Eric M. Engen is Senior Economist at the Federal Reserve Board; William G. Gale is Senior Fellow at the Brookings Institution; and Cori E. Uccello is Senior Health Fellow at the American Academy of Actuaries.

Lifetime Earnings, Social Security Benefits, and the Adequacy of Retirement Wealth Accumulation

by Eric M. Engen, William G. Gale, Cori E. Uccello

Summary and Introduction

The United States has traditionally depended on the so-called three-legged stool—Social Security, private pensions, and additional personal saving—to finance retirement, but all three legs are becoming increasingly creaky. Social Security and Medicare face long-term financial shortfalls, because of a combination of the imminent retirement of the baby-boom generation, generally lengthening life spans, and rising health care costs and per capita health care expenditures, which are projected to continue increasing in the coming decades. The trend in pensions from defined benefit to defined contribution plans brings with it a set of opportunities but also a set of risks for future retirees. Aggregate saving rates have been extremely low in recent years, and evidence shows that some households save very little, especially in the form of financial assets.

The extent to which households are already saving adequately for retirement is thus an important issue for policymakers, especially as they deal with issues like Social Security reform. It is also a central issue in academic research that aims to understand the forces that shape the way people make forward-looking decisions on saving.

Despite the importance of the question, there is significant controversy about how well households are preparing for retirement. Researchers have taken a wide variety of approaches to examine the issue, including measuring changes in household consumption at the time of retirement, calculating the annuitized value of existing wealth, comparing the wealth accumulation patterns of current and previous generations, and comparing the results of simulation models of optimal wealth accumulation with households' actual saving behavior. Each approach generates useful information, but each also has shortcomings that may limit the applicability of the results.[1]

This article provides new evidence on the adequacy of household wealth accumulation. The research departs from most of the previous analyses in two key ways. First, whereas most simulation models of optimal wealth accumulation assume that earnings are nonstochastic, this research follows earlier work (Engen, Gale, and Uccello 1999) in deriving optimal wealth accumulation patterns for households in a stochastic life-cycle model that allows for uncertainty in earnings and mortality. Uncertainty about future earnings implies that there will be a distribution of optimal wealth-to-earnings ratios, rather than a single benchmark ratio, among households that are otherwise observationally equivalent (that is, households that are similar on the basis of age, education, pension status, marital status, and wage history). This finding fundamentally changes the interpretation of observed saving patterns relative to a nonstochastic model. In particular, it implies that some households should be expected to exhibit low ratios of wealth to lifetime earnings, even if every household is forward-looking and makes optimal choices. The notion that low levels of saving could still represent adequate replacement rates is reinforced by the notion that the federal government provides Social Security payments and Medicare benefits to retirees.

The second way in which this analysis departs from most of the previous research is to base the measures of adequate wealth accumulation on lifetime earnings rather on than current earnings.[2] There are several reasons to believe that using data on lifetime earnings will prove useful in studying the adequacy of saving. Most importantly, lifetime earnings are almost certainly more closely correlated with economic well-being during working years and desired economic status in retirement than are earnings in any particular year. In addition, use of lifetime earnings may help clarify who is saving too little. For example, Mitchell, Moore, and Phillips (1998) and Engen, Gale, and Uccello (1999) found that, controlling for other factors, it was less likely that households with higher current earnings were saving adequately for retirement, when adequate saving was defined as having a sufficiently high ratio of wealth to current earnings. In contrast, Dynan, Skinner, and Zeldes (2004) found that high-earning households saved a greater share of their income. A possible explanation of this apparent difference is that people with high current earnings are more likely to have current earnings that exceed average lifetime earnings. Hence, if their wealth targets were actually developed with respect to lifetime earnings, their adequacy of saving would be systematically understated by examining the ratio of wealth to current earnings. Likewise, the adequacy of saving by people who had temporarily low earnings would be overstated by the ratio of wealth to current earnings.

To examine these issues, the Health and Retirement Study is used to construct a sample of all married households in which the husband was between the ages of 51 and 61 in 1992 and worked full-time. Using this sample, the results suggest that households at the median of the wealth-to-lifetime earnings distribution are saving as much as, or more than, what the underlying model suggests is optimal, and households at the high end of the wealth distribution are saving significantly more than what the model indicates. But the results also show undersaving among the lowest 25 percent of the population. These results are consistent with results in Engen, Gale, and Uccello (1999), which used data on current earnings. The results of this article depend on features of the simulation model, as further discussed below.

The central role of Social Security in the income of many elderly households highlights the potential impact of policy reforms on the adequacy of saving. This analysis shows that a 30 percent cut in Social Security benefits would have significant effects on the level and distribution of the adequacy of saving. The overall share of households whose actual wealth exceeds the median optimal target ratio of wealth to earnings would fall by 5 percentage points, or 10 percent. The drop would be much higher among lower-income households and among households with less education.

The overall effect of a Social Security benefit reduction of 30 percent is several times as large as the effect of a 40 percent reduction in stock market values. Other changes, such as increases in health expenditures or improvements in life expectancy, also have significant effects on the adequacy of saving.

Lastly, analyses using ratios of wealth to current earnings are compared with those analyses using ratios of wealth to lifetime earnings. Controlling for lifetime earnings, households with high current earnings tend to save far more adequately than do other households.

This article begins with a discussion of the definition of adequate saving used for this analysis, describes the underlying model and discusses the data, and then presents the basic results. In the succeeding sections, the article examines the effects of Social Security reform on the adequacy of saving, provides sensitivity analysis, and compares the results using wealth–lifetime earnings ratios with results using wealth–current earnings ratios. Caveats and conclusions are offered at the end.

Defining Adequate Saving

A household that is saving adequately is defined as one that is accumulating enough wealth to be able to smooth its marginal utility of consumption over time in accordance with the optimizing model of consumption described in the next section. Other possible definitions relate to poverty rates among the elderly; the maintenance of preretirement living standards in retirement; economy-wide, golden-rule levels of capital accumulation; and so on.

This definition of adequate saving is the natural one for examining the adequacy of saving from the perspective of economic research, and it takes seriously the concern that people may not be behaving optimally. Optimal behavior is simulated with the model, and then the model results are compared with actual wealth accumulation patterns. Thus, whereas in most other contexts deviations between a model and the data indicate that the model is flawed, any shortfall of actual wealth relative to the model's wealth patterns will be interpreted as evidence that behavior is flawed, that is, that actual saving is too low. This assessment, of course, is subject to any qualifications about features of the model that do not accurately capture the full set of incentives and opportunities facing households.

The research results, however, will speak only to whether the observed levels of wealth are consistent with the patterns of an optimizing model. They cannot in any way prove that people are actually solving the optimization problem defined in the simulation model. Nor do the results speak to several important related issues, such as whether Social Security or pensions are responsible for observed levels of wealth accumulation or whether higher saving rates would raise the welfare of households or the nation.

Modeling Adequate Saving

This section highlights key aspects of the model used to develop benchmark saving patterns.[3]

Description of the Model

Households enter the model with two adults aged 21. One child is added 4 years later, when the parents are 25, and a second when they are 28. Each child leaves the home at the age of 21. Families are not linked across generations. Each adult faces an age-varying probability of dying, with a maximum life span of 110 years. Each year, the assets of those who die are bequeathed to members of the generation that is then 45 years old. The bequests are distributed in accordance with the wealth distribution of the 45-year-olds, thus capturing the empirically established tendency of wealthier households to receive larger inheritances. The inheritance is assumed to be unanticipated.

In each period, forward-looking households maximize expected lifetime utility by choosing total consumption (the product of consumption per capita times the number of people in the household) and total saving subject to a lifetime budget constraint; nonnegativity constraints on net assets, income, and payroll taxes; and uncertainty regarding future earnings, life span, and inheritances. There are no markets for insurance against these uncertainties. Because the probability of death at each age is positive, borrowing against the uncertain portion of future income and inheritances is not permitted.

Utility is separable over time and separable within a time period between consumption and leisure. The utility function for consumption exhibits constant relative risk aversion, a constant intertemporal elasticity of substitution, and constant prudence, which implies that risky income and uncertain life spans lead to precautionary saving behavior. Thus, households save for retirement and as a precaution against downturns in future income and the possibility of outliving assets once retired.

Before retirement, consumption may be financed by labor earnings, decumulations of previously accumulated assets, or inheritances received. After retirement, consumption is financed by assets accumulated earlier, which are fully taxable, and by annuity income from Social Security and private defined benefit pensions. Labor supply is exogenous, and retirement occurs at a predetermined age. Household earnings are modeled as the sum of a stochastic component and a nonstochastic component. The latter follows a hump-shaped pattern with respect to age and varies by education class.

Because the model does not have a closed-form solution and the analytical solution would be intractable, a numerical solution method is used to derive the households' optimal consumption profile. Earnings shocks during the life cycle are simulated with a random number generator for each of 10,000 households. Because households receive different earnings shocks, they end up with different realized income, patterns of consumption and saving, and wealth.

The model requires specification of numerous parameter values, the most important of which are highlighted here. The conditional survival probabilities for males and females are based on estimates from the life tables for 1994 used by the Social Security Administration (Bell 1997). Retirement occurs at age 62.

Because saving is the difference between income (which before retirement consists largely of labor earnings) and consumption, the specification of the age-earnings profile is an important determinant of optimal saving patterns. To estimate the mean age-earnings profile, this analysis uses panel data on earnings of employed heads of households and their spouses from the Panel Survey of Income Dynamics from 1980 to 1992, conducted by the University of Michigan's Institute for Social Research. Households are excluded in which the head is self-employed or is older than age 65. A fixed-effects model with log earnings is estimated as a function of age, age squared, and year dummies to control for macroeconomic effects, with separate equations for household heads with 16 or more years of education and for those with less education. Earnings for the group with more education are always higher, rise and fall more steeply, and peak at later ages than do earnings for the group with less education. In addition, the wages of all age groups are assumed to rise by 1 percent per year to reflect aggregate growth in the economy.

To measure the variability in current earnings, data from the Internal Revenue Service–Michigan tax panel are used to estimate the stochastic process for the logarithm of earnings variations (Engen 1993a, 1993b).

Measurement error is less of a problem with earnings data collected from Internal Revenue Service W-2 forms that are filed with income tax returns, because wages are directly reported by employers. On the basis of that analysis, we model the stochastic process for labor earnings shocks as a first-order autoregressive process with a persistence parameter of 0.85 and a variance of 0.05. Under this specification, about half of a given shock to earnings remains after 5 years.

A progressive income tax structure is imposed, similar to the actual U.S. system in operation in 1998, with statutory marginal rates of 15 percent, 28 percent, 31 percent, 36 percent, and 39.6 percent. The taxable income brackets, in dollars, are those that were effective in 1998 for joint tax filers. Households are allowed a standard deduction of $7,100 and an exemption of $2,650 for each person. To capture the effect of preferential tax rates on capital gains and tax-preferred saving vehicles, without introducing the substantial complication of explicitly modeling tax-favored saving, tax rates on capital income are capped at 20 percent. The Social Security payroll tax is modeled by taxing labor earnings up to a limit of $68,400 at a 6.2 percent rate—the employee share of the payroll tax.

The model assumes that each household receives Social Security on the basis of features of the average age-earnings profile of its education class, not on its individual wage profile.[4] For example, among households without a defined benefit pension, Social Security is assumed to replace 35 percent of average final earnings for heads of household with less than 16 years of education and 21 percent of average final earnings for those with 16 or more years of education.[5]

The interest rate has two roles in the model: it affects the growth of consumption, and it affects the overall return on saving. The interest rate is specified as an average of the historical real risk-free rate of return and a mix of all returns, and thus an after-tax real rate of return of 3 percent is used (the average tax rate on capital income is used here).[6]

Specifying the underlying preference parameters—the intertemporal elasticity of substitution (or risk aversion, given the functional form) and the pure rate of time preference—is difficult but crucial. The goal of the model is to describe optimal (and, implicitly, time-consistent) behavior, rather than actual behavior. As a result, choosing these values so that the model is well calibrated with actual household wealth data, or using estimates of these parameters from previous empirical studies that exploit data on actual consumption choices, would inappropriately impose the assumption that the actual behavior of households was optimal. Likewise, basing the choice on values used in other simulation models would also be misleading, since most of these models aim to explain actual behavior. Thus, other sources of information or evidence on optimal behavior are used.

In particular, the time preference rate is set at 3 percent and the intertemporal elasticity of substitution (or the inverse of the coefficient of relative risk aversion) at 0.33. If the time preference rate were not set at the real after-tax, risk-free interest rate (3 percent in this model, as noted above), consumers would find it in their interest to continue to borrow or lend until the two items were equated.[7] The specification of the intertemporal elasticity of substitution is consistent with results in the study by Barsky and others (1997), which asked people to rate the desirability of different hypothetical consumption profiles or payoffs and used the results to calculate the implied preference parameters. This specification is thus consistent with people's preferences, but it is not based on their actual behavior and hence avoids the bias that would arise from assuming that actual behavior is optimal.

Optimal Saving Behavior

The research results are reported in terms of the ratio of current wealth to lifetime earnings to date.[8] The wealth measure excludes the present value of Social Security and defined benefit pensions.

Optimal wealth-to-earnings ratios will evolve differently for different households for two reasons. The first is that differences in education affect the level and shape of the age-earnings profile and differences in pension coverage affect retirement income. In Table 1, median simulated optimal wealth-to-lifetime earnings ratios (which we will refer to as *wealth-earnings ratios*) are reported for households classified by age, education, and pension status, assuming a time preference rate of 3 percent. Optimal wealth-earnings ratios rise during the life cycle. When education status is controlled for, households with pensions have lower optimal wealth-earnings ratios than those without, because pensions provide retirement income. When pension status is controlled for, households with college graduates have lower optimal wealth-earnings ratios when young, and almost equal or higher ratios when old, than do other households.

The second reason why wealth-earnings ratios vary across households in our model is that households receive different earnings shocks over time and at a given point in time. As a result, households that are observationally equivalent in the data (that is, they are identical with respect to age, lifetime earnings, family size, life expectancy, education, and pension status) will have different optimal wealth-earnings ratios. In Table 2, the importance of heterogeneous earnings shocks in generating a distribution of wealth-earnings ratios is evident. The table focuses on college graduates with pensions, but similar results occur for other groups. With a time preference rate of 3 percent, wealth-earnings ratios among 35- to 39-year-olds vary by a factor of 190, from 0.0004 at the 5th percentile to 0.0765 at the 95th percentile. Among 60- to 62-year-olds, wealth-earnings ratios vary by a factor of 16.

These observed ratios represent households' optimal responses to the pattern of earnings shocks they receive. The low wealth accumulation exhibited by a significant minority of households in the simulation model is consistent with optimizing behavior and in no way implies a retirement saving shortfall owing to myopia, irrationality, or poor information. Similar dispersion occurs with a time preference rate of zero, though all of the benchmarks are higher.

Data Issues

In 1992, the Institute for Social Research at the University of Michigan conducted the Health and Retirement Study (HRS), which gathered data on a nationally representative sample of persons born between 1931 and 1941 and on their spouses regardless of age. Reinterviews have occurred every 2 years since then. The survey oversamples blacks, Hispanics, and Florida residents and contains detailed information on wealth, pensions, income, employment, demographics, and health. Data from the 1992 HRS are used in this study, the sample for which consists of the 2,626 married households in which the husband was born between 1931 and 1941 and worked at least 20 hours per week in the 1992 survey. Results are weighted in accordance with a nationally representative population. For some of the subgroups, the sample sizes are small. (See Table A-1 for sample sizes.)

Lifetime earnings data are used from the study by Khitatrakun, Kitamura, and Scholz (2000), who developed a lifetime earnings history for each individual in the HRS sample using self-reported data on current and retrospective earnings and other information. Separate age-earnings profiles were estimated by sex and education (that is, not a college graduate or was a college graduate). The results were aggregated across spouses to form

Table 1.
Median simulated optimal wealth-to-lifetime earnings ratios, by age, education, and pension status

	Fewer than 4 years of college		At least 4 years of college	
Age	No pension	Pension	No pension	Pension
30–34	0.0234	0.0211	0.0069	0.0066
35–39	0.0363	0.0295	0.0153	0.0109
40–44	0.0520	0.0391	0.0379	0.0210
45–49	0.0671	0.0492	0.0656	0.0363
50–54	0.0739	0.0530	0.0847	0.0489
55–59	0.0752	0.0525	0.0945	0.0555
60–62	0.0717	0.0492	0.0964	0.0553

SOURCE: Authors' calculations using data from the Health and Retirement Study conducted in 1992.

NOTE: "Lifetime earnings" is defined as the present value of all earnings received to date. The time preference rate is 3 percent.

Table 2.
Distribution of simulated optimal wealth-to-lifetime earnings ratios, by age

Age	5th percentile	25th percentile	Median	75th percentile	95th percentile
30–34	0	0.0024	0.0066	0.0188	0.0543
35–39	0.0004	0.0030	0.0109	0.0306	0.0765
40–44	0.0006	0.0057	0.0210	0.0483	0.1005
45–49	0.0012	0.0135	0.0363	0.0683	0.1181
50–54	0.0031	0.0232	0.0489	0.0792	0.1233
55–59	0.0060	0.0300	0.0555	0.0818	0.1198
60–62	0.0067	0.0322	0.0553	0.0791	0.1119

SOURCE: Authors' calculations using data from the Health and Retirement Study conducted in 1992.

NOTES: "Lifetime earnings" is defined as the present value of all earnings received to date. The time preference rate is 3 percent.

The table focuses on college graduates with pensions.

household measures of lifetime earnings to date. In this analysis, this measure of lifetime earnings to date is used as the denominator of the wealth-earnings ratios.

An alternative approach would estimate lifetime earnings using administrative records based on Social Security earnings. The choice between these two alternative approaches represents trade-offs along several dimensions. Unlike the Social Security records, data for this analysis have the advantage of not being subject to censoring at the Social Security earnings cap and not automatically omitting uncovered earnings. Thus, on the one hand, these data are arguably a better measure of lifetime earnings than a measure based on Social Security earnings would be.

On the other hand, these data may lack the precision of Social Security earnings records. Gustman and Steinmeier (1999), for example, calculated averaged indexed monthly earnings (AIME) using the self-reported data, used in this analysis, and Social Security earnings records. To calculate AIME using self-reported earnings, they used reports on earnings from current and previous jobs, the age at which the respondent initially entered the labor force, years of full-time work, and years of covered work. They found that the AIME estimate using self-reported earnings overestimated the AIME using earnings records by 3 percent to 7 percent for men and by more than 20 percent for women.

For the purposes of this study, these findings suggest that the lifetime earnings estimates for men are fairly good using the self-reported data but that the lifetime earnings estimates for women may be overstated. As a result, household lifetime earnings may be overstated. However, because women in the cohort in question had far lower lifetime earnings than did men, the extent of overstatement of household lifetime earnings will be significantly smaller than it will for women's lifetime earnings. For example, Gustman and Steinmeier (1999) estimated average AIMEs of $19,200 for men and $6,900 for women. To the extent that the data overestimate lifetime earnings, the results will systematically understate the actual adequacy of saving.

Because the simulation model accounts for both precautionary saving and saving for retirement, the empirical wealth measure needs to be broad enough to account for both. Three measures of wealth are defined:

- *Broad wealth* is all net worth other than equity in vehicles. Specifically, broad wealth is the sum of equity in the primary residence, other real estate equity, equity in businesses, and net financial assets. Financial assets include balances in defined contribution plans, 401(k) plans, individual retirement accounts, and Keogh plans as well as non-tax-advantaged financial assets, minus consumer debt.
- *Narrow wealth* is broad wealth but without any equity in the primary residence.
- *Intermediate wealth* is broad wealth minus half of equity in the primary residence.

For reasons explained in Engen, Gale, and Uccello (1999), it is appropriate to include housing equity in retirement saving calculations. Nevertheless, it may not be appropriate to include every dollar of equity, since liquidating housing wealth through a sale or reverse mortgage imposes some transactions costs. Excluding half of housing wealth—as is done with the intermediate-wealth measure—to account for transactions costs certainly overestimates such costs. Therefore, the intermediate-wealth measure generates the most reasonable results, which are probably conservative results. Results for all three wealth measures are also presented, which together bound all the possible options for including or excluding housing equity.

All of the simulated wealth measures above exclude Social Security. In the HRS data, however, estimates of expected defined benefit pension benefits can be generated. The additional information provided by the defined benefit pension wealth data in the HRS is used, and therefore defined benefit pension wealth in the empirical wealth measures is included.[9]

Thus, unlike in the simulation model, pension wealth varies across households that have pensions, even after controlling for education status. Because in this study defined benefit pensions are included in wealth, the resulting wealth measures from the HRS data are compared with the simulation's wealth benchmarks above for households that do not have pension coverage, to avoid double-counting defined benefit pension assets.

Focusing the sample on married couples in which the husband is still a full-time worker may somewhat bias the sample over time, since wealthier households may retire earlier. As reported in Engen, Gale, and Uccello (1999), this focus on married couples may affect the observations for 61- and 62-year-olds, but it is less likely to affect younger age groups.

Results

For a household with a given set of observable characteristics, the simulation model generates a distribution of optimal wealth-earnings ratios rather than a single optimal level. This implies that the optimal wealth-earnings ratio cannot be determined precisely for any particular household. Instead, the distributions of observed and simulated wealth-earnings data for married households are compared with a given set of characteristics: age, lifetime earnings, education, family size, and pension status. Thus, the strategy for this study for examining the adequacy of saving focuses mainly on two issues: determining the proportion of households whose wealth-earnings ratios exceed the median simulated wealth-earnings ratio for households with the same characteristics and comparing wealth-earnings ratios at different percentiles of the actual and simulated distributions. Both approaches provide valuable information, but neither permits one to identify which particular households are saving adequately or inadequately.[10]

Median Wealth-Earnings Ratios

In Table 3, the results are shown for the comparison of each HRS household's wealth-earnings ratio with the median of the distribution of wealth-earnings ratios from the simulation for households with the same characteristics, assuming a 3 percent time preference rate. For the full sample, 56 percent of households have ratios of intermediate wealth to lifetime earnings to date (which will be referred to in Table 3 and the following tables as *wealth-earnings ratios*) that exceed the median simulated wealth-earnings ratio for households with the same observable characteristics.

The interpretation of this result depends on the fact that the saving benchmark is derived from a stochastic rather than a nonstochastic model. In a nonstochastic model, all households of the same age, earnings patterns, education, and pension status would be assigned the same optimal wealth-earnings ratio, and the finding above would be interpreted as showing that 56 percent of households exceed the optimal ratio. That would mean that 44 percent of households fall short of their assigned optimal wealth-earnings ratio, which would (perhaps erroneously) suggest that a significant portion of the population is undersaving.

In contrast, once it is recognized that households face uncertainty about their future earnings, it is appropriate to use a stochastic model as the benchmark, which implies that one would expect only 50 percent of households to exceed the benchmark, since the stochastic model represents a median wealth-earnings ratio. Thus, the same fact—that 56 percent of households exceed the simulated median—would instead suggest adequate, indeed somewhat more than adequate, wealth accumulation relative to the benchmark at the median of the distribution.

The treatment of housing wealth can have significant effects on the results, with between 47 percent and 65 percent of households having wealth-earnings ratios that exceed the median simulated ratio, depending on whether none or all of housing equity is included, respectively (see Table 3). All of these results in this study should be compared against a benchmark expectation that only 50 percent of households will exceed the median.

The table shows several other interesting results as well. When controlling for education, having a pension is associated with an increase of about 10 to 19 percentage points in the proportion of households that exceed the median target wealth-earnings ratio. When pensions are controlled for, having more education is associated with an increase of 9 to 19 percentage points in the likelihood of exceeding the simulated median wealth-earnings ratio. These qualitative results are consistent with those of numerous previous studies.[11] As with previous studies of the adequacy of saving, this analysis does not determine whether the results are due to the direct effects of pensions and education or to unobserved characteristics that affect household saving and that are correlated with pension coverage and education.

The results do not vary significantly with respect to age. The proportion of households whose wealth-earnings ratios exceed the median simulated ratio rises as current and lifetime incomes rise. This suggests that high-earnings households may have some important difference in tastes or opportunities for saving compared with others.[12]

Distribution of Wealth-Earnings Ratios

In Table 4, the distribution of wealth-earnings ratios is presented. The top panel provides simulated wealth-earnings ratios from the model, using the same distribution of households across education groups as is found in the HRS. The bottom panel reports data from the HRS using the intermediate-wealth measure.

The median of wealth-earnings ratios in the data exceeds the median in the simulation. In addition, the model underestimates wealth-earnings ratios at the high end of the distribution; that is, the model excludes a significant amount of real-world wealth accumulation. This result may not be particularly surprising because the model does not include bequest motives or the possibility of receiving a very high rate of return, perhaps on an entrepreneurial investment.

At the 25th percentile and lower, however, the empirical wealth-earnings ratio is below that of the simulated distribution, and the difference is especially large at the 5th percentile. This result is consistent with a significant amount of undersaving at the low end of the wealth distribution. It is also consistent, however, with other explanations that the model does not take into account. In particular, the model omits any sort of government-provided consumption floor (Hubbard, Skinner, Zeldes 1995; Scholz, Seshadri, Khitatrakun 2003).

Table 3.
Percentage of households with wealth–lifetime earnings ratios at or above the simulated median

Characteristic	Narrow wealth [a]	Intermediate wealth [b]	Broad wealth [c]
All households	47	56	65
Either spouse has defined benefit pension coverage			
All	51	61	71
Husband with 4 or more years of college	65	72	77
Husband with fewer than 4 years of college	46	57	68
Neither spouse has defined benefit pension coverage			
All	35	42	51
Husband with 4 or more years of college	46	53	62
Husband with fewer than 4 years of college	31	39	48
Education of husband			
4 or more years of college	61	68	74
Fewer than 4 years of college	42	52	62
Age of husband			
51–54	44	54	64
55–59	49	58	66
60–61	47	56	65
Current earnings (thousands of dollars)			
0–10	19	34	53
10–20	28	40	51
20–30	31	42	51
30–40	36	45	57
40–50	43	56	66
50–75	57	64	72
More than 75	66	73	79
Lifetime earnings (millions of dollars)			
0.0–1.0	27	39	49
1.0–1.5	33	47	60
1.5–2.0	50	57	66
2.0–2.5	55	65	72
More than 2.5	60	66	72
Current earnings quartile			
Lowest	29	40	50
Second	40	51	62
Third	53	61	70
Highest	65	71	78
Lifetime earnings quartile			
Lowest	29	40	53
Second	45	55	65
Third	54	63	71
Highest	59	66	72

SOURCE: Authors' calculations using data from the Health and Retirement Study conducted in 1992.

NOTES: Simulated medians assume a time preference rate of 3 percent.

"Wealth-earnings ratios" refer to ratios of intermediate wealth to lifetime earnings to date.

Some overlapping may occur.

a. "Narrow wealth" is broad wealth minus all equity in the primary residence.

b. "Intermediate wealth" is broad wealth minus half of the equity in the primary residence.

c. "Broad wealth" is the sum of equity in the primary residence, other real estate equity, equity in businesses, and net financial assets.

Characteristics of High Savers

In Table 5, *low savers* are defined as those whose actual wealth-earnings ratios fall below the simulated optimal median, and *high savers* are defined as households whose intermediate wealth–earnings ratios exceed the median ratio from the simulation.[13]

The typical high-saver household has more wealth and higher lifetime wages than does the typical low-saver household. High savers have fewer children living at home; they are more likely to be self-employed, to be college graduates, and to have pension coverage; they are less likely to be nonwhite or Hispanic; and they are less likely to smoke. High savers are also more likely to say that they have thought about retirement and that they have slightly longer financial horizons. They are more likely to believe they will live to age 75, and they expect to retire earlier than low savers. High savers are more likely to have received an inheritance and, among recipients, have received larger inheritances than have low savers.

In analyzing the estimates of three probit models of whether a household is a high saver, education, pension coverage, and self-employment are associated with a higher likelihood of having an actual wealth-earnings ratio that exceeds the simulated median wealth-earnings ratio for households with the same characteristics (Table 6). Nonwhite households have a lower likelihood of exceeding the medians, when controlling for other factors.

Model 1 controls for lifetime earnings levels and basic household demographic variables. In this framework, having higher lifetime earnings leads to very strong positive effects on the adequacy of saving. Households with lifetime earnings in excess of $1.5 million (1992 dollars) are about 12 to 16 percentage points more likely to exceed the applicable median target than are households with lifetime earnings below $1 million.

Model 2, however, shows that the effect of lifetime earnings disappears once current earnings are included. Households with high current income are more likely than other groups to exceed their median target ratio of wealth to lifetime earnings. This is consistent with the views that higher current earners save a lot and that they have substantial transitory income, which pushes their current income above their average lifetime earnings. This shows that, once lifetime earnings have been controlled for, the anomaly reported by Mitchell, Moore, and Phillips (1998) and Engen, Gale, and Uccello (1999) disappears. That is, high-income households in this study are more likely to be saving adequately for retirement.

Model 3 adds in other indicators, which have plausible signs. The likelihood of being a high saver is low for smokers, perhaps because of a higher time preference rate for those households. The likelihood of being a high saver rises with declines in expected retirement age, with the extent to which the household has thought about retirement, and with the household's financial horizon. It is also higher for households who have contacted the Social Security Administration to find out about their benefits and for households who have received a large inheritance.

Table 4.
Distribution of simulated and actual wealth-earnings ratios, by lifetime earnings quartiles

Lifetime earnings quartile	5th percentile	25th percentile	Median	75th percentile	95th percentile
			Simulated wealth–lifetime earnings ratios [a]		
All	0.0728	0.0739	0.0750	0.0815	0.0961
Lowest	0.0728	0.0739	0.0750	0.0754	0.0920
Second	0.0728	0.0739	0.0750	0.0754	0.0935
Third	0.0728	0.0739	0.0750	0.0815	0.0957
Highest	0.0728	0.0747	0.0755	0.0935	0.0964
			Actual wealth–lifetime earnings ratios [b]		
All	0.0031	0.0430	0.0906	0.1768	0.4740
Lowest	-0.0026	0.0165	0.0554	0.1322	0.4974
Second	0.0066	0.0398	0.0860	0.1664	0.4867
Third	0.0169	0.0590	0.1024	0.1726	0.3924
Highest	0.0122	0.0593	0.1248	0.2211	0.4776

SOURCE: Authors' calculations using data from the Health and Retirement Study conducted in 1992.

a. Simulated medians assume a time preference rate of 3 percent.

b. "Actual wealth-earnings ratios" reflect the intermediate wealth measure, which is the sum of half of the equity in the primary residence, other real estate equity, equity in businesses, and net financial assets.

Table 5.
Characteristics of low and high savers

Characteristic	Low savers	High savers
Wealth (dollars)		
Narrow [a]	31,907	286,989
Broad [a]	77,908	383,864
Combined wages of husband and wife (dollars)		
Current [a]	39,416	52,125
Lifetime [a]	1,607,926	1,964,083
Age of husband (years)	56	56
Number of children living at home	0.86	0.79
Husband has 4 or more years of college (percent)	19	32
Either spouse has defined benefit pension coverage (percent)	64	79
Either spouse is self-employed (percent)	21	27
Race of husband (percent)		
Nonwhite	13	7
Hispanic	8	4
In fair or poor health (percent)		
Husband	12	9
Wife	16	10
Smokes (percent)		
Husband	31	18
Wife	28	18
Husband's life expectancy (percent)		
Relative mortality optimism (age 75) [b]	-0.03	0.03
Relative mortality optimism index missing	1	1
Certain will not attain age 75	7	4
Wife's life expectancy (percent)		
Relative mortality optimism (age 75) [b]	-0.11	-0.06
Relative mortality optimism index missing	3	4
Certain will not attain age 75	4	3
Retirement expectancy		
Expected retirement age (years)	64	63
Expect never to retire (percent)	15	12
Don't know when will retire (percent)	10	8
Thought about retirement (percent)		
Hardly at all	26	15
A little	14	12
Some	20	29
A lot	24	32
Not ascertained	15	12

(Continued)

Table 5.
Continued

Characteristic	Low savers	High savers
Financial planning horizon (percent)		
0–1 year	16	8
1–5 years	40	45
5–10 years	34	35
Beyond 10 years	8	9
Not ascertained	2	2
Risk aversion (percent)		
Level 1 (least risk averse)	14	10
Level 2	11	10
Level 3	12	12
Level 4 (most risk averse)	64	69
Inheritance		
Received (percent)	17	26
Value, given receipt [a] (dollars)	10,000	18,000

SOURCE: Authors' calculations using data from the Health and Retirement Study conducted in 1992.

NOTES: A "high saver" is defined as a household whose intermediate wealth–lifetime earnings ratio exceeds the median simulated optimal ratio for households with the same characteristics, when the simulation model uses a time preference rate of 3 percent. A "low saver" is defined as a household whose actual wealth-earnings ratios fall below the simulated optimal median.

"Narrow wealth" is broad wealth minus all equity in the primary residence. "Broad wealth" is the sum of equity in the primary residence, other real estate equity, equity in businesses, and net financial assets.

See the text for a complete description of the study sample.

Some overlapping may occur.

a. Values are medians for households with the stated characteristic; values for other characteristics are means.

b. The mortality optimism index is the difference between the respondent's subjective expectation of life expectancy and an objective measure of that respondent's life expectancy, as a percentage of the latter.

It might be misleading to designate as high-saving those households with actual wealth-earnings ratios above the simulated optimal median wealth-earnings ratios. Because the optimal wealth-earnings ratio varies among observationally equivalent households, there is no way to determine, with the current data, whether any particular household is actually saving more than it needs for retirement. It could be that, given its earnings history, the household has an optimal wealth-earnings ratio that is higher than its actual ratio, even though its actual ratio exceeds the median ratio for households with similar characteristics. This should not be a significant concern, however, because the determinants of being a high-saving household in the data—that is, having more education; having a pension; collecting information about future Social Security benefits; undertaking better health habits, for example, not smoking; having a longer life expectancy or a younger expected retirement date or both—are all factors that theory and evidence suggest should be correlated with higher rates of wealth accumulation. Thus, this study interprets the results concerning which is a high-saving household, and by extension the results comparing the distributions of actual wealth-earnings ratios and simulated wealth-earnings ratios, as consistent with a large body of other research on saving cited above.

Effects of Social Security Reforms

The Social Security program is of particular interest in analyzing the adequacy of household saving. Not only was the program instituted in response to widespread perceptions of financial fragility among the elderly, but the program also provides the bulk of financial resources to most current elderly households (Diamond and Orszag 2003).

The framework developed above can be used to examine the impact of changes in Social Security benefits on the overall level of adequacy, and perhaps equally important, the effects on particular subgroups. To gain a sense of perspective, the framework can also compare these effects with those deriving from changes in other economic outcomes, such as realizations of the stock market or health care costs. These items are examined in this section and the next.

Table 6.
Probit regression models of the likelihood that a household is a high saver, by characteristics of the household

Characteristic	Model 1 Coefficient estimate	Model 1 Marginal probability	Model 2 Coefficient estimate	Model 2 Marginal probability	Model 3 Coefficient estimate	Model 3 Marginal probability
Age						
55–59	0.074	0.029	0.132 **	0.052	0.170 ***	0.067
60–61	0.106	0.042	0.201 **	0.079	0.266 ***	0.104
Household current earnings (thousands of 1992 dollars)						
20–30			-0.143	-0.057	-0.172	-0.068
30–40			-0.178	-0.071	-0.266 **	-0.106
40–50			0.012	0.005	-0.035	-0.014
50–75			0.267 **	0.105	0.235 *	0.092
More than 75			0.486 ***	0.186	0.505 ***	0.192
Household lifetime earnings (millions of 1992 dollars)						
1.0–1.5	0.104	0.041	0.096	0.038	0.045	0.018
1.5–2.0	0.320 ***	0.125	0.202 *	0.079	0.107	0.042
2.0–2.5	0.417 ***	0.161	0.149	0.059	-0.057	-0.023
More than 2.5	0.405 ***	0.157	0.011	0.004	-0.209	-0.083
Children living at home						
1	-0.038	-0.015	-0.056	-0.022	-0.042	-0.017
2	-0.020	-0.008	-0.059	-0.024	-0.012	-0.005
3 or more	-0.116	-0.046	-0.142	-0.057	-0.061	-0.024
Husband has 4 or more years of college	0.261 ***	0.102	0.179 ***	0.071	0.071	0.028
Either spouse has defined benefit coverage	0.584 ***	0.230	0.579 ***	0.228	0.510 ***	0.201
Either spouse is self-employed	0.469 ***	0.181	0.454 ***	0.175	0.537 ***	0.205
Race of husband						
Nonwhite	-0.340 ***	-0.135	-0.348 ***	-0.138	-0.329 ***	-0.131
Hispanic	-0.107	-0.042	-0.098	-0.039	-0.074	-0.029
Fair or poor health						
Husband					-0.023	-0.009
Wife					-0.042	-0.017
Smokes						
Husband					-0.209 ***	-0.083
Wife					-0.293 ***	-0.117
Husband's life expectancy						
Relative mortality optimism (age 75)					0.038	0.015
Relative mortality optimism index missing					0.291	0.112
Certain will not attain age 75					-0.283 *	-0.113
Wife's life expectancy						
Relative mortality optimism (age 75)					0.089	0.035
Relative mortality optimism index missing					0.036	0.014
Certain will not attain age 75					0.078	0.031

(Continued)

Table 6.
Continued

Characteristic	Model 1 Coefficient estimate	Model 1 Marginal probability	Model 2 Coefficient estimate	Model 2 Marginal probability	Model 3 Coefficient estimate	Model 3 Marginal probability
Expected retirement age						
56–59					-0.504 **	-0.198
60–61					-0.452 *	-0.178
62					-0.934 ***	-0.354
63–64					-1.065 ***	-0.390
65					-1.335 ***	-0.473
66–69					-1.307 ***	-0.457
70					-1.420 ***	-0.515
Will never retire					0.608	0.226
Don't know when will retire					0.313 **	0.121
Thought about retirement						
A little					0.056	0.022
Some					0.243 ***	0.095
A lot					0.202 **	0.079
Not ascertained					-0.262	-0.104
Financial planning horizon						
1–5 years					0.306 ***	0.120
5–10 years					0.222 **	0.087
Beyond 10 years					0.309 **	0.119
Not ascertained					0.165	0.064
Risk aversion						
Level 2					0.049	0.019
Level 3					0.151	0.059
Level 4 (most risk averse)					0.155 *	0.061
Ever contacted Social Security Administration					0.146 **	0.058
Inheritance (thousands of 1992 dollars)						
0–5					-0.334 **	-0.132
5–10					0.068	0.027
10–25					0.049	0.019
25–100					0.399 ***	0.151
More than 100					0.874 ***	0.295
Constant	-0.654***		-0.717***		0.137	

SOURCE: Authors' calculations using data from the Health and Retirement Study conducted in 1992.

NOTES: Model 1 controls for lifetime earnings levels and basic household demographic variables. Model 2 controls for household current earnings, in addition to lifetime earnings and demographic variables. Model 3 adds other indicators, such as outlooks on mortality and retirement, financial planning, and inheritance.

The dependent variable takes a value of one if the household's actual intermediate wealth–lifetime earnings ratio exceeds the simulated wealth-earnings ratio, and zero otherwise.

Some overlapping may occur.

N = 2,476.

*** = statistically significant at the 1 percent level, ** = statistically significant at the 5 percent level, * = statistically significant at the 10 percent level.

The experiments considered are immediate and permanent reductions in Social Security benefits of either 15 percent or 30 percent. These figures roughly correspond to one manner of bringing the Social Security system into fiscal balance over a 75-year period or on a permanent basis, respectively.[14] Because this sample focuses on heads of households in their 50s and early 60s and because of the interest in obtaining upper-bound impacts of the policies in questions, households are not permitted to alter their other saving behavior. Thus, the results show the maximal impact of benefit cuts on the adequacy of household saving for households with heads who are at least 50 years old.

Reducing benefits raises the optimal simulated wealth-earnings ratios, which exclude Social Security. As shown in Table 7, reductions in Social Security benefits have a significant impact on the share of households whose actual wealth-earnings ratios exceed the target ratios. A 30 percent reduction in benefits reduces the proportion of households above the median optimal ratio by 5 percentage points, or almost 10 percent of the total that exceeds the median. The effect is felt fairly consistently across households with and without pension coverage. It is interesting that essentially no effect is felt by highly educated households, but the 30 percent reduction has a relatively large effect on less-educated households,

Table 7.
Effects of cuts in Social Security benefits on the adequacy of saving, as measured by the percentage of households whose actual wealth-earnings ratios exceed the median optimal simulated ratio

Characteristic	Base case	15 percent cut	30 percent cut
Full sample	56	54	51
Either spouse has defined benefit pension coverage			
All	61	59	56
Husband with 4 or more years of college	72	70	68
Husband with fewer than 4 years of college	57	54	51
Neither spouse has defined benefit pension coverage			
All	42	40	38
Husband with 4 or more years of college	53	53	53
Husband with fewer than 4 years of college	39	36	34
Husband's education			
4 or more years of college	68	66	65
Fewer than 4 years of college	52	49	46
Age			
51–54	54	52	49
55–59	58	55	52
60–61	56	54	52
Current earnings (thousands of 1992 dollars)			
0–10	34	31	28
10–20	40	39	35
20–30	42	39	34
30–40	45	42	40
40–50	56	52	50
50–75	64	62	59
More than 75	73	71	69
Lifetime earnings (millions of 1992 dollars)			
0.0–1.0	39	37	37
1.0–1.5	47	44	39
1.5–2.0	57	55	53
2.0–2.5	65	61	58
More than 2.5	66	64	62

SOURCE: Authors' calculations using data from the Health and Retirement Study conducted in 1992.

NOTES: The "base case" represents the percentage of households for the full study sample whose ratios of intermediate wealth to lifetime earnings to date exceed the median simulated wealth-earnings ratio for households with the same observable characteristics (see Table 3).

Some overlapping may occur.

where a drop of 5 percentage points represents a 12 percent decline in the proportion of households whose actual wealth-earnings ratios exceed the optimal ratios.

This 30 percent cut would hit moderate-earnings households particularly hard as well. Households with lifetime earnings between $1.0 million and $1.5 million would face a drop of 8 percentage points, more than 16 percent, in the proportion that exceeds the optimal median wealth-earnings ratio. Likewise, households with current earnings between $20,000 and $30,000 would face a drop of 8 percentage points, or almost 20 percent.

Sensitivity Analysis

For comparison purposes, the base-case results from Table 3 are repeated in Table 8, followed by the results of various sensitivity analyses. As noted above, a reduction of Social Security benefits by 30 percent reduces the proportion of households whose broad wealth exceeds the median target by 5 percentage points.

Some observers believe that the assumptions used in the Social Security Trustees' forecasts and in this article systematically understate the typical future life span (Lee and Skinner 1999). To account for this possibility, survival rates are raised by 10 percent. This increases life expectancy at birth by about 7.5 years for men and 8 years for women. The resulting survival rates are higher than those in the Social Security Administration's high-cost scenario. This change has a significant impact, reducing the proportion of households that exceed the median saving benchmark by 10 percentage points in the HRS data.

Raising the predetermined retirement age to 65 raises the proportion of households who exceed the median wealth-earnings ratio by about 5 percentage points.[15]

To simulate the effects of a substantial decline in the stock market, each household's actual wealth is reduced by 40 percent of its stock and mutual fund holdings and, on the assumption that retirement funds are divided equally between stocks and other assets, by 20 percent of balances in defined contribution pensions, individual retirement accounts, Keogh plans, and 401(k) plans. This has a very small impact on the results for the median household, presumably because stock holdings are concentrated among the wealthiest families. The effect is 20 percent to 40 percent as large as reducing Social Security benefits. Although this result might be thought to be attributable to the fact that the data are from 1992 and that equity values and participation in the stock market have increased substantially since then, Engen, Gale, and Uccello (2004) show that even in more recent years variations in the stock market have little impact on the adequacy of wealth accumulation.

As a further sensitivity test, all simulated wealth-earnings ratios are raised by 20 percent. This scenario could cover a number of possibilities. For example, if health care accounts for 10 percent of household expenditure before retirement, this amounts to tripling health expenditure in retirement; if preretirement health expen-

Table 8.
Sensitivity analysis: Percentage of households whose actual wealth–lifetime earnings ratios are at or above the simulated median wealth–lifetime earnings ratio, under alternative scenarios

Scenario	Intermediate wealth	Broad wealth
Base case [a]	56	65
30 percent cut in Social Security benefits	51	60
10 percent increase in survival rates	46	55
Retirement at age 65	61	69
40 percent decline in the stock market	54	64
20 percent increase in all simulated wealth-earnings ratios	49	58
Exclusion of business wealth	52	61

SOURCE: Authors' calculations using data from the Health and Retirement Study conducted in 1992.

NOTES: For comparison purposes, the base-case results from Table 3 are repeated.

"Intermediate wealth" is broad wealth minus half of the equity in the primary residence. "Broad wealth" is the sum of equity in the primary residence, other real estate equity, equity in businesses, and net financial assets.

a. The parameters of the base case are as follows: the time preference rate is 3 percent, intertemporal elasticity of substitution is set at 0.33, autoregressive persistence parameter is set at 0.85, retirement is at age 62, a real after-tax rate of return is 3 percent, and income from Social Security and a defined benefit pension is derived from the average final earnings of one's own education class.

diture is 20 percent of all household spending, it represents a doubling. Likewise, raising the simulated wealth-earnings ratios could be a rough way to serve as a proxy for uncertainty regarding health expenses or income in retirement. Although this may not be a worst-case scenario, a 20 percent increase does reduce the proportion of households that exceed the simulated median wealth-earnings ratios by 7 percentage points.[16]

Equity in a business may reflect human capital that is specific to the owner. Households may be unable to cash in such wealth to finance retirement. Excluding all business wealth from the estimates reduces the share of households exceeding the median optimal wealth-earnings ratio by 4 percentage points.

Comparisons with Data on Current Earnings

Comparisons of lifetime earnings with current earnings are of interest to provide information about income mobility and also to help resolve anomalous results in the literature, as discussed in the introduction.

In Table 9, the sample is arranged into quartiles based on lifetime earnings and current earnings and analyzed for the extent to which households with high lifetime earnings also have high current earnings. The results show a relatively strong correlation between current and lifetime earnings. About 55 percent of households are in the same quartile of the current earnings and lifetime earnings distributions, and another 37 percent are in adjacent quartiles. Less than 8 percent of households have a quartile ranking by one earnings measure that is two or three quartiles away from its ranking with the other measure.

The top panel of Table 10 shows the proportion of households in each current earnings and lifetime earnings quartile that have actual wealth–current earnings ratios that exceed their median optimal simulated ratios. (The wealth–current earnings ratios are taken from Engen, Gale, and Uccello 1999.) Almost three-quarters of households that are in the top lifetime earnings quartile but in the lowest current earnings quartile have actual wealth–current earning ratios above their median simulated ratio. In contrast, among households that are in the

Table 9.
Allocation of households, by current and lifetime earnings quartiles (in percent)

Current earnings quartile	Lifetime earnings quartile			
	Lowest	Second	Third	Highest
Lowest	17.0	5.1	1.9	0.9
Second	6.5	10.8	6.0	1.6
Third	1.1	7.7	10.7	5.5
Highest	0.4	1.4	6.4	17.0

SOURCE: Authors' calculations using data from the Health and Retirement Study conducted in 1992.

Table 10.
Percentage of households whose actual wealth–current earnings ratios exceed the median optimal simulated ratio, by current and lifetime earnings quartiles

Current earnings quartile	Lifetime earnings quartile			
	Lowest	Second	Third	Highest
	Wealth–current earnings			
Lowest	37	50	51	74
Second	29	50	55	61
Third	23	42	58	73
Highest	16	56	61	64
	Wealth–lifetime earnings			
Lowest	40	44	34	28
Second	41	58	54	40
Third	36	55	64	71
Highest	49	79	77	69

SOURCE: Authors' calculations using data from the Health and Retirement Study conducted in 1992.

NOTES: Simulated medians assume a time preference rate of 3 percent.

The intermediate-wealth measure is used, which is the sum of half of the equity in the primary residence, other real estate equity, equity in businesses, and net financial assets.

Table 11.
Allocation of households, by whether the household's wealth to current or lifetime earnings ratio is at or above the simulated median

At or above wealth–current earnings median	At or above wealth–lifetime earnings median		
	All	Yes	No
All households	100	56	44
Yes	51	48	3
No	49	8	41

SOURCE: Authors' calculations using data from 1992 from the Health and Retirement Study.

highest current earnings quartile but in the lowest lifetime earnings quartile, only 16 percent exceeded the median optimal simulated ratio of wealth to current earnings. These patterns are consistent with what would be expected if temporary fluctuations in earnings were substantial and households were planning for retirement with respect to average lifetime earnings rather than to current earnings.

In the bottom panel (Table 10), among households with the same lifetime earnings, households with higher current earnings are generally much more likely to exceed the simulated optimal ratio of wealth to lifetime earnings. This result suggests that transitory income components are substantial and that such components are typically saved.

The classification of households according to whether they are above or below the median simulated optimal wealth-earnings ratio does not depend too much on whether current or lifetime earnings are used as the denominator (Table 11). Of the 56 percent of households whose wealth-to-lifetime earnings ratios exceed the median optimal simulated ratios, about 88 percent also exceed the median target based on current earnings. Likewise, of the 51 percent of households who exceed the median optimal wealth–current earnings ratios given their characteristics, about 95 percent exceed the analogous wealth–lifetime earnings ratio. This is not an indication that use of lifetime earnings is unimportant—as shown above, controlling for lifetime earnings affects the classification of which households are undersaving. Rather, it is mainly a reflection of the fact that current age-adjusted earnings and average age-adjusted lifetime earnings tend to be relatively close to each other for most households in a given year.

Concluding comments

This article builds on our previous work, in which uncertainty was incorporated into the analysis of the adequacy of saving, by incorporating measures of lifetime earnings into the analysis as well. The focus on uncertainty is crucial because it fundamentally alters the interpretation of observed results. The addition of information on lifetime earnings is valuable because theory and evidence indicate that average lifetime earnings more closely approximate the standard of living that the household is trying to obtain in retirement than do current earnings, which tend to fluctuate.

An important caveat to our results is that the distributions of observed and simulated wealth outcomes are compared, but optimal wealth values cannot be derived for individual households. In an important recent paper, Scholz, Seshadri, and Khitatrakun (2003) were able to solve for optimal wealth accumulation for each household, using a model that recognized uncertainty related to earnings, mortality, and health expenditures. In all important respects, their results are similar to those reported here and in Engen, Gale, and Uccello (1999). In particular, they found that most households were saving at least as much as what the underlying simulation model indicated was optimal and that 20 percent of households at the low end of the wealth distribution are undersaving. This suggests that incorporating household-specific targets strengthens the support for the conclusions obtained above.

Table A-1.
Number of households in sample, by age, education, and pension status

Age	All	Fewer than 4 years of college		At least 4 years of college	
		No pension	Pension	No pension	Pension
All households	2,626	656	1,345	150	475
51–54	1,093	281	545	54	213
55–59	1,154	281	604	72	197
60–61	379	94	196	24	65

SOURCE: Authors' calculations using data from the Health and Retirement Study conducted in 1992.

NOTE: The study sample consists of 2,626 married households in which the husband was born between 1931 and 1941 and worked at least 20 hours per week on the 1992 survey.

Notes

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[1] A complete review of the literature is beyond the scope of this article. Engen, Gale, and Uccello (1999) and the Congressional Budget Office (2003) provide recent reviews of the literature.

[2] Gustman and Steinmeier (1998) and Scholz, Seshadri, and Khitatrakun (2003) also use lifetime earnings data to study the adequacy of saving.

[3] Engen, Gale, and Uccello (1999) provide a complete description and citations of related literature.

[4] In Engen, Gale, and Uccello (1999), we ran a sensitivity analysis in which each individual's replacement rate depended on the individual's actual salary during the final year, rather than on the mean age-earnings profile, given education. This generated significantly greater uncertainty and hence higher optimal precautionary saving levels, and hence lower reported levels of adequate saving, but the general pattern of the effects of alternative sensitivity analyses—changes in Social Security benefits or stock market values, for example—was the same as it is in the simpler case examined here.

[5] These replacement rates are consistent with or somewhat lower than those in Carroll (1997); Hubbard, Skinner, and Zeldes (1995); Laibson, Reppetto, and Tobacman (1998); and Scholz, Seshadri, and Khitatrakun (2003). The data generating these replacement rates are discussed in Engen, Gale, and Uccello (1999, Appendix B).

[6] If the model had a safe asset and risky assets, the Euler equation for optimal consumption growth would be determined by the return on the safe asset, and the overall return on saving would be a weighted average of these assets. The real return on short-term Treasury bills has averaged about 1 percent historically. Longer-term government and corporate bonds have yielded about 2 percent in real terms, and the equity market about 9 percent in the postwar period. A market-weighted basket of these returns gives a real pretax return of about 5 percent.

[7] In Engen, Gale, and Uccello (1999), we also reported results with a time preference rate of zero. Using this time preference rate in the current study would reduce the reported adequacy of saving but would have little impact on how that reported level varies with respect to changes in Social Security benefits or other features of the model.

[8] Despite our reporting the results this way, our model should not be confused with a "buffer stock" or target saving model (see Carroll 1992). In our model, as already noted, households save both for retirement and as a precaution against uncertain income and life span. The model generates consumption-age profiles that rise, peak in the mid-50s, and then decline, controlling for family size. Because of the need for precautionary saving, generated by uncertain earnings, the general shape of the consumption-age profile is less sensitive to whether the time preference rate is above or below the after-tax rate of return than it would be in a nonstochastic model (see Engen, Gale, and Uccello 1999).

[9] This approach follows that of Moore and Mitchell (1997) and Gustman and Steinmeier (1998). The Health and Retirement Study (HRS) collected detailed pension plan information for about two-thirds of respondents who reported pension coverage on a current or previous job. This information was gathered from the respondents' employers or from Summary Plan Description data from the Department of Labor. The Institute for Social Research (ISR) at the University of Michigan developed a software program that uses this information in conjunction with user-defined macroeconomic assumptions to estimate the present value of future pension benefit payments. We estimate pension wealth from current jobs, and separately we estimate wealth from defined benefit and defined contribution pension plans, including both 401(k) and non-401(k) plans. To estimate defined benefit pension wealth, we use the restricted pension plan data, the ISR software program, and the long-term intermediate assumptions in the 1995 Social Security Trustees report. We impute plans to the one-third of HRS respondents with defined benefit plans who lack a pension plan match using a hot deck match based on industry and occupation. Defined benefit wealth from the current job reflects work to 1992. This understates defined benefit wealth, since no credit is given for expected future accruals. We estimate defined contribution pension wealth on the current job using self-reported account balances. Previous research suggests that using the restricted employer-provided pension plan data does not improve upon the self-reported account balance data (Johnson, Sambamoorthi, and Crystal 2000). Defined contribution wealth reflects self-reported defined contribution balances if these are given or imputed defined contribution balances if they are not. When imputing missing account balances, we take advantage of the longitudinal nature of the HRS by incorporating wave 2 self-reported account balances when available. For workers with missing wave 1 defined contribution balances who report balances in wave 2, we estimate their wave 1 balance as the wave 2 balance minus any contributions and interest earned between the two waves. Contributions are based on self-reported employee and employer contribution rates, if available. If unavailable, we use the sample's median contribution rates of 4 percent for employee contributions and 2 percent for employer contributions. We also account for increasing wages by assuming a nominal wage growth rate of 4.9 percent in 1992. We assume a nominal rate of return of 7.1 percent in 1992 and 6.1 percent in 1993. We use a regression-based imputation procedure to estimate missing defined contribution account balance information for those missing

such information in wave 1 and wave 2. We estimate a log-linear model of account balances based on wages, employer and employee contribution rates, tenure, occupation, full-time status, sex, and marital status.

[10] As discussed later in the article, recent work by Scholz, Seshadri, and Khitatrakun (2003) estimates optimal wealth measures on an individual basis.

[11] See Kotlikoff, Spivak, and Summers (1982); Robb and Burbidge (1989); Bernheim (1992); Bernheim and Scholz (1993); Gale (1997); Moore and Mitchell (1997); Banks, Blundell, and Tanner (1998); Mitchell, Moore, and Phillips (1998); Warshawsky and Ameriks (1998).

[12] For further evidence on these issues see Dynan, Skinner, and Zeldes (2002, 2004); Gentry and Hubbard (1998); Carroll (2000).

[13] Similar qualitative patterns emerge if we use definitions of high savers based on broad or narrow wealth or the simulation model or both with a time preference rate of zero.

[14] See, for example, Diamond and Orszag (2003) and Orszag and Shoven (2005). Our analysis of these options does not imply that they are the only or even the preferred methods of bringing about long-term fiscal balance.

[15] To analyze retirement at age 65, we raise the pension and Social Security replacement rates by 10 percent and allow earnings to continue between the ages of 62 and 65, according to the same age-earnings profile and the same stochastic process used in the rest of the analysis.

[16] Fuchs (1998b) cites data showing that health expenditure per capita for persons over the age of 65 is more than three times greater than that before age 65, but this includes government-provided care, as well as out-of-pocket expenses. Fuchs (1998a) notes that if health expenditures continue to grow at the same rate as they have in the past, health care for the elderly will absorb 10 percent of gross domestic product (GDP) in 2020, compared with 4.3 percent in 1995. He estimates that this will require either a sizable increase in public health expenditure or a reduction in the amount of nonhealth private goods and services the elderly can purchase compared with earlier years or both. See Hubbard, Skinner, and Zeldes (1994) for information on the age profile of health expenditure and Dick, Garber, and MaCurdy (1994) for an analysis of nursing home stays.

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