a younger spouse age 80-81 at baseline, the rate of home-ownership fell by 23 percentage points between 1995 and 2000. Particularly large declines were associated with demographic and health states such as ill health, nursing home stays lasting over 100 days, and death. These patterns suggest that there may be an intimate connection between the possible need for care and the need the elderly feel to own their homes "free and clear."

Psychological Factors. Psychological factors play an important role in retirement, with one of the most significant relating to decision-making competence. For instance, as noted above, one way to deliver resources for LTC care involves cash payments to qualified beneficiaries; this is appealing to many as it eliminates having to deal with insurers. On the other hand, beneficiaries can also be exploited by those who take over their decision making authority (Stone 2001). (It is not clear that fears of abuse would be different in a reimbursement framework.) Some policymakers and consumer advocates worry that cash benefits provided to those with a condition requiring LTC services may not ultimately end up being used to obtain care, if

unscrupulous service providers or even ill-intentioned relatives abuse the structure. Of course this neglects the other side of the coin, which is the disregard of personal preference and limitation of individual choices.

Conclusions

Retirement security, and indeed financial security more generally, can be summed up simply as “having the resources you need, when you need them.” Standard immediate life annuities are effective at providing a part of the resources needed in retirement, as they can help meet routine expenditures as long as the retiree is alive and healthy. But such products do little to deal with retirees’ need for resources when emergencies arise, and they can even exacerbate financial distress in exigent situations. We have argued that better retirement security requires new mechanisms to enable retirees to bring additional resources to bear in emergencies, particularly given health shocks. Given the potential for a decline in the ability to make a choice among those who need LTC at the time they need it, the real design challenge is how to write effective contracts that work today to anticipate potential future decline, with sufficient safeguards and flexibility for change at later date. Clearly much research is required in this important area.

Appendix

This appendix describes some technical details of our model. The interested reader should also consult Ameriks et al. (2007).

1. Preferences over consumption are described by a standard exponentially discounted, time-separable utility function with constant relative risk aversion based on the excess of consumption C over a subsistence level, C_{SUB} : $u(C) = (C - C_{SUB})^{1-\gamma} / (1-\gamma)$. We set $C_{SUB} = 5$ (equivalent to \$5,000, as we measure dollar amounts in thousands) and $\gamma=3$, and set the subjective time discount factor to 0.98.

2. End-of-life utility from bequests defined by the function $v(b)$:

$v(b) = (\varpi / (1-\gamma)) ((\varphi - C_{SUB}) + (b/\varpi))^{1-\gamma}$. We use the same coefficient of CRRA, $\gamma=3$, over bequests as over consumption. We set $\varphi=12$. (Note that Ameriks *et al.* (2007) use $\varphi=6$ so that the values of ϖ here are analogous but not identical to those reported in that paper.)

3. For consumption in non-LTC bankruptcy, we set $C_{BAN} = 8$. We assume all saved assets grow at a constant real rate of 2 percent per year, and we do not allow individuals to borrow (Ameriks *et al.* 2007 include a risky asset).

4. The age-dependent transition matrix for health states is calibrated to national data via 16 parameters (we do this exercise once for men and once for women). The state of good health has no costs, the “sick” state (sickness that does not require long term care) has cost of \$6,000 annually, long term care costs are set to \$50,000 annually, and we assume zero costs associated with death.

References

- Abel, Andrew. (2003). Comment on Michael Hurd: "Bequests: By Accident or by Design?" in Alicia H. Munnell and Annika Sunden (eds.) *Death and Dollars: The Role of Gifts and Bequests in America*. Washington, D.C.: The Brookings Institution: 118-126.
- Ameriks, John. (2002). *Recent Trends in the Selection of Retirement Income Streams Among TIAA-CREF Participants*. TIAA-CREF Research Dialogue, Issue No. 74.
- Ameriks, John, Andrew Caplin, Steven Laufer, and Stijn Van Nieuwerburgh. (2007). 'The Joy of Giving or Assisted Living? Using Strategic Surveys to Separate Bequest and Precautionary Motives.' NBER Working Paper No. 13105.
- Andreoni, James. (1989). 'Giving with Impure Altruism: Applications to Charity and Ricardian Equivalence.' *Journal of Political Economy*, 97:1447-1458.
- Arno, Peter S. (2002). 'Economic Value of Informal Caregiving,' Presentation before the Annual Meeting of the American Association of Geriatric Psychiatry. Orlando, FL, February 24.
- Brown, Jeffrey. (2001). 'Private Pensions, Mortality Risk, and the Decision to Annuitize.' *Journal of Public Economics*, 82(1): 29-62.
- Brown, Jeffrey and Amy Finkelstein. (2004). 'The Interaction of Public and Private Insurance: Medicaid and the Long-Term Care Insurance Market.' NBER Working Paper No. 10989.
- Brown, Jeffrey, Olivia S. Mitchell, James Poterba, and Mark Warshawsky. (2001). *The Role of Annuity Markets in Financing Retirement*. Cambridge, MA: MIT Press.
- Carroll, Christopher. 2007. 'Why Do the Rich Save So Much?,' Johns Hopkins Working Paper.
- Chan, Sewin and Ann Huff-Stevens. (2008). 'Is Retirement Being Remade? Developments in Labor Market Patterns at Older Ages,' this volume.

- Congressional Budget Office. (2004). *Financing Long-Term Care for the Elderly*. CBO Report. Congressional Budget Office: Washington, D.C., April.
- Consumer Reports*. (2003). 'Do You Need Long Term Care Insurance?' 68(11): 20-24.
- Davidoff, Thomas, Jeffrey Brown and Peter Diamond. (2005). 'Annuities and Individual Welfare.' *American Economic Review*, Vol. 95, December 2005: 1573-1590.
- De Nardi, Mariachristina. (2004). 'Wealth Distribution, Intergenerational Links, and Estate Taxation.' *Review of Economic Studies*, 71(3):743-68.
- De Nardi, Mariachristina, Eric French, and John Bailey Jones. (2006). 'Differential Mortality, Uncertain Medical Expenses, and the Saving of Elderly Singles,' NBER Working Paper No. 12554.
- Duhigg, Charles. (2007). 'Aged, Frail and Denied Care by Their Insurers,' *The New York Times*, March 26: A1.
- Dushi, Irena and Anthony Webb. (2004). 'Household Annuitization Decisions: Simulations and Empirical Analyses.' *Journal of Pension Economics and Finance*, 3: 109-143.
- French, Eric and John Bailey Jones. (2004). 'On the Distribution and Dynamics of Health Care Costs.' *Journal of Applied Econometrics*, 19(6): 705-721.
- Friedman, Benjamin M. and Mark J. Warshawsky. (1988). 'Annuity Prices and Saving Behavior in the United States,' In Zvi Bodie, John Shoven and David Wise (eds.), *Pensions in the US Economy*. Chicago: University of Chicago Press: 53-77.
- Friedman, Benjamin M. and Mark J. Warshawsky. (1990). 'The Cost of Annuities: Implications for Saving Behavior and Bequests.' *Quarterly Journal of Economics*, 105(1): 135-154.
- Hurd, Michael D. (1987). 'Savings of the Elderly and Desired Bequests.' *American Economic Review*, 77(3): 298-312.

- Johnson, Richard W., Leonard E. Burman, and Deborah I. Kobes. (2004). *Annuitized Wealth at Older Ages: Evidence from the Health and Retirement Study*. Washington, DC: The Urban Institute.
- Kotlikoff, Laurence J. and Avia Spivak. (1981). 'The Family as an Incomplete Annuities Market.' *Journal of Political Economy*, 89(April): 372-391.
- Kotlikoff, Laurence J. and Lawrence H. Summers. (1981). 'The Role of Intergenerational Transfers in Aggregate Capital Accumulation.' *Journal of Political Economy*, 89(4): 706-32.
- Laitner, John and F. Thomas Juster. (1996). 'New Evidence on Altruism: A Study of TIAA-CREF Retirees.' *American Economic Review*, 86(4): 893-908.
- LIMRA International research. (2006). 'Annuity Sales – 4th Quarter 2006.' www.limra.com/pressroom/databank/
- Lopes, Paula and Alexander Michaelides. (2007). 'Rare Events and Annuity Market Participation.' *Finance Research Letters*, 4(2): 82-91.
- Milevsky, Moshe A. (2006). *The Calculus of Retirement Income*. New York: Cambridge University Press.
- Milevsky, Moshe A. and Vladyslav Kyrychenko. (2008). 'Does a Variable Annuity Come with a License to Take on More Investment Risk?', this volume.
- Milevsky, Moshe A. and Virginia R. Young. (2007). 'The Timing of Annuitization: Investment Dominance and Mortality Risk.' *Insurance: Mathematics and Economics*, 40(1), January: 135-144.
- Milliman Consultants. (2004). 'Long-Term Care Insurance—Combination Products. A Summary: April 2004.' www.milliman.com/expertise/life-financial/publications/rr/

- Mitchell, Olivia S., James Poterba, Mark Warshawsky, and Jeffrey Brown. (1999). 'New Evidence on the Money's Worth of Individual Annuities.' *American Economic Review*, December: 1299-1318.
- Murtaugh, Christopher M., Brenda C. Spillman, and Mark J. Warshawsky. (2001). 'In Sickness and in Health: An Annuity Approach to Financing Long-term Care and Retirement Income.' *Journal of Risk and Insurance*, 68(2): 225-254.
- National Alliance for Caregiving and AARP. (2004). *Caregiving in the U.S.: Final Report*.
<http://caregiving.org/pubs/data.htm>
- National Center for Health Statistics. (2002). *Health, United States 2002: Chartbook on Trends in the Health of Americans*. Hyattsville, Maryland.
- Norton, Edward and Courtney H. Van Houtven. (2005). 'Intervivos Transfers and Exchange,' RAND Working paper. RAND Corporation.
- Palumbo, Michael. (1999). 'Uncertain Medical Expenses and Precautionary Saving Near the End Of the Life Cycle.' *Review of Economic Studies*, 66(2): 395-421.
- Pauly, Mark V. (1990). 'The Rational Nonpurchase of Long-Term-Care Insurance.' *Journal of Political Economy*, 98(1): 153-168.
- Sinclair, Sven and Kent Smetters. (2004). 'Health Shocks and the Demand for Annuities,' CBO Technical Working Paper 2004-9. Washington, DC: Congressional Budget Office.
- Spillman, Brenda C., Christopher M. Murtaugh and Mark J. Warshawsky. (2003). 'Policy Implications of an Annuity Approach to Integrating Long-term Care Financing and Retirement Income.' *Journal of Aging and Health*, 15(1): 45-73.
- Stone, Robyn I. (2001). 'Providing Long-term Care Benefits in Cash: Moving to a Disability Model.' *Health Affairs*, 20(6): 96-108.

- Turra, Cassio and Olivia Mitchell. (2008). 'The Impact of Health Status and Out-of-Pocket Medical Expenditures on Annuity Valuation,' this volume.
- Walker, Lina. (2004). 'Elderly Households and Housing Wealth: Do They Use It or Lose It?' Working paper, Michigan Retirement Research Center, University of Michigan.
- Warshawsky, M.J., Spillman, B.C., & Murtaugh, C.M. (2002). 'Integrating Life Annuities and Long-term Care Insurance: Theory, Evidence, Practice and Policy.' In Zvi Bodie, Brett Hammond, and Olivia Mitchell (Eds.), *Innovations in Retirement Financing*. Philadelphia, PA: University of Pennsylvania Press: 198-221.
- Yaari, Menahem E. (1965). 'Uncertain Lifetime, Life Insurance, and the Theory of the Consumer.' *Review of Economic Studies*, 32(2): 137-150.

Figure 1. Baseline estimates of willingness to pay for a \$5,000 fixed annuity by level of Medicaid aversion and strength of bequest motive.

Source: Authors' calculations.

Notes: The contour lines in this figure represent various levels of the ratio of the retiree's estimated willingness to pay to the zero-cost, risk-neutral present valuation of the annuity contract. For example, for all combinations of Medicaid aversion and bequest motives on the line marked "1.2" in the figure above, the retiree is willing to pay (up to) 20 percent above the cost of the contract in order to obtain the contract. For this figure, the retiree is assumed to be a healthy, 65 year-old female, with \$200,000 in total wealth and pre-existing (real) annuity income of \$15,000 per year. Estimates of the median values of the strength of the bequest motive and Medicaid aversion within the surveyed population are indicated by the grey dashed lines on the chart.

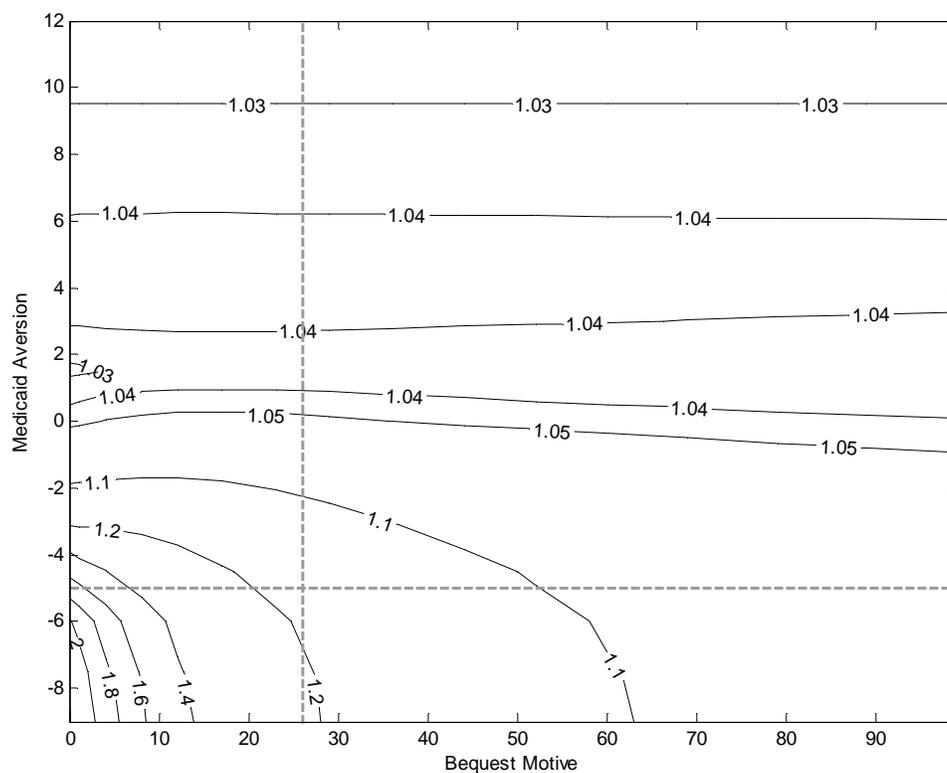


Figure 2. Baseline estimates of willingness to pay for a \$10,000 fixed annuity by level of Medicaid aversion and strength of bequest motive.

Source: Authors' calculations.

Notes: See Figure 1.

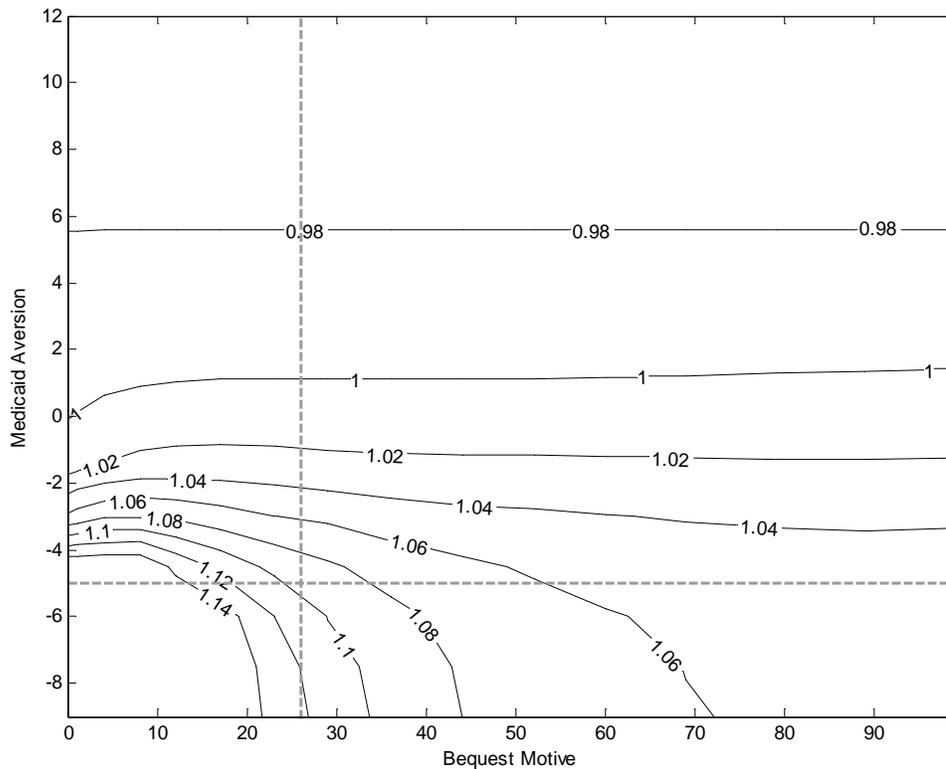


Figure 3. Higher liquid wealth estimates of willingness to pay for a \$5,000 fixed annuity by level of Medicaid aversion and strength of bequest motive.

Source: Authors' calculations.

Notes: See Figure 1. For this figure, the retiree is assumed to be a healthy, 65 year-old female, with \$286,000 in total wealthy and pre-existing (real) annuity income of \$10,000 per year. Estimates of the median values of the strength of the bequest motive and Medicaid aversion within the surveyed population are indicated by the grey dashed lines on the chart.

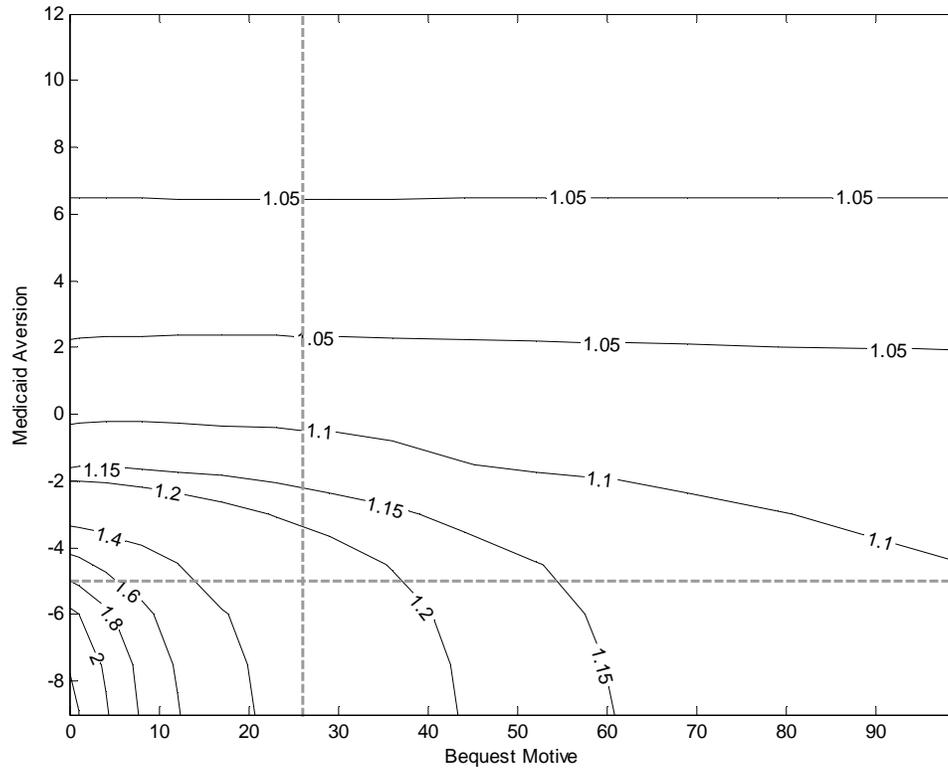


Figure 4. Lower wealth and income estimates of willingness to pay for a \$5,000 fixed annuity by level of Medicaid aversion and strength of bequest motive.

Source: Authors' calculations.

Notes: See Figure 3.

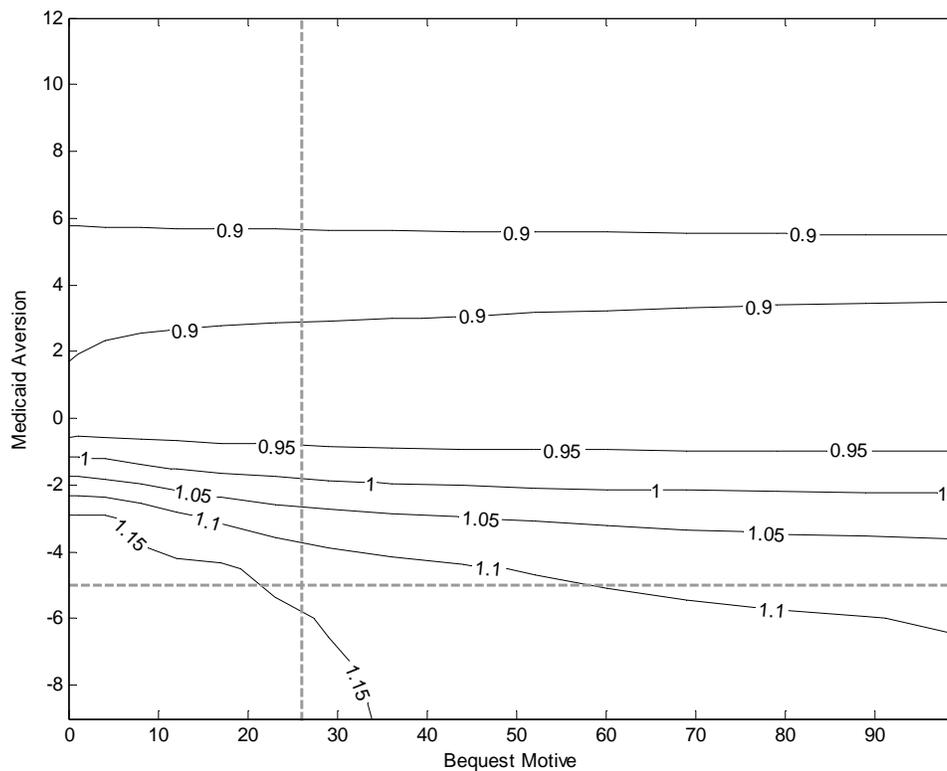


Figure 5. Higher wealth and income estimates of willingness to pay for a \$5,000 fixed annuity by level of Medicaid aversion and strength of bequest motive.

Source: Authors' calculations.

Notes: See Figure 1. For this figure, the retiree is assumed to be a healthy, 65 year-old female, with \$500,000 in total wealthy and pre-existing (real) annuity income of \$25,000 per year. Estimates of the median values of the strength of the bequest motive and Medicaid aversion within the surveyed population are indicated by the grey dashed lines on the chart.

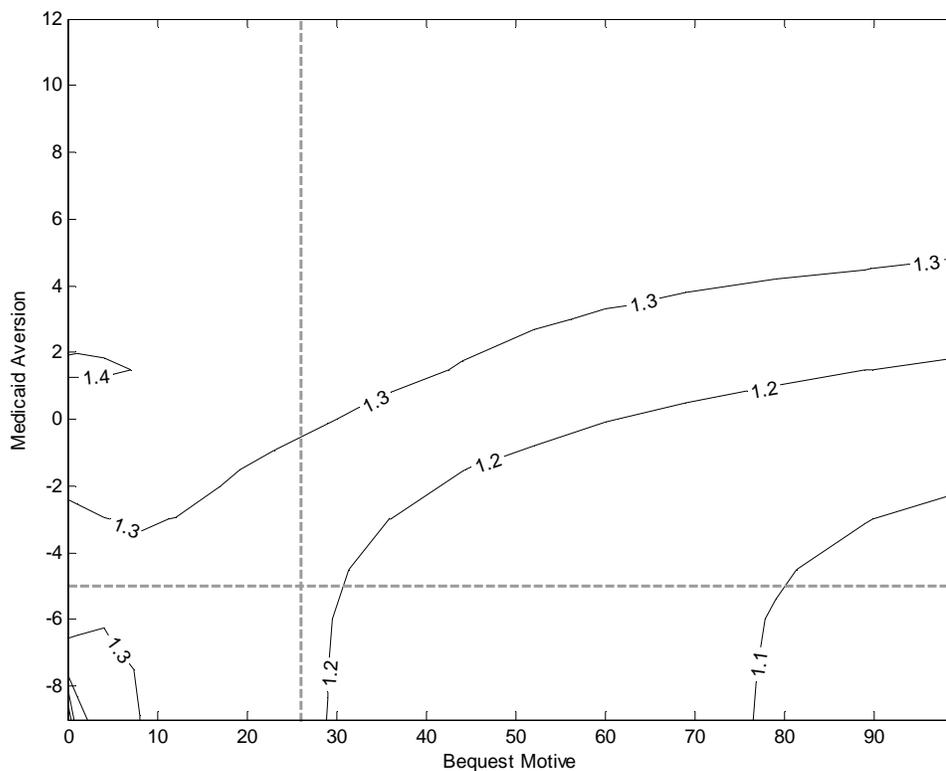


Figure 6. Baseline estimates of willingness to pay for a reversible \$5,000 fixed annuity by level of Medicaid aversion and strength of bequest motive.

Source: Authors' calculations.

Notes: See Figure 1. For this figure, the retiree is assumed to be a healthy, 65 year-old female, with \$200,000 in total wealthy and pre-existing (real) annuity income of \$15,000 per year. Estimates of the median values of the strength of the bequest motive and Medicaid aversion within the surveyed population are indicated by the grey dashed lines on the chart. The annuity used in this figure is different from those used in Figures 1-5, as this annuity can be "reversed" (in other words, cashed-in or refunded) at any time.

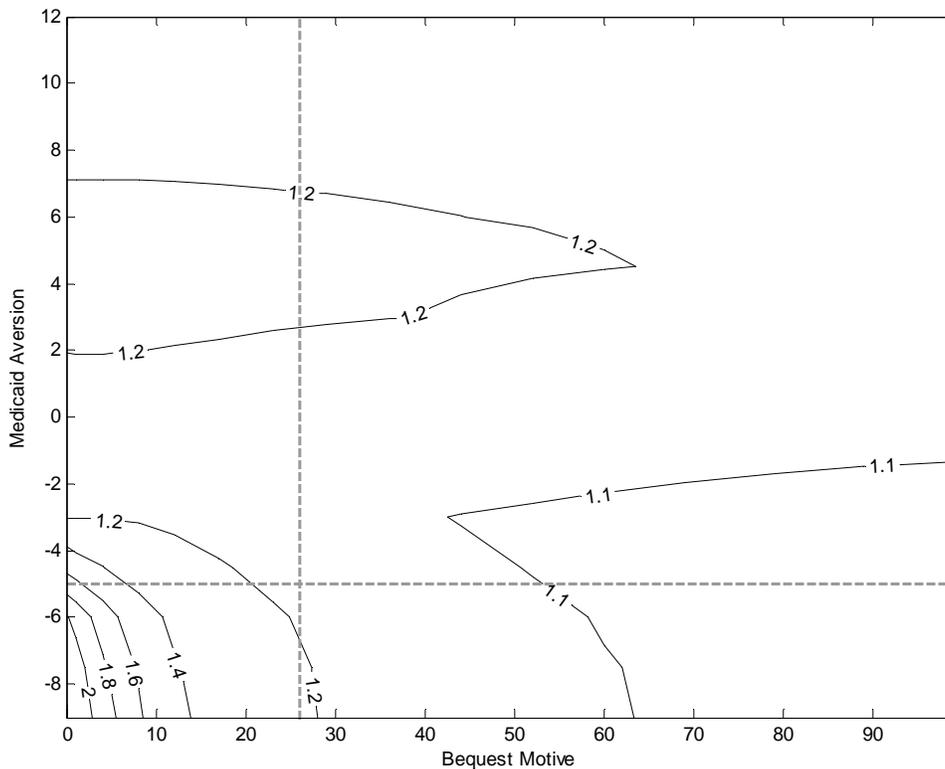


Figure 7. Baseline estimates of willingness to pay for \$10,000 ‘Longevity Insurance’ annuity by level of Medicaid aversion and strength of bequest motive.

Source: Authors’ calculations.

Notes: See Figure 1. For this figure, the retiree is assumed to be a healthy, 65 year-old female, with \$200,000 in total wealthy and pre-existing (real) annuity income of \$15,000 per year. Estimates of the median values of the strength of the bequest motive and Medicaid aversion within the surveyed population are indicated by the grey dashed lines on the chart. The annuity used in this figure is different from those used in Figures 1-6. This annuity is a “longevity insurance” policy that pays annual benefits of \$10,000 starting at age 85 in exchange for level, constant annual payments from the current age of 65 through age 84.

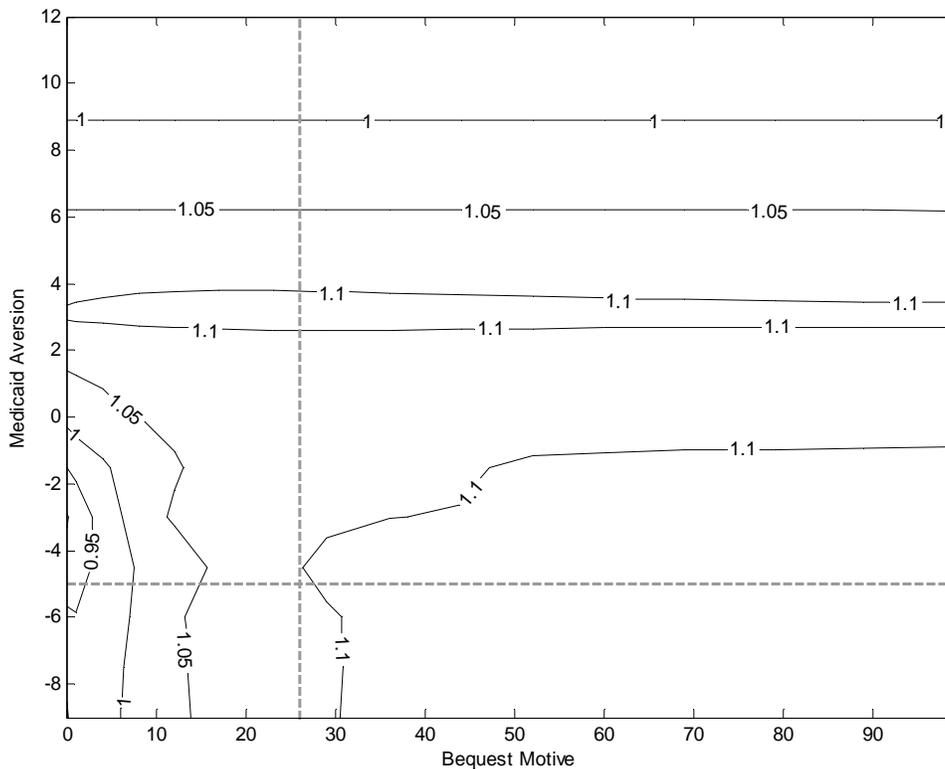
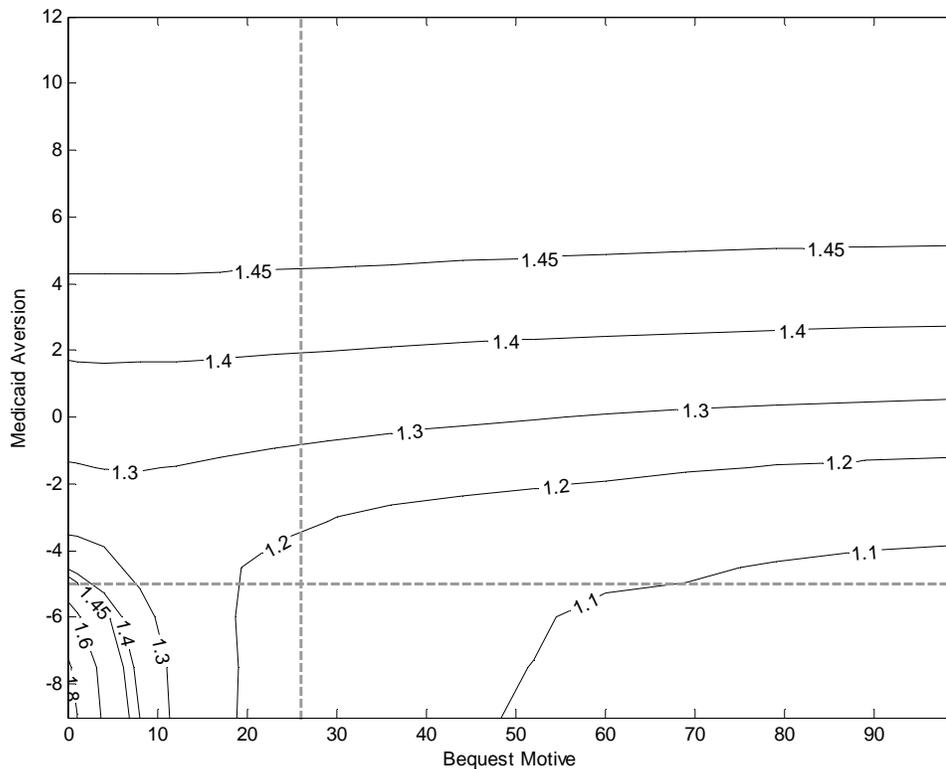


Figure 8. Baseline Estimates of willingness to pay for a “Pop-up” LTCI/annuity combination by level of Medicaid aversion and strength of bequest motive.

Source: Authors’ calculations.

Notes: See Figure 1. For this figure, the retiree is assumed to be a healthy, 65 year-old female, with \$200,000 in total wealthy and pre-existing (real) annuity income of \$15,000 per year. Estimates of the median values of the strength of the bequest motive and Medicaid aversion within the surveyed population are indicated by the grey dashed lines on the chart. The annuity used in this figure is different from those used in Figures 1-6. This annuity is a hypothetical LTCI/Annuity policy that pays a standard \$5,000 annual annuity and an additional \$10,000 in each year of LTC.



Endnotes

¹ Related work includes studies by Murtaugh, Spillman and Warshawsky (2001); Warshawsky, Spillman and Murtaugh (2002); and Spillman, Murtaugh and Warshawsky (2003).

²The standard references are Yaari (1965) and Davidoff, Brown, and Diamond (2005)

³ All cash flows are assumed to be in real, inflation-adjusted dollars; we do not model inflation risk.

⁴ This approach is similar to the “warm glow” specification of Andreoni (1989) with a CES parameter matching that for consumption rather than the dynastic altruistic formulation implied by concern with children's utility per se.

⁵Taxes are ignored and we assume no income in the year of death.