UTILITY FROM ACCUMULATION

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INTRODUCTION

IT IS FAMILIAR THAT INDIVIDUALS MIGHT DERIVE utility from accumulation, that is, from the possession (in contrast to the expenditure) of wealth. See, for example, Weber (1930) and Pigou (1941). The benefits may be internal (peace of mind, a sense of success) or external (status, power). Another possibility is that individuals merely behave as if there is utility from accumulation, due perhaps to evolutionary imperatives or habits developed during working years that persist through retirement.[1] Utility from accumulation may help to explain the existence of misers, of high-ability individuals who continue working longer and harder than seems to be justified by needs for future consumption or bequest motives, and, relatedly, of people who view their wealth more as a measure of success (a way of keeping score) than as a means to more tangible ends.

In light of these motivations, it is not surprising that various modern literatures explore the possibility that individuals derive utility from wealth, relative wealth, or the anticipation of future consumption. Most notable has been some work on risk premiums, asset pricing, and growth. See, for example, Kurz (1968), Bakshi and Chen (1996), Gong and Zou (2002), and Kuznitz, Kandel, and Fos (2008). More closely related is Carroll's (2000) discussion of why some of the rich save more than the life-cycle model predicts. Greater attention to utility from accumulation can also be seen as part of a broader recent effort to incorporate alternative behavioral hypotheses in economic models, both generally and in public economics in particular. On the latter, see Bernheim (2002) and Bernheim and Rangel (2007).

The present investigation incorporates utility from accumulation in an intertemporal model in order to examine effects on consumption, savings, inter vivos gifts and bequests (both to descendants and to charities), and annuitization. It is natural to explore these relationships. Moreover, in these areas there are empirical regularities that seem difficult to explain using conventional models. For example, many argue that individuals with significant wealth accumulations do not dissave at a sufficiently high rate during retirement. For a survey and analysis of competing views, see Hurd (1990). In choosing between inter vivos gifts and bequests to descendants, individuals seem to do far too little of the former in light of the potential estate tax savings. See Joulfaian and McGarry (2004) and Poterba (2001). The magnitude of charitable bequests (versus inter vivos contributions) also seems puzzling in light of tax considerations. More broadly, patterns of bequests have proved difficult to explain. See, for example, Bernheim's (2002) survey. And individuals do not appear to annuitize as much as is optimal. See, for example, Davidoff, Brown, and Diamond (2005). Perhaps utility from accumulation would help to explain some of these phenomena. In addition, because those who obtain significant utility from accumulation will save and bequeath more than others do, these individuals may be disproportionately important in understanding the pertinent behaviors.

The next section presents the model, analyzes individuals' optimizing behavior, and derives results regarding the effects of utility from accumulation. A final section relates these findings to observed behavior.

ANALYSIS

Individuals' expected utility is given by

$$\textbf{(1)}\quad Z = \sum_{i=1}^{\infty} p_i \left(U_i(c_i) + G_i(g_i) + \alpha V_i(w_i) + \left(1 - \frac{p_{i+1}}{p_i}\right) B_i(w_i) \right).$$

The probability p_i is the likelihood of being alive in period i. The p_i's are nonincreasing; it is natural to take $p_1 = 1$, and one can place a finite limit T on the possible length of life by setting $p_{T+1} = 0$. In each period i, individuals derive utility from their current consumption, c_i, from current (inter vivos) gifts, g_i, from their currently held (to the end of the period) accumulation of wealth, w_i, and, if they die at the end of the period, from their bequest of that wealth. Both gifts and bequests may be interpreted as transfers to descendants or to charities. The derivatives U', G', V', and B' are positive, and U'', G'', V'', and B'' are negative. The nonnegative weight α on V is introduced for later comparative statics regarding the magnitude of utility from accumulation.

Individuals have initial wealth w_0. In each period, wealth may be spent on current consumption, c_i, current gifts, g_i, or a current one-period-forward annuity, a_i, or wealth may simply be held over for the next period (which becomes a bequest should an individual die at the end of the period). Each dollar spent on period i's annuity yields $\pi_i = p_i/p_{i+1}(1 + \delta)$ of additional wealth in the next period, where $\delta \geq 0$ is a loading factor. (Note that conventional annuities, under which a current premium is paid to finance a constant future stream conditional on remaining alive, can be constructed by a series of such one-period instruments.[2]) Accordingly, in (at the end of) any period t, wealth is given by

$$\textbf{(2)} \quad w_t = w_0 - \sum_{i=1}^{t}(c_i + g_i + a_i) + \sum_{t=1}^{t-1}\pi_i a_i.$$

(For $t = 1$, the final term may be ignored; equivalently, we could define $a_0 = 0$ and begin the latter summation at $i = 0$.) All choice variables, c_i, g_i, and a_i, as well as the level of wealth in each period, w_i, are constrained to be nonnegative, although only interior solutions with positive values are considered. All monetary values are expressed in real, time 0 dollars (which simplifies exposition by allowing notation for interest to be omitted).

Because choices of c_i, g_i, and a_i in each period affect all future periods by influencing wealth, it is helpful to state an expected utility function for each period going forward:

$$\textbf{(3)} \quad Z_t = p_t\left(U_t(c_t) + G_t(g_t) + \alpha V_t(w_t) + \left(1 - \frac{p_{t+1}}{p_t}\right)B_t(w_t)\right) + Z^*_{t+1}(w_t + \pi_t a_t),$$

where Z^*_{t+1} indicates the maximized value of subsequent expected utility, beginning in period $t + 1$, where an individual enters that period with initial wealth of w_t and also the gross return from the prior period's annuity, $\pi_t a_t$. Thus, in any period t, raising either current consumption, c_t, or current gifts, g_t, raises current utility but reduces future wealth and thus subsequent periods' utility. Raising the period annuity, a_t, reduces w_t and thus lowers both the current utility from accumulation and also the utility from bequests (if the individual were to die at the conclusion of that period), but it also raises subsequent periods' utility (relative to the alternative of saving) because the gross return $\pi_t a_t$ exceeds the cost of the annuity a_t. (In cases of interest, $\pi_i > 1$, keeping in mind that the alternative to period annuities of ordinary savings is always available.) This is the standard benefit of an annuity: conditional on survival, one has more disposable wealth available in the next period, compared to the alternative of (precautionary) savings.

From expression (3), the first-order conditions for each period t are as follows:

$$\textbf{(4)} \quad \frac{dZ_t}{dc_t} = p_t\left(U_t' - \alpha V_t' - \left(1 - \frac{p_{t+1}}{p_t}\right)B_t'\right) - Z^{*\prime}_{t+1} = 0,$$

$$\textbf{(5)} \quad \frac{dZ_t}{dg_t} = p_t\left(G_t' - \alpha V_t' - \left(1 - \frac{p_{t+1}}{p_t}\right)B_t'\right) - Z^{*\prime}_{t+1} = 0,$$

and

$$\textbf{(6)} \quad \frac{dZ_t}{da_t} = p_t\left(-\alpha V_t' - \left(1 - \frac{p_{t+1}}{p_t}\right)B_t'\right) + (\pi_t - 1)Z^{*\prime}_{t+1} = 0.$$

From conditions (4) and (5), it is immediate that

$$\textbf{(7)} \quad U_t' = G_t'.$$

That is, in allocating resources between current consumption and current gifts, the marginal utility of the two will be equated. One can also combine conditions (4) and (6) to yield

$$\textbf{(8)} \quad p_t U_t' = \pi_t Z^{*\prime}_{t+1}.$$

This expression captures the margin of reducing current consumption to finance a greater annuity (rather than reducing wealth holdings to do so, as stated initially and captured by condition (6)).

It will prove useful below to introduce a further implication of individuals' optimization that links choices across periods. In particular, it is possible for an individual in any period j to reduce consumption by a dollar and use the proceeds to finance a series of annuities that ultimately increases consumption in period k. Assuming that all of the proceeds of each increment to the one-period annuity are used in the next period to purchase additional annuities so as to move funds to the subsequent period, and so on until period k, this modification has no other effects on utility. (In particular, wealth in each period is unchanged.) Since the only effects on utility are due to changes in consumption in periods j and k, the corresponding condition for optimality is

$$\textbf{(9)}\quad p_j U_j' = \left(\prod_{i=j}^{k-1} \pi_i \right) p_k U_k', \quad \text{or}$$

$$U_j' = (1+\delta)^{-(k-j)} U_k', \quad \text{for all } j < k.$$

The second line of expression (9) follows from the definition of π_i and indicates the familiar notion that optimal annuitization equates the marginal utility of consumption across periods, but only incompletely to the extent of loading costs.

It is now possible to identify the effects on individuals' optimization of changes in the importance of utility from accumulation by differentiating the pertinent first-order conditions with respect to α. From condition (7), it follows that

$$\textbf{(10)}\quad U_t'' \frac{dc_t}{d\alpha} = G_t'' \frac{dg_t}{d\alpha}.$$

Accordingly, the direction of the change in consumption and gifts within each period must be the same. Differentiating condition (9) gives

$$\textbf{(11)}\quad U_j'' \frac{dc_j}{d\alpha} = (1+\delta)^{-(k-j)} U_k'' \frac{dc_k}{d\alpha},$$

$$\text{for all } j < k.$$

This expression indicates that consumption must change in the same direction in all periods. Combined with expression (10), the implication is that both consumption and gifts in all periods move in the same direction as α is changed.

To determine the effect on a_t, we can differentiate condition (8) with respect to α (bearing in mind from expression (3) that $Z_{t+1}^{*}{}'$ depends on w_t and $\pi_t \alpha_t$, and thus on all periods' consumption, gifts, and annuities through period t, and also directly on α, which weights each period's marginal utility from accumulation from period $t+1$ forward). When this is done and terms are rearranged, the result is

Before proceeding with the interpretation of expression (12), it is helpful to use this expression for the case in which $t = 1$ to show that raising α unambiguously reduces consumption and gifts in every period. Supposing otherwise, it follows from expressions (10) and (11) that consumption and gifts rise (or stay the same) in each period. Therefore, the numerator on the right side of expression (12) is negative, as is the denominator. (The term $Z_{t+1}^{*}{}''$ is negative since Z_{t+1}^{*} is the maximized value of the sum of strictly concave functions.) On the left side of (12), we have, for $t = 1$, just the single term $(\pi_1 - 1)(da_1/d\alpha)$, so a_1 must rise as well. Accordingly, w_1 falls. This fact combined with the stipulated increase in α implies that the magnitude of the first term in expression (6), the first-order condition for the annuity, rises, which in turn implies that $Z_{t+1}^{*}{}'$ rises, which, using expression (8), indicates that U_t' rises as well (all for $t = 1$). This, in turn, means that c_1 falls, a contradiction with the maintained hypothesis. Hence, we can conclude that, indeed, raising α reduces consumption and gifts in all periods.

Returning to expression (12), this conclusion indicates that the first two terms in the numerator on the right side are positive. Since the third term is negative, the effect of raising α on the level of annuitization is ambiguous. (To confirm that the effect is ambiguous rather than merely difficult to sign, examples of each possibility are suggested in the margin; in the examples, greater annuitization is favored when utility from accumulation arises only in the later period of a two-period model, whereas less annuitization is favored when utility from accumulation arises only in the earlier period.[3])

The intuition is as follows. The first term derives from the left side of expression (8): since consumption in period t falls, the marginal utility of consumption in that period, U_t', rises; accordingly, on the right side, $Z_{t+1}^{*}{}'$ must also rise, and reduced annuitization in prior periods, ceteris paribus, has this effect. The second term on the right side of expression (12) indicates that, because both consumption and gifts in all prior periods are lower and thus wealth entering period $t+1$ is higher on this account, the marginal return to additional wealth (as may also be provided by more annuitization

$$\textbf{(12)}\quad \sum_{i=1}^{t} (\pi_i - 1) \frac{da_i}{d\alpha} = \frac{p_t U_t'' \dfrac{dc_t}{d\alpha} + \pi_t Z_{t+1}^{*}{}'' \displaystyle\sum_{i=1}^{t} \left(\frac{dc_i}{d\alpha} + \frac{dg_i}{d\alpha} \right) - \pi_t \sum_{i=t+1}^{\infty} p_i V_i'}{\pi_t Z_{t+1}^{*}{}''}.$$

in preceding periods) is lower, which makes the optimal level of annuities before period $t + 1$ fall. On the other hand, because the direct effect of raising α is to raise the utility from accumulation in all periods from $t + 1$ forward, the marginal return to additional wealth is higher. That is, $Z^{*}_{t+1}{}'$ on the right side of expression (8) rises mechanically as α is increased, so there is less need for prior-period annuities to fall, and it may even be optimal for them to increase. Finally, the summation on the left side of expression (12) captures the fact that annuities in all prior periods yield a greater return relative to savings, conditional upon reaching period t alive.

In summary, raising α increases the direct return to having more wealth to hold due to the utility from accumulation, and thus to annuitizing in prior periods, but raising α reduces the marginal return to wealth because the higher α also induces a reduction in consumption and gifts that leaves more wealth before any adjustment in the level of annuities is made (and raising α also raises the target marginal return because $U_t{}'$ rises). Accordingly, we can state:

Proposition: As the utility from accumulation, α, rises,

(a) consumption in each period falls,

(b) inter vivos giving in each period falls, and

(b) annuities purchased in each period may fall or rise.

INTERPRETATION

It is useful to relate these results regarding utility from accumulation to empirical regularities that have otherwise been difficult to explain. The first implication of utility from accumulation is that consumption falls in all periods. As noted in the introduction, many have argued that, during retirement years, individuals do not appear to consume their accumulated wealth at as high a rate as standard theory predicts they should. If utility from accumulation during retirement years is important, however, this behavior is more plausible.

Second, the presence of utility from accumulation reduces inter vivos gifts. Since consumption is also reduced, the overall implication is not that individuals give less overall but rather that more in aggregate is ultimately transferred to others and that transfers are more in the form of bequests than is predicted by standard theory. This result is consistent with three difficult-to-explain phenomena. First, bequests seem to be greater than most explanations predict. Second, as previously mentioned, individuals subject to estate taxation seem to rely far less on inter vivos giving to descendants than maximizing behavior would suggest.[4] Finally, and related, the same analysis is applicable to charitable giving. Although charitable giving is exempt from both gift and estate taxation, which makes the transfer tax system neutral regarding the timing of gifts, there is a substantial income tax incentive to give during one's lifetime. Specifically, inter vivos charitable gifts generate full tax deductions against ordinary income, whereas this deduction is sacrificed when transfers occur at death. Furthermore, the practice of deferring private transfers and charitable gifts until the time of death seems all the more surprising in the absence of utility from accumulation when one considers the additional utility advantages of inter vivos giving over bequests: the ability to experience various benefits while still alive, including the joy of observing descendants or charitable beneficiaries make use of the gifts and the praise or status one may receive, and also the fact that earlier gifts may be more valuable to recipients (children may benefit more from gifts that fund home purchases, entrepreneurship, or simple consumption during early-adult years when they are liquidity constrained than in later years, when bequests are typically received).

These points about giving are reinforced when one considers the forms in which substantial inter vivos gifts often are made. For descendants, trusts are frequently employed. For philanthropic transfers, there are trusts, private foundations, and other devices. Although there are a variety of reasons donors may wish to maintain some control, another benefit of these instruments is that donors still feel some sense of ownership of the assets, perhaps generating a degree of continued utility from accumulation. In the absence of such mechanisms, inter vivos gifts may well be even lower than the current, seemingly depressed levels.

Third, utility from accumulation has an ambiguous effect on annuities. One might have expected annuitization to fall since, in the present formulation of the utility function, the value of annuities is not assumed to generate utility from accumulation.[5] Moreover, since consumption and inter vivos giving fall, there would appear to be less need to annuitize to maintain consumption levels in the future. It was seen, however, that there is a countervailing effect, namely, that annuitization increases effective wealth in future periods, conditional on survival, so future wealth – a source of subsequent utility from accumulation – need not be spent down as much to finance consumption. Perhaps as an empirical matter, this latter effect is secondary. Alternatively, if current utility from accumulation is high but future utility from accumulation is not, annuitization would tend to be lower. Accordingly, utility from accumulation might contribute to attempts to explain low levels of annuitization. See Davidoff, Brown, and Diamond (2005), who argue that conventional theories seem insufficient to explain minimal annuitization and also suggest that answers may be found in alternative, psychological theories.

One suspects that the relative importance of utility from accumulation varies across individuals. Such variation would help to account for the large, difficult-to-explain heterogeneity in savings behavior. See Bernheim, Skinner, and Weinberg (2001) and Venti and Wise (1998). A further implication is that, at any point in time, the behavior of those with substantial wealth may be disproportionately governed by a model with utility from accumulation since individuals subject to this phenomenon will as a consequence hold more wealth than others do. Furthermore, although outside the present model, those with stronger utility from accumulation will be motivated to work harder, which will additionally contribute to their holding above-average wealth. Therefore, even if utility from accumulation is far from universal, it may be disproportionately important in understanding overall savings behavior as well as giving and bequests, both to descendants and to charities.

Although the present focus is on positive analysis, utility from accumulation may have normative significance as well. Different explanations of savings and giving behavior seem potentially relevant to capital taxation, estate and gift taxation, and policies relating to retirement savings, including Social Security. Regarding estate taxation in particular, if bequests consist substantially of wealth that was accumulated because such accumulation directly produced utility (rather than primarily because it produced anticipatory utility from transferring it to descendants or charities), the case for estate taxation may be stronger, just as it is regarded to be to the extent that bequests are accidental. Note that, in the present model, the assumption that $\pi_t > 1$ implies that annuitization would be complete if there were no bequest motive or utility from accumulation, in which case there would be no accidental bequests. See the first-order condition (6), which indicates a corner solution in this case. As is apparent from that same condition, introducing positive utility from accumulation can restore an interior solution of incomplete annuitization, which gives rise to accidental bequests: individuals choose not to fully annuitize in order to hold wealth that yields utility from accumulation.

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Notes

1 Different explanations for utility from accumulation may have different normative implications, but the present discussion is confined to positive analysis.

2 The form of annuity contract in the model here is the same as that in Davidoff, Brown, and Diamond (2005), although in their two-period model this contract is equivalent to a conventional annuity.

3 In a two-period model, take the extreme case in which there is no utility from gifts or bequests and in which either V_1 or V_2 is set equal to zero; remaining functions are the log of their arguments. Furthermore, let $p_1 = 1$, $p_2 = 0.5$, and $\delta = 0$. One can show that $da_1/d\alpha > 0$ when $V_1 = 0$ whereas $da_1/d\alpha < 0$ when $V_2 = 0$. In the former case, the only effect of raising α is to increase the value of remaining wealth in period 2, which wealth is increasing in annuitization. In the latter case, the only effect of raising α is to increase the value of unannuitized wealth from period 1.

4 To some extent, the use of bequests may be explained by individuals' unwillingness to face death. However, for high-wealth individuals who engage in elaborate estate planning, this reason seems insufficient. Poterba (2001) considers a number of other possible explanations for the low level of inter vivos giving, and he largely finds them to be implausible, but he does not consider utility from accumulation.

5 Modifying the model so that annuitization does not reduce perceived wealth in determining utility from accumulation (formally, making V a function of $w_t + a_t$) does not dramatically affect these results. The two competing effects are still present, although the relative weights differ.

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