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Understanding the Postwar Decline in U.S. Saving: A Cohort Analysis

IN 1950 THE RATE of net national saving in the United States was 12.3 percent. In 1994 it was only 3.5 percent.[1] The difference in these saving rates is illustrative of a dramatic long-term decline in U.S. saving. The U.S. saving rate averaged 9.1 percent per year in the 1950s and 1960s, 8.5 percent in the 1970s, 4.7 percent in the 1980s, and just 2.7 percent in the first five years of the 1990s.[2]

The decline in saving in the United States has been associated with an equally dramatic decline in domestic investment. Since 1990, net

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1. The net national saving rate is defined as net national product less national consumption (household consumption plus government purchases), divided by net national product. The National Income and Product Account (NIPA) data used in the body of this paper do not incorporate recently revised NIPA data for the years starting in 1959.

2. The recently released revised NIPA data also show a dramatic decline in the U.S. net national saving rate. For example, during the 1960s the saving rate based on the revised data averaged 12.1 percent compared with 4.6 percent during the period 1990–95. Saving rates in the revised data are higher than in the unrevised data because government consumption has been redefined to exclude government purchases of durables, but to include the imputed rent on the stock of government durables. The Commerce Department appears, however, to be understating this imputed rent because its measure includes only the depreciation on the stock of government durables.

domestic investment has averaged 3.6 percent per year, compared with 8.2 percent in the 1950s, 7.9 percent in the 1960s and 1970s, and 6.1 percent in the 1980s. The low rate of domestic investment appears to have limited growth in labor productivity and, consequently, real wages. Since 1979, labor productivity has grown at less than half the rate observed between 1950 and 1979, and total real compensation (wages plus fringe benefits) per hour has grown at only one-seventh its previously observed rate.

This paper develops a unique cohort data set to study the decline in U.S. saving. It focuses on four periods for which Consumer Expenditure Surveys (CEX) are available: 1960–61, 1972–73, 1984–86, and 1987–90. These and a host of other microeconomic surveys are combined with National Income and Product Account (NIPA) data and other aggregates to form measures of cohort-specific consumption and resources. The benchmarking of our cohort data set to NIPA aggregates ensures that our findings relate directly to the decline in net national saving measured by these aggregates.

We use our cohort data within a simple life cycle framework to decompose the postwar change in U.S. saving in terms of changes in the following factors: the intergenerational distribution of resources, cohort-specific consumption propensities, the rate of government spending on goods and services, and demographics. Our findings are striking. Most of the decline in U.S. saving can be traced to two factors. First, the government's redistribution of resources toward older generations with high consumption propensities from younger ones, including those not yet born, with low or zero consumption propensities. Second, a dramatic rise in the consumption propensities of older Americans. The form of government transfers to the elderly—the fact that they are annuitized and, in the case of health care, made in kind—may help to explain the rise in the elderly's spending rate. For the young and middle-aged, the findings are different. The consumption propensities of most young generations have declined slightly or remained constant over time, and this has bolstered U.S. saving.

The next two sections of this paper provide a brief discussion of related research and present some stylized facts about recent trends in U.S. saving and consumption. We then describe our method for decomposing changes in national saving. We discuss data construction and data sources in general terms (details are provided in appendix A) and present our findings. We next relate the increase in the propensity of the elderly to consume to the increase in the annuitization of their resources recently documented by Alan Auerbach, Laurence Kotlikoff, and David Weil and Auerbach and others.[3] We address a number of questions about the reliability of our findings and examine the paper's implications for future rates of U.S. saving. We conclude with a summary.

Related Studies

Several recent studies of U.S. saving focus on personal saving, defined as saving out of disposable income. Lawrence Summers and Chris Carroll suggest that younger cohorts may be hoping to rely on social security in their retirement and are, in consequence, saving too little on their own. In contrast, Barry Bosworth, Gary Burtless, and John Sabelhaus compare personal saving rates in the 1960s, 1970s, and 1980s and conclude that all age groups are now saving at lower rates than used to be the case. Orazio Attanasio reaches a third conclusion. He places the blame for current low levels of personal saving on the failure of a particular subset of cohorts to save, namely, those born between 1925 and 1939.[4]

The studies by Bosworth, Burtless, and Sabelhaus and by Attanasio use consumer expenditure data that directly cover only 80 percent of aggregate consumption. Although Bosworth and his coauthors impute some missing consumption components, they ignore health care, as does Attanasio. This is a significant omission. Health care is a large and growing component of national consumption. Moreover, as medical consumption has grown as a share of output, so too has overall consumption, suggesting that medical consumption, or at least its method of finance, has played a key role in the decline in the U.S. rate of saving.

Even were all the studies of personal saving in agreement, it would be hard to assess their implications for national saving. From a theoretical perspective, personal saving bears no necessary relationship to

3. Auerbach, Kotlikoff, and Weil (1992); Auerbach and others (1995).

4. Summers and Carroll (1987); Bosworth, Burtless, and Sabelhaus (1991); Attanasio (1993).

national saving. This point can be understood by considering the standard life cycle model under certainty. According to this model, the appropriate measure of household saving is the propensity of households to consume out of the present value of their remaining lifetime resources. This propensity will be invariant to present-value neutral changes in the timing of after-tax income flows, each of which will produce a different value of personal saving.

For example, an increase in households' current social security taxes that is offset, in present value, by higher projected social security benefits will leave their consumption and, thus, national saving unchanged, but lower their personal saving. The postwar period has witnessed an enormous growth in social security and other government transfer programs. Hence changes over time in U.S. personal saving rates may simply reflect the life cycle pattern of these tax and transfer programs, rather than some underlying change in household consumption and saving behavior.

The problem with studying national saving through personal saving is actually deeper than this discussion suggests because the tax and transfer labels of government receipts and expenditure programs are not unique.[5] Assuming that agents are rational, the same fiscal policy can be classified in countless ways without making a difference to economic outcomes, including national saving. But each classification will result in a different measure of personal saving. For example, suppose that the U.S. government had historically classified social security contributions as loans to the government rather than as taxes, and current and past social security benefit payments as the repayment of past loans plus an old age tax rather than as transfer payments.[6] That would have produced an entirely different reported path of personal saving during the postwar period, but it would not have altered national saving, assuming rational consumption and saving behavior. In 1993, as an example, the personal saving rate would have been almost twice as large as the rate reported.

5. See, for example, Kotlikoff (1993).

6. Such reclassification is not merely a hypothetical possibility. The so-called privatization of the Chilean social security system amounts, in large part, to classifying workers' social security contributions as loans, rather than taxes. Under the Chilean "reform," workers contribute to pension funds. But the pension funds then lend most of these funds to the government, which uses them to make benefit payments to current social security recipients.

Studies that focus directly on household consumption and, by implication, on national saving are few and far between. The work of David Cutler and others is one example.[7] This study employs an infinite-horizon model to study the response of household consumption to demographic change. Its findings suggest that high rates of household consumption and low rates of national saving reflect households' projections of higher future per capita income levels as a result of the aging of the U.S. population. There are two major problems with this analysis, however. First, the assumed intergenerational altruism underlying the infinite-horizon model is strongly rejected by household and cohort panel data.[8] Second, the study's results are highly sensitive to the authors' assumption about the initial position of the economy.

Michael Boskin and Lawrence Lau estimate an aggregate consumption function, taking into account aggregation over different cohorts.[9] Their results suggest that a decline in saving by generations born after the Great Depression has been largely responsible for the postwar decline in U.S. saving—a finding at odds with those reported here. However, they find that the age distribution of resources is an important determinant of aggregate consumption—a finding consistent with those reported here.

The Postwar Decline in U.S. Saving: Some Stylized Facts

Table 1 reports average values of the net national saving rate for the 1950s, 1960s, 1970s, 1980s, and the first four years of the 1990s. The net national saving rate is defined as $(Y - C - G)/Y$, where Y refers to net national product (NNP), C to household consumption, and G to government spending (purchases of goods and services). The table also reports rates of government and household consumption out of output, G/Y and C/Y, respectively. In addition, the table reports our preferred measure of private sector saving, which we call the household saving rate. This is defined as $(Y - G - C)/(Y - G)$; that is, the share saved of the output left to the household sector after the government has

7. Cutler and others (1990).

8. See Altonji, Hayashi, and Kotlikoff (1992, 1995), Abel and Kotlikoff (1994), and Hayashi, Altonji, and Kotlikoff (1996).

9. Boskin and Lau (1988a, 1988b).

Table 1. Saving and Spending Rates
Percent

Period	*Net national saving rate*	*Government spending rate*	*Household consumption rate*	*Household saving rate*
1950–59	9.1	21.0	69.9	11.5
1960–69	9.1	22.1	68.8	11.7
1970–79	8.5	21.4	70.1	10.8
1980–89	4.7	21.3	74.0	5.9
1990–94	2.7	20.7	76.6	3.4

Source: Authors' calculations from the National Income and Product Accounts (NIPA).

consumed. Unlike the personal saving rate, the household saving rate is not affected by present-value neutral changes in the timing of income flows. Nor is it altered by changes in the classification of government receipts and expenditures, assuming that agents are rational and are not deceived by the government's choice of language.

As table 1 indicates, government spending has not been responsible for reducing the rate of national saving. Indeed, the rate of government spending, G/Y, has declined since the 1960s. Furthermore, in the 1990s government spending has averaged just 20.7 percent of output—as low a rate as any observed in the five periods considered. The rate of household consumption, on the other hand, rose from 69.9 percent of output in the 1950s to 76.6 percent in the early 1990s.[10] This increased rate of household consumption is associated with a decline in the household saving rate from 11.5 percent in the 1950s to 3.4 percent in the 1990s.

Table 2 considers the role of health care spending in the growth of household spending. It shows that medical expenditures (M/Y) have increased from 3.9 percent of NNP in the 1950s to 12.8 percent in the 1990s. In the 1950s health care spending represented less than 6 percent of household consumption. In the 1990s to date it has represented almost 17 percent. The increase in the rate of medical spending is associated with only a modest reduction in the rate of nonmedical spending. In the 1950s nonmedical consumption averaged 66.0 percent

10. The rise in the rate of household consumption began in the 1970s. The household consumption rate rose by 1.6 percentage points between the early 1970s and the late 1970s (that is, from 1970–74 to 1975–79), by 2.1 percentage points between the late 1970s and the early 1980s, by 2.0 percentage points between the early 1980s and late 1980s, and by 1.6 percentage points between the late 1980s and the early 1990s.

Table 2. Household and Medical Consumption Rates
Percent

Period	*Household consumption rate*	*Medical consumption rate*
1950–59	69.9	3.9
1960–69	68.8	5.2
1970–79	70.1	7.3
1980–89	74.0	10.1
1990–93	76.6	12.8

Source: Authors' calculations from the NIPA.

of NNP. In the 1990s it has averaged 63.8 percent. Thus, although the rate of medical consumption has risen by 8.9 percentage points between the 1950s and 1990s, the rate of nonmedical consumption has fallen by only 2.2 percentage points.

Decomposing the Changes in National Saving

We adopt the no bequest, life cycle model under certainty as an initial framework for decomposing the postwar changes in national saving. In so doing, we do not belittle other determinants of saving, such as uncertainty and the desire to bequeath. Rather, we believe that this model is a useful starting point. Our analysis relates cohorts' consumption to their resources. In the base case, resources refers to net wealth plus the actuarial present value of future nonasset pretax income, minus the actuarial present value of net taxes (taxes paid less transfer payments received).[11]

The base case assumes that individuals correctly foresee their future resource streams (pretax nonasset income, taxes, and transfer payments) through 1993 and form projections of these variables for the years after 1993. We also present results based on the assumption of myopic expectations. Under myopic expectations, individuals are assumed to extrapolate current age- and sex-specific levels of nonasset incomes, taxes, and transfers into the future on the basis of recently observed rates of productivity growth.

11. Discounting is at a constant real interest rate. The "actuarial" value of income, taxes, and transfers received or paid in future years is that discounted by the probability of surviving to these years.

Our results can also be considered from the perspective of a life cycle model with uncertainty, in which expected, rather than actual realized resources, determine consumption. Realized future income, taxes, and transfers represent an unbiased estimate of the ex ante expected values of these resource streams, since they differ from their expected values by a mean-zero expectation error. If the expectation error in total resources is small, then the use of realized future resources rather than expected future resources, the theoretically more appropriate resource measure, will make little difference to our results. Note that the expectation error in total resources could be small even if expectation errors with respect to particular components of resources were large. The reason is that these expectation errors may be offsetting. For example, the introduction and growth of medicare after 1965 may not have been expected by the young cohorts that were making consumption decisions in the early 1960s. But, presumably, the future slowdown in the growth of their real wages was also unanticipated. This unexpected decline in the human capital component of their resources may have offset much of the unexpected increase in the present value of their medicare benefits.

Our interest is in the net national saving rate, which at time t is given by

$$\frac{S_t}{Y_t} = 1 - \frac{C_t}{Y_t} - \frac{G_t}{Y_t}, \tag{1}$$

where S_t stands for net national saving.

In the standard life cycle model with certainty and homothetic preferences, each cohort's consumption is proportional to the present value of its remaining lifetime resources ("resources," for short). We denote the per capita resources of the cohort aged i at time t as r_{it}. This is the sum of the cohort's per capita net wealth, nw_{it}, its per capita present value of future labor earnings (human wealth), hw_{it}, its per capita present value of private and government employee pension benefits (pension wealth), pw_{it}, less its per capita present value of future tax payments net of the per capita present value of future transfer payments received (the generational account), ga_{it}.

Since our empirical analysis attributes all consumption to adult cohorts aged eighteen through one hundred, we write aggregate consumption at time t as the sum of consumption of individual cohorts aged eighteen through one hundred;[12] that is, as

$$C_t = \sum_{i=18}^{100} \alpha_{it} r_{it} P_{it}, \tag{2}$$

where i indexes age, α_{it} stands for the average propensity to consume of i-year-olds at time t, and P_{it} stands for the number of i-year-olds at time t. We note for future reference that $\alpha_{it} = c_{it}/r_{it}$, where c_{it} is the average level of consumption of those aged i at time t.

Our goal is to decompose changes over time in the net national saving rate into changes in the rate of government spending, G_t/Y_t, and changes in the determinants of the rate of household spending, C_t/Y_t. These determinants are clarified by expressing the rate of household spending as

$$\frac{C_t}{Y_t} = \left(\sum_{i=18}^{100} \alpha_{it} \frac{r_{it} P_{it}}{r_t P_t} \right) \frac{R_t}{Y_t}, \tag{3}$$

where R_t stands for the total value of resources of living generations at time t (that is, $R_t = \Sigma_i r_{it} p_{it}$), P_t stands for the total population at time t, and r_t stands for the resources per capita of living generations at time t.

According to equation 3, changes over time in the rate of household consumption can be traced to changes over time in four factors: cohort-specific propensities to consume (α_{it}), the shape of the age-resource profile (r_{it}/r_t), the age-composition of the population (P_{it}/P_t), and the resources-to-output ratio, that is, the ratio of the total resources of current generations to current output (R_t/Y_t).

In our empirical analysis we compute the values of five factors—the four above and government spending—for each of the periods 1960–61, 1972–73, 1984–86, and 1987–90. We then consider how the national saving rate in each of these periods would have differed had one of the five factors not taken its actual value but, instead, a value observed in another period.

This decomposition of changes in life cycle saving into those due to changes in demographics, saving behavior, and age-resource profiles

12. Cohorts over the age of one hundred are grouped together with those aged one hundred.

has a long tradition, dating back to the work of Albert Ando and Franco Modigliani.[13] Their lessons bear repeating. First, increases in any cohort's propensity to consume will, all else equal, raise the rate of aggregate household spending and lower national saving. Second, given the value of R_t/Y_t, higher rates of population growth and real wage growth mean higher rates of national saving for the following reason. In the life cycle model, the propensity to consume is predicted to rise with age. Since growth in both population and real wages raises the values of P_{it}/P_t and r_{it}/r_t for younger cohorts and lowers them for older cohorts, such growth produces a reweighting of α_{it} that reduces the rate of household spending and raises the rate of national saving.

The ultimate effect of growth in population and real wages on national saving is ambiguous, however, because such growth is also likely to raise R_t/Y_t. Faster population growth means that the remaining lifetime resources and incomes of the young play a bigger role in determining the overall value of R_t/Y_t. But since the ratio of future resources to current income is larger for the young than it is for the old, population growth raises R_t/Y_t. Faster real wage growth also raises R_t/Y_t because it raises the resources-to-income ratio of the young, while leaving that of the old unchanged.

The final lesson is that redistribution across generations can alter national saving. It does so by altering the age-resource profile, or the resources-to-output ratio, or both. Government tax and transfer policy can, of course, produce such redistribution. Consider government redistribution among living generations—specifically, from the young to the old at time t—that leaves the resources-to-output ratio unchanged. Such redistribution is accomplished by raising the present value of taxes net of the transfers of young generations (the generational account) and reducing the present value of taxes net of the transfers of older generations, while leaving unchanged the net tax burden faced by current generations collectively. This policy lowers the values of r_{it}/r_t for the young and raises them for the old. Thus it raises the weights applied to relatively high values of α_{it} and reduces those applied to relatively low values, producing a higher rate of aggregate household spending.

Next, consider redistribution from future to current generations that raises the resources-to-output ratio, but leaves the age-resource profile

13. Ando and Modigliani (1963).

unchanged. This can be accomplished by reducing the generational account of each current generation by just the amount needed to produce the same percentage increase in its remaining lifetime resources. This policy raises the rate of household spending by an amount that depends on the resource- and population-weighted economywide propensity to consume (the bracketed term in equation 3).

Data Construction and Sources

To decompose changes in national saving across the four periods chosen, one needs to know the value of the five factors listed above for each period. Of these factors, the rate of government spending and the age-composition of the population are readily available. This is not the case for the value of c_{it} or r_{it}, both of which are needed to form α_{it}. The value of r_{it} is also needed to form the age-resource profile and the resources-to-output ratio.

Our procedures for calculating c_{it} and r_{it} are described in detail in appendix A. Briefly, we form these variables, or their constituent components, by using cross-sectional profiles and population data to distribute aggregate variables by age and sex. For example, to determine the average value of consumption of fifty-three-year-old males and females in the period 1960–61, we use CEX and other data to determine relative per capita consumption by age and sex during that period, and use this age-sex relative consumption profile and data on the age-sex composition of the population during this period to distribute aggregate personal consumption expenditures from the NIPA for this period by age and sex. As a second example, consider how we calculate the human wealth component of the resources of thirty-eight-year-old females in 1972. For 1972 and subsequent years we distribute actual or projected NIPA labor income by age and sex, using profiles of relative average annual earnings by age and sex derived from the U.S. Census Bureau's annual Current Population Survey (CPS), as well as actual and projected population counts by age and sex. The resulting values for the average earnings of thiry-eight-year-old females in 1972, of thirty-nine-year-old females in 1973, of forty-year-old females in 1974, and so forth are then actuarially discounted back to 1973.

As just suggested, our study treats individuals, rather than households, as the life cycle decisionmakers. In practice, it is impossible to conduct this type of cohort analysis on the basis of the household as the decisionmaking unit for the simple reason that households are transient entities that appear and disappear through time, as the result of marriage, divorce, separation, and death. The empirical issue arising from treating individual adults within a multiadult household as separate decisionmakers is how to allocate household income and consumption among them. We allocate the total income earned by married couples evenly between the husband and wife, and allocate income earned by other adults to those adults. In allocating married couples' income evenly among spouses, we are, in effect, implicitly viewing marriage as the choice of an occupation that generates income (which may be negative) for each spouse. To examine the sensitivity of our results to this view of marriage, we also present results in which the income earned by spouses is allocated to the nominal recipient of that income.

As described in more detail in appendix A, household consumption taken from the CEX is allocated among adults in the following manner. Wherever it is possible to determine the particular consumer of a good or service within the household, such as the consumer of pipe tobacco, this individual is allocated this consumption. Consumption that is not so easily allocable—such as expenditure on food—is allocated among all adults and children, using a child-adult equivalency scale and assuming equal consumption by all adults. The children's consumption is then reallocated equally to each coresident parent.

Illustrating the Data Construction

Our general method of distributing an aggregate variable in time t, say Z_t, by age and sex can be understood more precisely by considering the following equation:

$$Z_t = z_{40t}^m \sum_{i=18}^{100} (v_{it}^m P_{it}^m + v_{it}^f P_{it}^f). \tag{4}$$

In equation 4, z_{40t}^m stands for the average value of Z for forty-year-old males at time t; v_{it}^m and v_{it}^f stand for the ratios of the average values of Z for males and females, respectively, aged i at time t to z_{40t}^m; and P_{it}^m and P_{it}^f stand for the populations of males and females, respectively, aged i in year t. Given the value of Z_t from the NIPA or another source, the relative age-sex profile of Z (v_{it}^m and v_{it}^f) calculated from a cross-sectional survey, and P_{it}^m and P_{it}^f calculated from population data, one can use equation 4 to solve for z_{40t}^m. One can then multiply this value by v_{it}^m (v_{it}^f) to determine z_{it}^m (z_{it}^f), that is, the average value of Z for males (females) aged i in year t. Finally, one can form a population-weighted average of z_{it}^m and z_{it}^f to produce an average value of Z for age group i at time t.

In the case of c_{it}, we use the 1961–62, 1972–73, 1984–86, and 1987–90 CEX and the 1977 and 1987 National Medical Expenditure Surveys (NMES) to form relative profiles of total consumption by age and sex. By total consumption we mean all of the components of household consumption that are included in the NIPA aggregate, including health care and imputed rent on owner-occupied housing. The age-sex relative consumption profiles for the four periods derived in these calculations are used with period-specific counts of population by age and sex to distribute NIPA values of aggregate household consumption in each of the four periods.

Turning to r_{it}, recall that this variable is the sums of annuitized and nonannuitized resources. We form each of the components of r_{it} separately and then add them together. By annuitized resources we refer to the present value of future labor earnings (human wealth), social security benefits, private and government employee pension benefits, government health care benefits, welfare benefits, and other government transfers; and, as negative annuities, the present value of future taxes. Taxes include labor and capital income taxes, indirect taxes, payroll taxes, and property and other taxes. Nonannuitized resources refer simply to holdings of net wealth.

The computation of cohorts' nonannuitized resources for the four periods involves distributing by age and sex the aggregate value of household net wealth for each year, and then averaging over the years defining the four periods. The computation of each component of annuitized resources is more involved. First, for each year between 1960 and 1993 the national aggregate for a particular type of payment (or receipt) is distributed by age and sex, according to the cross-sectional age-sex relative profile that is applicable to that payment (or receipt). For example, aggregate 1965 social security benefits are distributed according to the age-sex relative profile for these benefits in 1965. This yields per capita estimates of the payment (or receipt) by age and sex for that year. The per capita annuity values for years after 1993 are estimated by either distributing projected aggregate payments (or receipts) according to the latest available cross-sectional relative profile, or assuming that age- and sex-specific per capita values, respectively, equal those in 1993 or some later year, except for an adjustment for productivity growth.

Second, for each generation in a given year t, the present value of all future per capita payments of a particular type (for example, indirect tax payments) is computed by multiplying these future per capita payments by the generation's projected population in the relevant years, discounting these values back to year t, and dividing the sum of the discounted values by the number of members of the generation alive in the base year. This method produces actuarially discounted per capita present values of the particular payment (or receipt) for each generation alive in year t. We consider three pretax real discount rates: 3 percent, 6 percent (our base case), and 9 percent.[14]

As an example of this method for calculating the different components of annuitized resources, consider our estimate of human wealth (HW). The formula for human wealth in year t for individuals of sex x born in year k (HW^x_{tk}) is

$$(5) \qquad HW^x_{tk} = \frac{1}{P^x_{tk}} \sum_{s=t}^{k+D} e^x_{sk} P^x_{sk} R^{s-t},$$

where e^x_{sk} stands for the average earnings in year s of a member of the generation born in year k and of sex x; P^x_{sk} is the population in year s of the same sex-specific generation; $R = 1/(1 + r)$, where r is the rate of interest; and D is the maximum age of life. The calculation of e^x_{sk} is given by

14. These rates bracket the pretax real rate of return observed, on average, between 1961 and 1992, where the rate of return in year t is calculated as $[(NW_t - E_t - P_t + C_t + T_t)/NW_{t-1}] - 1$, such that NW_t is household net worth in period t; E_t is aggregate labor income, excluding contributions to private pension funds; P_t is pension income, including private pensions, government employee pensions, workers' compensation, and veterans' benefits; C_t is personal consumption expenditure; and T_t is aggregate net tax payments.

(6) $$e^x_{sk} = \frac{d^x_{sk} E_s}{\sum_{s=t}^{k+D} (d^m_{sk} P^m_{sk} + d^f_{sm} P^f_{sk})} .$$

In equations 5 and 6, E_s is aggregate labor earnings in year s, and d^x_{sk} is the ratio in year s of the average earnings of the generation born in year k and of sex x to the average earnings of our reference group—those who were aged forty in year s (that is, those for whom $k = s - 40$).

The construction of relative profiles by age and sex (d^x_{tk}) is described by the following equations:

(7) $$j^x_{sk} = \frac{\sum_{i=1}^{N^x_{sk}} w^x_{ski} j^x_{ski}}{\sum_{i=1}^{N^x_{sk}} w^x_{ski}} ,$$

and

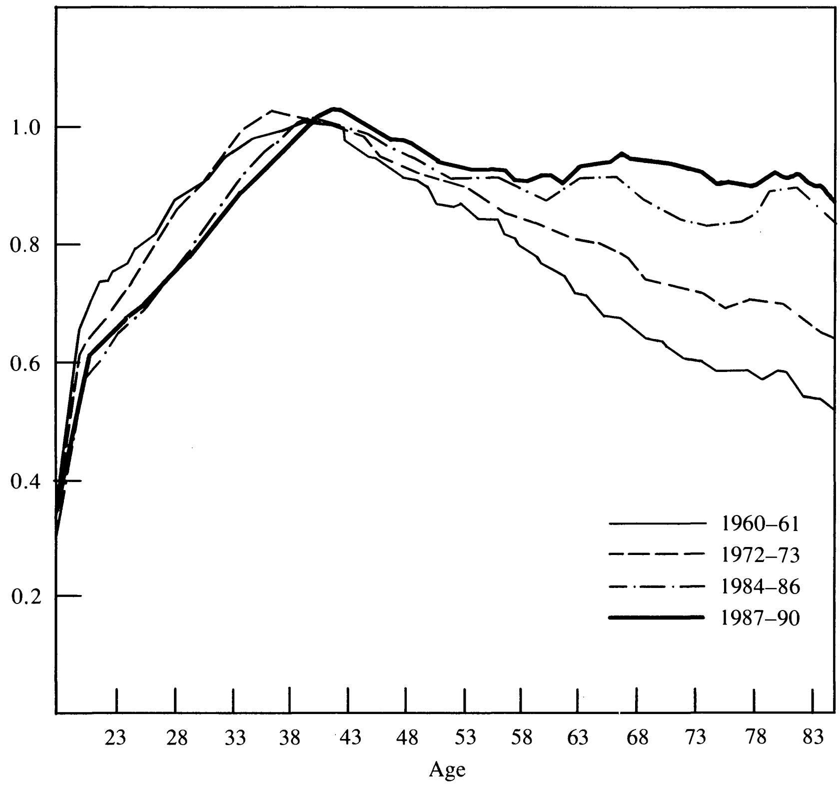
(8) $$d^x_{sk} = \frac{j^x_{sk}}{j^m_{s,s-40}} .$$

In equation 7, j^x_{sk} is the weighted average (across cohort members indexed by i) of labor income; N^x_{sk} is the number of observations in year s of individuals of sex x born in year k; j^x_{ski} is the wage and salary income in year s of the i-th individual of sex x who was born in year k; and w^x_{ski} is the person weight of this observation. Equation 8 shows the calculation for year s of the average labor income of members of the generation of sex x born in year k, relative to that of contemporaneous forty-year-old males.

The national aggregates used in these calculations come from the National Income and Product Accounts, the Federal Reserve System's Flow of Funds (FOF), the American Council of Life Insurance (ACLI), the Current Population Survey, and the Survey of Current Business (SCB). The sources for cross-sectional relative profiles are the CPS, the Survey of Income and Program Participation (SIPP), the Consumer Expenditure Survey, the Survey of Consumer Finances (SCF), the Social Security Administration's Annual Statistical Supplement (SSAASS), and the Health Care Financing Administration (HCFA).

Figure 1. Relative Total Consumption Profiles

Index, 40-years-old = 1



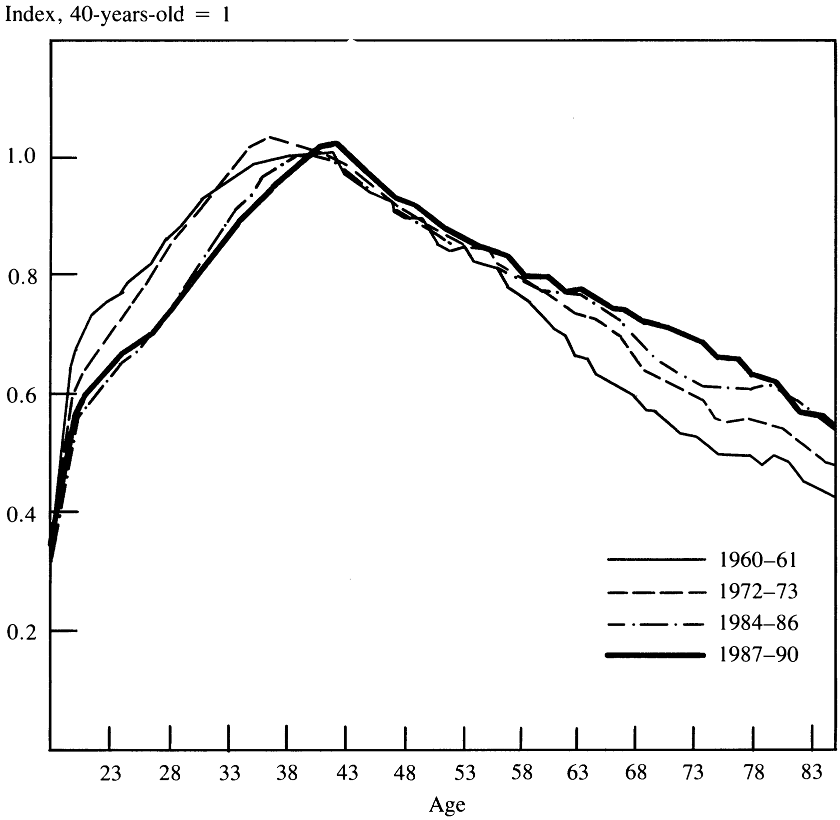
Source: Authors' calculations, based on the CEX.

The computations also use the historic and projected population counts of the Social Security Administration (SSA).

Looking at the Data

Before decomposing the changes in the U.S. saving rate during the postwar period, it is worth looking at some of the data that we have constructed. Tables 3 and 4 present the average values of consumption, resources, and the components of resources for males and females

Figure 2. Relative Nonmedical Consumption Profiles



Source: Authors' calculations, based on the CEX.

within ten-year age groups in each of the four periods under consideration (1960–61, 1972–73, 1984–86, and 1987–90).

To start with consumption, figure 1 presents cross-sectional relative age-consumption profiles for total consumption in each of the four periods. Figure 2 does the same for nonmedical consumption alone. The periods are based on the availability of CEX data. For each period, the average consumption of forty-year-olds is normalized to one.

The figures document a remarkable increase in the relative consumption of the elderly. This increase is more pronounced if medical care is included in the measure of consumption, but the increase in the relative

Table 3. Consumption, Total Resources, and Components of Resources, Males
Population weighted averages in thousands of 1993 dollars

	Age group								
Measure and period	*20–29*	*30–39*	*40–49*	*50–59*	*60–69*	*70–79*	*80–89*	*20–89*	*65–89*
Consumption									
1960–61	12.0	15.2	15.6	14.0	11.5	9.4	8.8	13.5	9.9
1972–73	14.8	19.7	20.3	18.8	16.9	14.9	14.0	17.6	15.3
1984–86	15.3	20.6	23.6	22.2	21.7	20.0	21.5	20.0	20.9
1987–90	16.6	21.4	25.4	23.7	23.9	23.4	23.1	21.6	23.7
Percent change[a]	37.7	41.4	62.7	69.6	108.2	148.3	163.8	60.2	138.8
Total resources									
1960–61	269.6	273.4	259.9	224.1	178.6	142.0	103.4	239.6	146.8
1972–73	316.4	338.9	335.2	307.9	255.8	201.1	130.0	304.8	205.3
1984–86	349.5	379.2	394.9	379.3	339.9	259.7	141.3	356.4	265.6
1987–90	364.5	393.6	410.0	399.3	362.3	281.3	154.6	373.6	286.0
Percent change[a]	35.2	44.0	57.8	78.2	102.8	98.1	49.5	55.9	94.8
Human wealth									
1960–61	358.7	315.7	238.5	140.5	48.7	11.3	4.5	224.8	17.5
1972–73	425.6	395.4	292.9	168.9	53.5	10.2	3.8	275.9	16.8
1984–86	479.2	454.0	354.0	189.7	57.5	11.5	3.8	326.5	18.2
1987–90	499.7	471.8	369.9	200.0	59.8	12.9	4.1	339.8	19.8
Percent change[a]	39.3	49.4	55.1	42.4	22.8	14.8	−7.3	51.1	12.6

Nonhuman wealth									
1960–61	11.8	44.1	81.1	111.3	125.4	118.2	91.8	70.8	118.0
1972–73	13.1	48.9	99.7	141.1	159.7	142.2	88.7	83.4	140.8
1984–86	14.5	50.5	109.1	163.6	185.1	157.0	73.6	87.8	154.5
1987–90	15.5	52.9	113.3	170.8	193.6	164.0	77.0	92.6	161.3
Percent change[a]	31.2	20.2	39.7	53.5	54.4	38.8	−16.1	30.8	36.7
Pension wealth									
1960–61	15.8	20.5	21.7	17.6	14.0	9.5	4.8	17.6	10.3
1972–73	18.2	26.4	36.9	39.5	29.3	18.6	12.1	27.9	20.5
1984–86	19.3	29.0	44.5	62.1	60.1	35.2	18.6	36.9	40.0
1987–90	20.0	29.6	45.3	65.3	65.4	41.0	21.6	39.1	45.4
Percent change[a]	26.8	44.4	108.9	270.5	367.0	331.4	352.5	122.1	339.7
Generational account									
1960–61	116.7	106.9	81.4	45.3	9.5	−3.0	−2.3	73.6	−0.9
1972–73	140.5	131.8	94.3	41.6	−13.3	−30.1	−25.3	82.4	−27.2
1984–86	163.4	154.2	112.6	36.1	−37.2	−55.9	−45.3	94.8	−52.8
1987–90	170.6	160.7	118.5	36.8	−43.5	−63.3	−51.8	97.8	−59.6

Source: Authors' calculations. Cohort per capita consumption numbers are based on the Consumer Expenditure Survey (CEX), the National Medical Expenditure Survey (NMES), and the NIPA. Total resources and the components of resources are based on the Current Population Survey (CPS, March files), the Survey of Consumer Finances (SCF), and the NIPA. The generational account is calculated on the basis of the CPS, the NIPA, unpublished budget projections provided by the U.S. Office of Management and Budget (OMB), and unpublished population projections provided by the Social Security Administration (SSA). See text and appendix A for details.

a. Percent change is calculated from the first period (1960–61) to the last (1987–90).

Table 4. Consumption, Total Resources, and Components of Resources, Females
Population Weighted Averages in Thousands of 1993 Dollars

	Age group								
Measure and period	*20–29*	*30–39*	*40–49*	*50–59*	*60–69*	*70–79*	*80–89*	*20–89*	*65–89*
Consumption									
1960–61	12.7	15.4	14.9	12.9	11.0	9.7	8.7	13.2	9.8
1972–73	15.5	20.6	19.7	17.6	16.2	14.6	13.7	17.4	14.8
1984–86	16.0	21.7	22.3	20.3	20.2	19.5	19.6	19.7	19.8
1987–90	17.2	22.6	24.2	22.3	22.2	22.2	21.8	21.5	22.2
Percent change[a]	35.7	46.8	62.5	72.8	101.8	129.7	149.6	62.6	126.8
Total resources									
1960–61	247.7	255.1	255.4	222.3	166.4	119.3	92.4	223.1	127.0
1972–73	296.3	319.0	323.2	297.3	246.2	181.8	106.3	282.8	183.7
1984–86	346.1	380.7	378.1	357.8	325.4	234.0	105.2	337.8	229.7
1987–90	365.8	399.6	397.5	378.3	346.7	253.2	116.8	357.3	247.3
Percent change[a]	47.7	56.6	55.7	70.2	108.3	112.3	26.4	60.2	94.8
Human wealth									
1960–61	328.1	280.0	204.3	109.9	32.1	5.5	1.2	188.1	9.7
1972–73	394.8	346.9	245.6	130.5	33.7	4.8	1.4	225.2	8.4
1984–86	451.1	418.2	303.5	143.1	37.2	6.1	1.7	272.4	9.5
1987–90	472.2	438.1	322.9	154.1	38.4	6.9	2.1	285.7	10.4
Percent change[a]	43.9	56.5	58.1	40.2	19.7	26.0	79.6	51.9	7.7

Nonhuman wealth									
1960–61	7.1	42.6	91.1	117.1	112.8	99.1	87.7	71.6	101.0
1972–73	12.3	54.7	105.6	138.9	144.4	114.7	65.7	83.9	114.0
1984–86	19.7	65.6	109.1	151.2	167.8	121.7	29.6	88.2	115.3
1987–90	21.4	68.7	113.6	157.9	175.5	126.8	31.0	93.0	119.8
Percent change[a]	202.3	61.4	24.7	34.8	55.5	28.0	−64.7	29.9	18.6
Pension wealth									
1960–61	16.9	22.0	21.8	19.0	14.5	7.3	2.9	18.0	8.6
1972–73	19.1	28.6	38.8	38.1	28.3	16.3	7.5	27.9	17.6
1984–86	20.7	31.2	47.0	61.4	52.4	28.5	16.0	36.7	31.1
1987–90	21.4	31.9	47.9	64.3	57.3	32.2	17.9	38.7	35.0
Percent change[a]	26.4	45.0	119.9	238.9	296.4	341.5	526.8	115.7	305.7
Generational account									
1960–61	104.4	89.4	61.8	23.7	−7.1	−7.4	−0.7	54.5	−7.7
1972–73	129.9	111.3	66.8	10.1	−39.8	−46.0	−31.6	54.2	−43.6
1984–86	145.4	134.2	81.5	−2.1	−68.1	−77.6	−57.9	59.5	−73.8
1987–90	149.1	139.1	86.9	−2.0	−75.5	−87.2	−65.9	60.1	−82.2

Source: Authors' calculations, using the data sources for table 3.
a. Percent change is calculated from the first period (1960–61) to the last (1987–90).

consumption of nonmedical goods and services is also striking. Figure 3 depicts the size of housing, medical, and other consumption for selected cohorts during the periods 1960–61 and 1987–90. The first two panels of figure 3 show these components in constant 1993 dollars. Consumption of all three was greater in the late 1980s than in the early 1960s. The third and fourth panels show the shares of the three components. They demonstrate that the share of medical consumption was significantly larger for all cohorts in the later period. For elderly cohorts, the increase in the share of medical consumption was accompanied by a decline in the shares of both housing and other consumption between the early 1960s and the late 1980s.

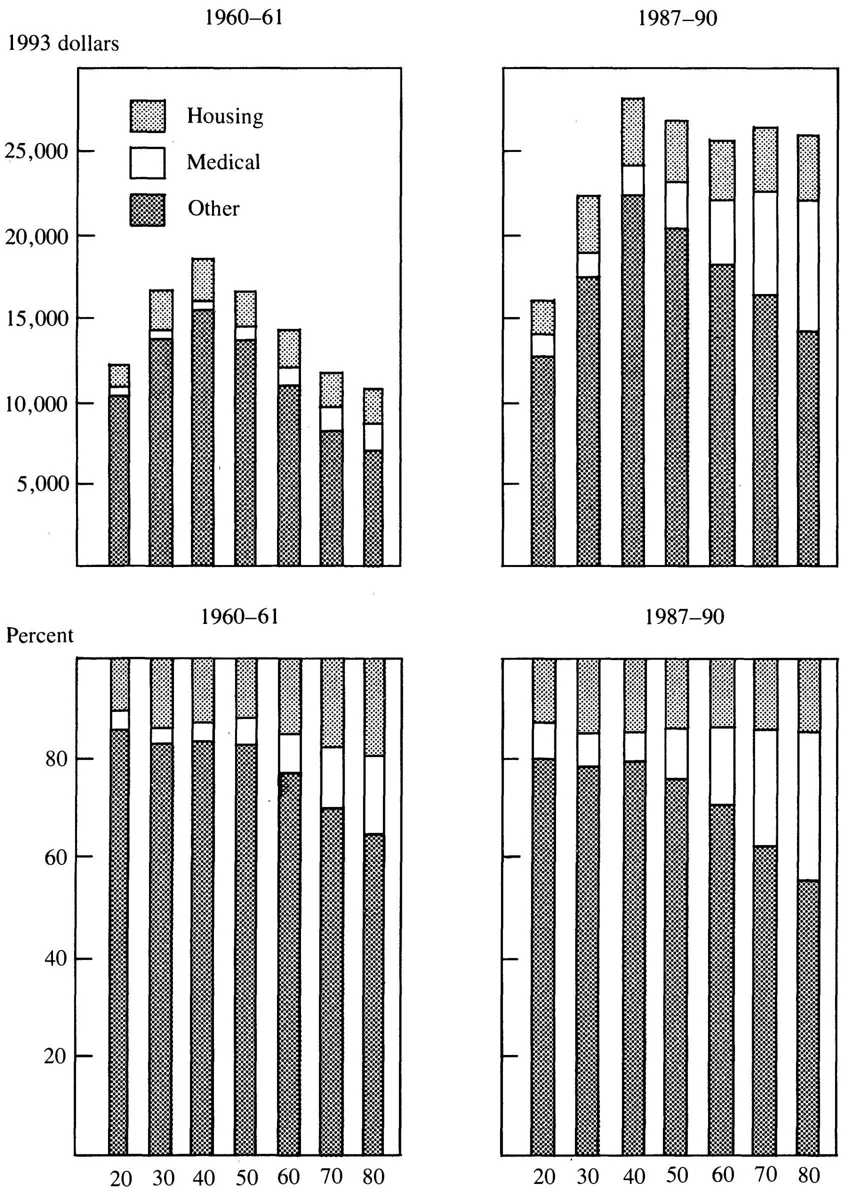
Table 5 examines some of the numbers underlying figures 1 and 2. It reports the ratio of the average level of total, as well as nonmedical, consumption of sixty-, seventy-, and eighty-year-olds to the respective levels of twenty-, thirty-, and forty-year-olds for each of the four periods. Table 5 shows that in 1960–61 seventy-year-olds consumed only 71 percent of the amount consumed by thirty-year-olds, whereas over the period 1987–90 their consumption exceeded that of thirty-year-olds by 18 percent. In the case of nonmedical consumption, seventy-year-olds consumed only 63 percent of the amount consumed by thirty-year-olds in 1960–61, compared with 91 percent over the period 1987–90. The increase in consumption of the elderly relative to other age groups has been equally dramatic.

Another way to summarize the increase in the relative consumption of the elderly is in terms of their share of total household consumption. In the early 1960s the elderly (those aged sixty-five and over) accounted for 10.6 percent of U.S. household consumption and 14.1 percent of the U.S. population. By the late 1980s, they accounted for 17.8 percent of total household consumption and 16.4 percent of the total population. Based on demographics alone, the elderly's share of consumption should have risen by 16.3 percent; instead, it rose by 67.9 percent.

This striking increase in the relative consumption of the elderly has coincided with an equally remarkable increase in their relative resources. Figure 4 depicts changes in the age distribution of resources (r_{it}/r_t) across the four periods.[15] Table 6 presents ratios of the average

15. The kinks at age eighty in figure 4 reflect our method of imputing relative nonhuman wealth for individuals of this age and above. The small number of observa-

Figure 3. Composition of Total Consumption, by Age



Source: Authors' calculations, based on the CEX.

Table 5. Consumption of the Elderly Relative to the Young
Ratio

Age comparison and type of consumption	*1960–61*	*1972–73*	*1984–86*	*1987–90*
Total				
Age 60/age 20	1.17	1.37	1.58	1.59
Age 70/age 20	0.97	1.21	1.56	1.64
Age 80/age 20	0.89	1.16	1.61	1.60
Age 60/age 30	0.86	0.93	1.09	1.15
Age 70/age 30	0.71	0.82	1.07	1.18
Age 80/age 30	0.65	0.79	1.11	1.16
Age 60/age 40	0.77	0.83	0.87	0.91
Age 70/age 40	0.64	0.73	0.86	0.94
Age 80/age 40	0.58	0.70	0.89	0.92
Nonmedical				
Age 60/age 20	1.11	1.28	1.43	1.42
Age 70/age 20	0.86	1.04	1.22	1.28
Age 80/age 20	0.75	0.91	1.16	1.11
Age 60/age 30	0.81	0.86	0.97	1.02
Age 70/age 30	0.63	0.70	0.83	0.91
Age 80/age 30	0.55	0.61	0.78	0.80
Age 60/age 40	0.73	0.78	0.77	0.80
Age 70/age 40	0.57	0.63	0.66	0.72
Age 80/age 40	0.49	0.55	0.62	0.63

Source: Authors' calculations, based on the CEX and the NMES. See text and appendix A for details.

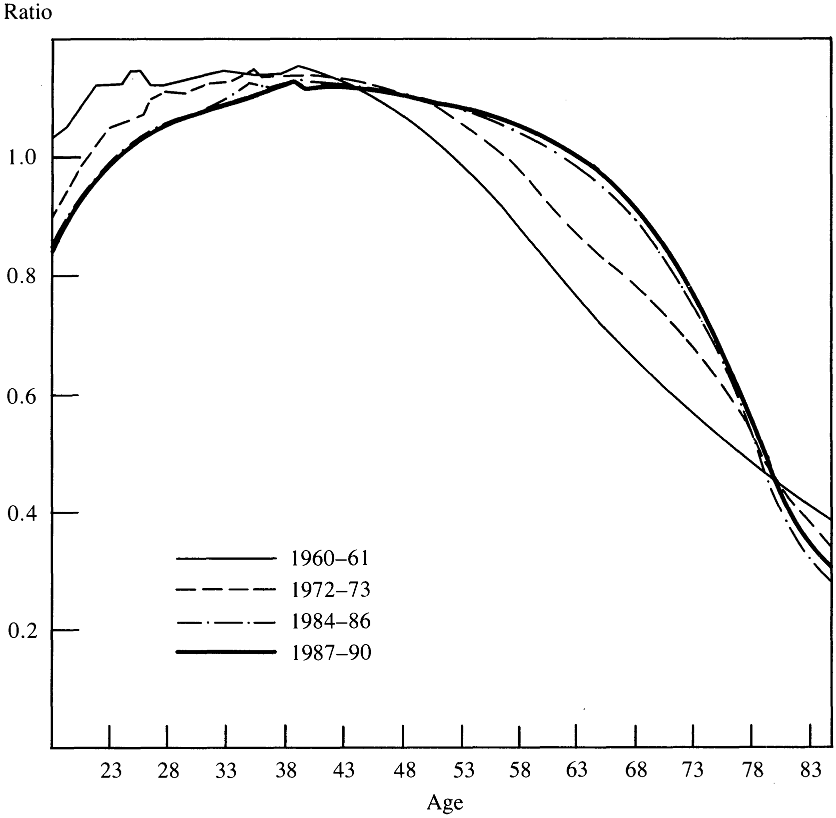
resources of sixty-, seventy-, and eighty-year-olds to those of twenty-, thirty-, and forty-year-olds. In 1960–61 the average resources of seventy-year-olds were only 55 percent as large as those of thirty-year-olds. In 1987-90 they were 81 percent as large. The resources of other older cohorts have also grown significantly, relative to those of younger cohorts, over the past three decades.

Figures 5 through 8 show the components of r_{it}/r_t: the human wealth ratio (hw_{it}/r_t), nonhuman wealth ratio (nhw_{it}/r_t), pension wealth ratio (pw_{it}/r_t), and generational account ratio (ga_{it}/r_t).[16] Figure 5 indicates a

tions at these ages in the Survey of Consumer Finances precludes forming separate estimates of average nonhuman wealth at these ages. Here, we assume that the relative nonhuman wealth of those aged eighty or above equals that of eighty-year-olds of the same sex.

16. Note that our base case calculations assume a 1.2 percent annual growth of labor productivity after 1993, and a discount rate of 6 percent.

Figure 4. Ratio of Cohort Resources Per Capita to Total Resources Per Capita



Source: Authors' calculations, using the data sources for table 5.

sizable decline in the human wealth ratio for young cohorts across the four periods. Indeed, this decline accounts for most of the overall decline in r_{it}/r_t for young cohorts. The reduction in the ratio of human wealth to resources at these ages is the result of a low projected rate of labor income growth compared to that of the 1960s and early 1970s. Figure 6 shows profiles of the ratio of nonhuman wealth to resources for the four periods. Although this ratio falls for all cohorts over age thirty-three, it falls relatively more for the oldest age groups. Figure 7 presents the ratio of pension wealth to resources for each of the four periods. As indicated, cohorts at preretirement ages experienced espe-

Table 6. Resources of the Elderly Relative to the Young[a]
Ratio

Age comparison	*1960–61*	*1972–73*	*1984–86*	*1987–90*
Age 60/age 20	0.79	0.97	1.10	1.13
Age 70/age 20	0.58	0.78	0.92	0.95
Age 80/age 20	0.43	0.49	0.48	0.50
Age 60/age 30	0.74	0.85	0.95	0.97
Age 70/age 30	0.55	0.67	0.79	0.81
Age 80/age 30	0.40	0.42	0.41	0.43
Age 60/age 40	0.73	0.82	0.90	0.93
Age 70/age 40	0.54	0.66	0.74	0.78
Age 80/age 40	0.40	0.41	0.39	0.41

Source: Authors' calculations, based on the CPS (March files), the SCF, the NIPA, unpublished budget projections provided by the OMB, and unpublished population projections provided by the SSA. See text and appendix A for details.
a. Rate of discount is 6 percent.

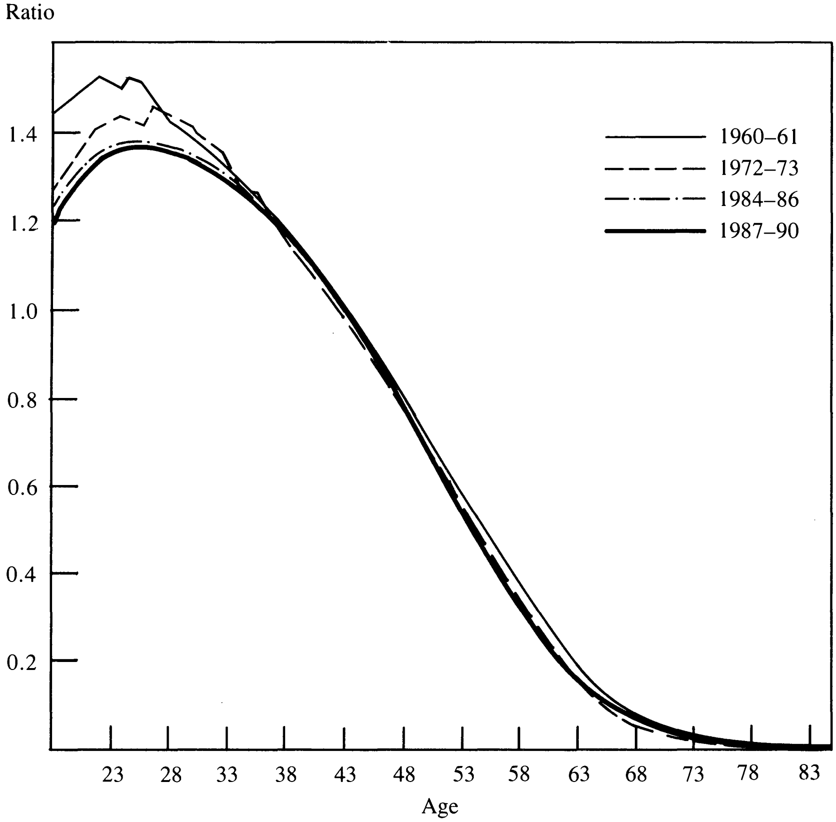
cially rapid growth in pension wealth over the last three decades. The increase in pw_{it}/r_t accounts for a sizable part of the overall increase in r_{it}/r_t for these cohorts.

Figure 8 shows changes over time in the ratio of the generational account to resources. Note that all cohorts experienced declines in ga_{it}/r_t between the early 1960s and late 1980s. However, the decline was much greater for cohorts aged fifty-five and older. In 1960–61, for example, the present value of net transfers to seventy-year-olds amounted to 3 percent of per capita resources. In the late 1980s the corresponding figure was about 22 percent. Changes in the generational account are clearly responsible for most of the rise in the relative resources of the elderly during the postwar period.

Figure 9 graphs age-specific consumption propensities (α_{it}) in the four periods. In each period the propensity to consume is roughly constant for ages up to about sixty, and then rises steadily. There is a local peak between ages thirty-five and forty-five that appears to reflect household expenditures on child rearing. Note that this peak occurs at later ages through time, which is consistent with the trend of parents having their first child at later ages.

The most striking feature of figure 9, however, is the very substantial increase in the consumption propensities of older Americans over time. For example, eighty-year-olds' propensity to consume rose from 8.7 percent in 1960–61 to 13.6 in the period 1987–90. However, there is

Figure 5. Ratio of Cohort Human Wealth Per Capita to Total Resources Per Capita



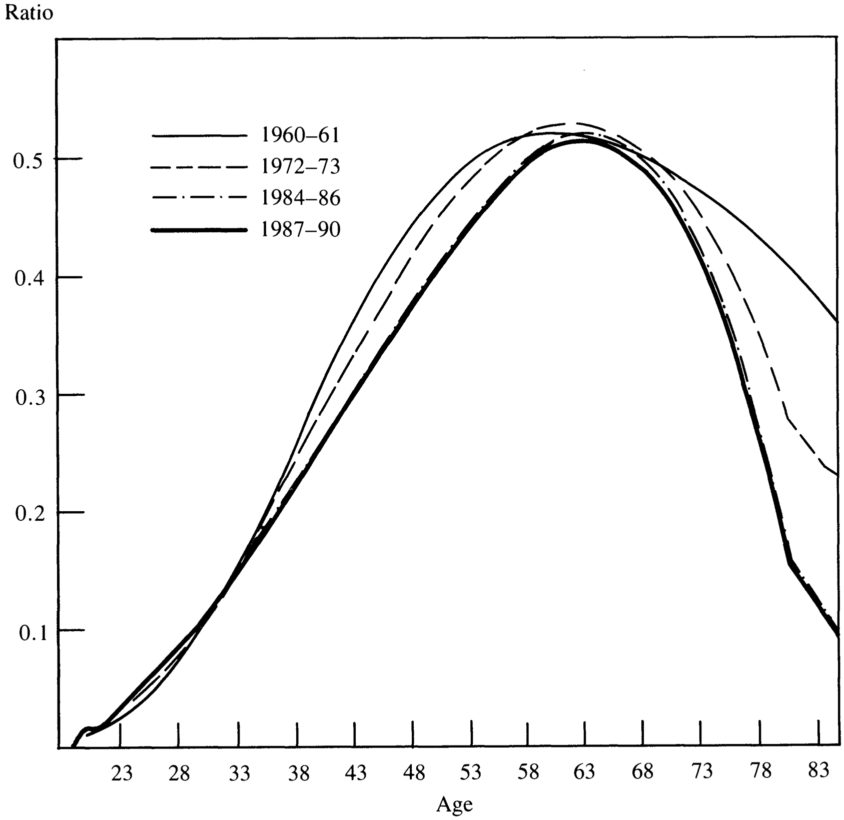
Source: Authors' calculations, based on the CPS and the NIPA.

no corresponding increase in the consumption propensities of the young or the middle-aged.[17]

Returning briefly to the point made above that, unlike propensities to consume out of total remaining lifetime resources that do not change

17. The findings that the consumption propensities of the very old have risen and that those of the young and middle-aged have remained relatively constant are robust to different assumed values of the discount rate. At a discount rate of 3 percent, for example, eighty-year-olds' propensity to consume rises from 8.6 percent in 1960–61 to 12.4 percent in 1987–90. At a discount rate of 9 percent, it rises from 8.9 to 14.9 percent. Detailed consumption propensities by age under alternative discount rate assumptions are available from the authors upon request.

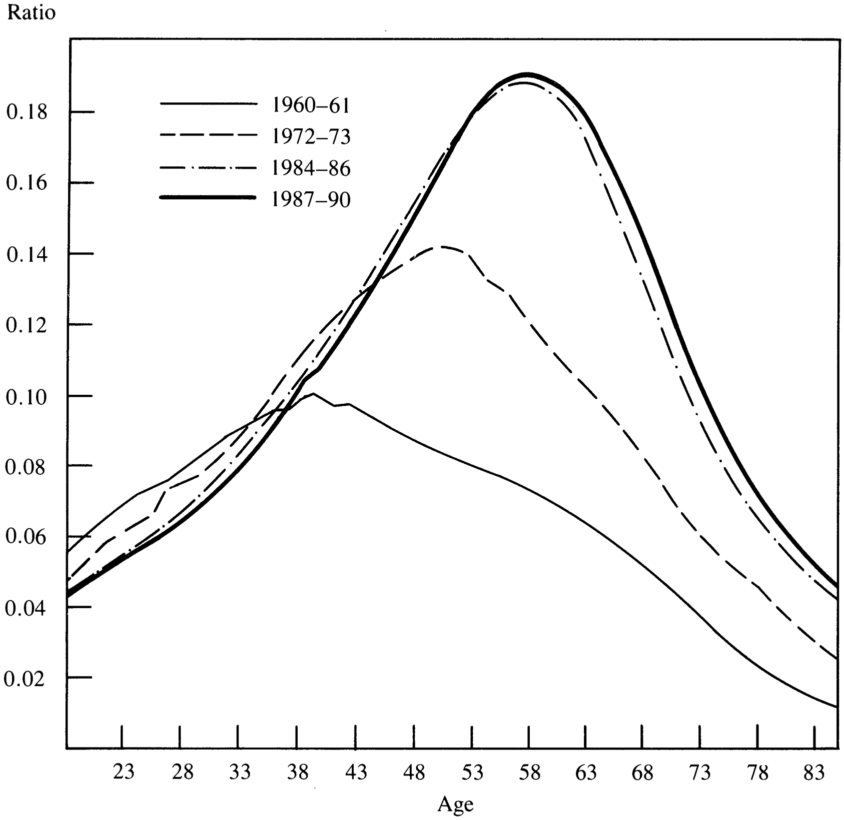
Figure 6. Ratio of Cohort Nonhuman Wealth Per Capita to Total Resources Per Capita



Source: Authors' calculations, based on the SCF and the NIPA.

when government receipts and payments are reclassified, propensities to consume or save out of disposable income are creatures of vocabulary, figure 10 presents propensities to save out of disposable income by age, in the late 1980s, for two different definitions of disposable income. *Conventional* disposable income is the sum of labor income, capital income, and pension income less net taxes. *Alternative* disposable income is almost identical, except that all social security contributions are classified as loans to the government, and all social security benefits are classified as the repayment of principal plus interest on past

Figure 7. Ratio of Cohort Pension Wealth Per Capita to Total Resources Per Capita

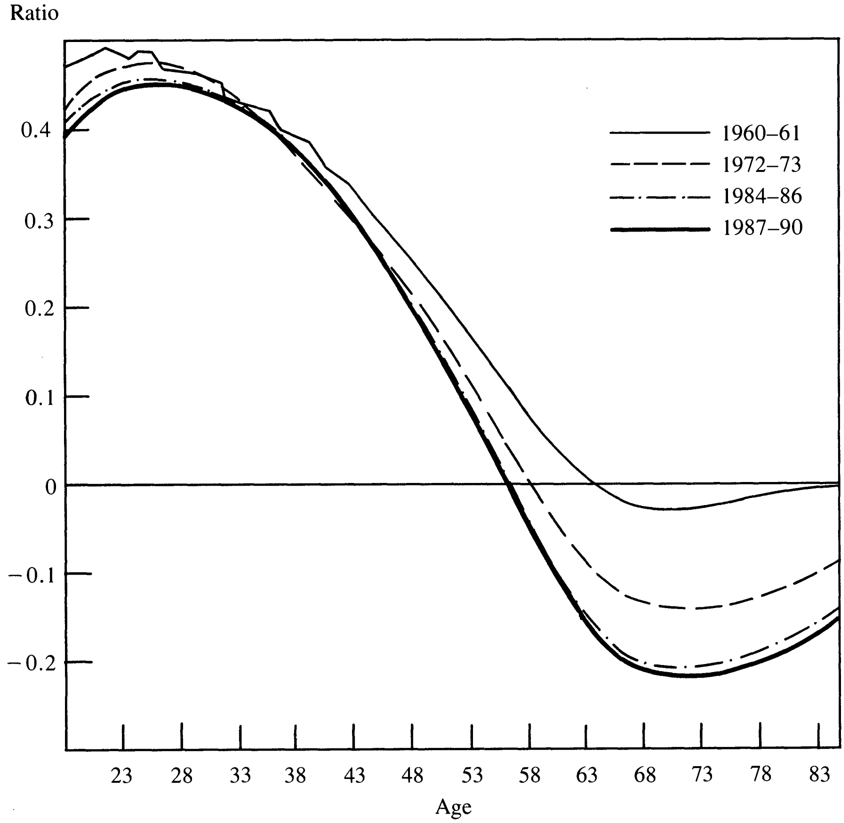


Source: Authors' calculations, based on the data sources for figure 5.

social security loans, less an old age tax.[18] The figure is remarkable in two respects. First, based on the conventional definition, average pro-

18. The old age social security tax is negative (positive) if the social security benefits received by a cohort exceed (are less than) the return of principal plus interest on the cohort's past social security contributions. The calculation assumes that the timing of the payment of this old age tax coincides with the time at which the cohort actually receives social security benefits. For example, if the present value (to age zero) of the old age social security net tax of a generation is 30 percent as large as the present value (to age zero) of its lifetime social security benefits, we assume that each year the generation faces a tax equal to 30 percent of its social security benefits, and otherwise treat payments to and benefits received from social security as equivalent to investing in a financial asset.

Figure 8. Ratio of Cohort Generational Account Per Capita to Total Resources Per Capita

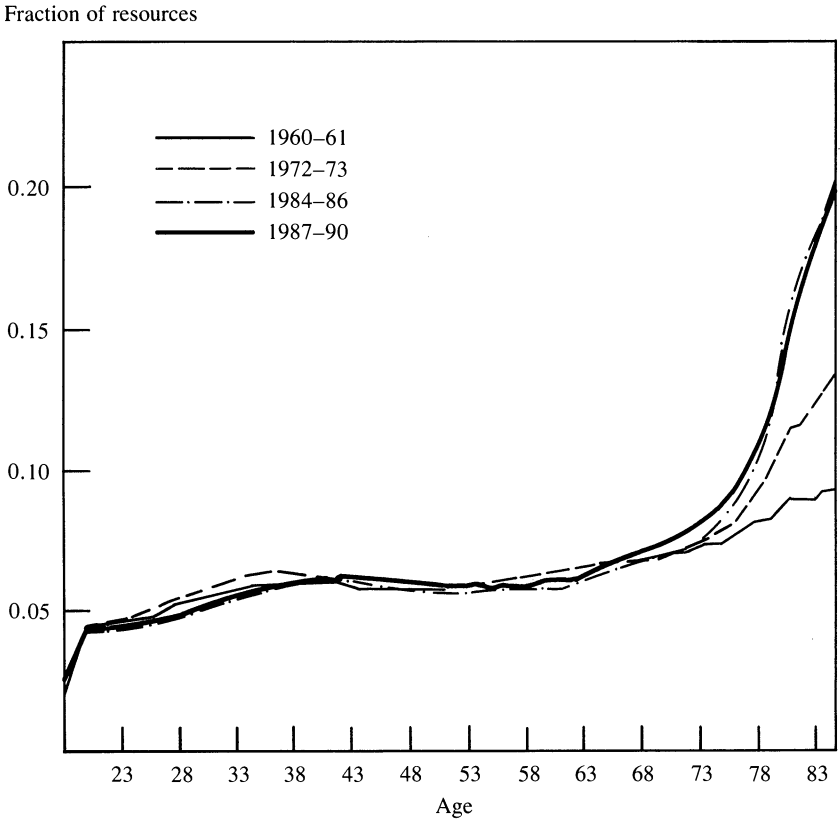


Source: Authors' calculations, based on the CPS, the NIPA, the SCF, and unpublished budget projections from the OMB.

pensities to save are substantially negative for the young and the old.[19] Second, propensities to save are very different for the two definitions of disposable income. Under the conventional definition, for example, both forty- and sixty-five-year-olds have zero propensity to save,

19. The fact that other studies (for example, Bosworth, Burtless, and Sabelhaus, 1991) report positive propensities to save out of disposable income at all ages, notwithstanding their use of conventional classifications, appears to reflect their failure to include all the components of consumption, in particular, medical goods and services.

Figure 9. Average Propensity to Consume out of Total Resources[a]



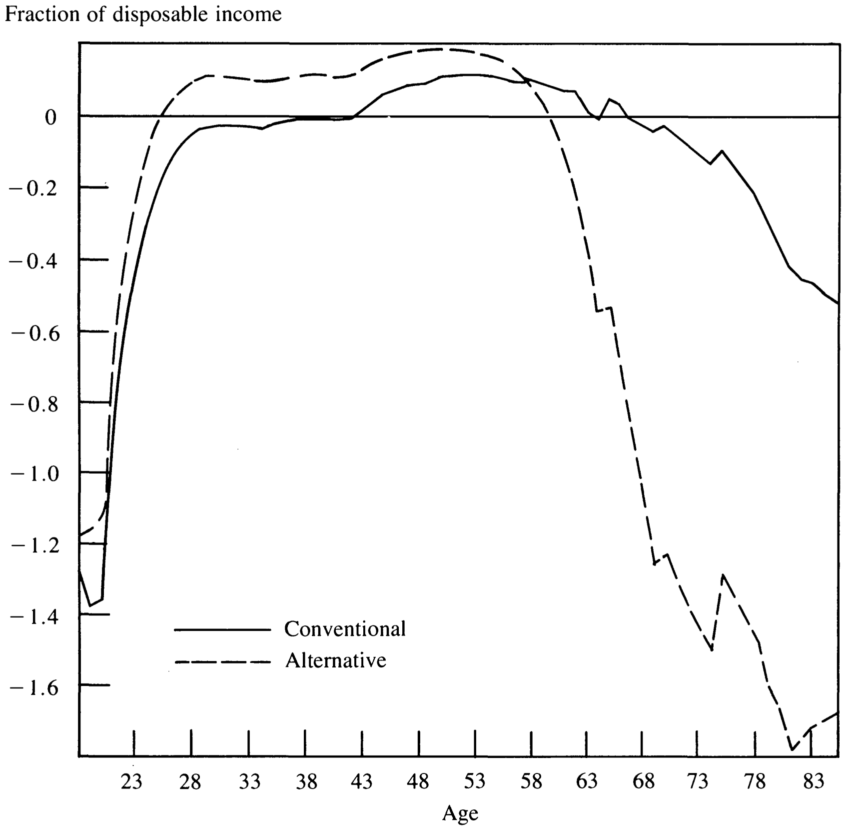
Source: Authors' calculations, using the data sources for table 5.
a. The rate of discount is 6 percent.

whereas under the alternative definition their propensities to save are 13 percent and −75 percent, respectively.

Figure 11 continues the main thread of the paper by showing changes in the age composition of the U.S. population over the four periods. It indicates a small rise in the share of the population over age sixty-five since the early 1960s. It also indicates that compared with the early 1960s, in the late 1980s there were relatively more adults in their twenties and thirties, and relatively fewer adults in their forties and fifties.

Figures 12 through 14 plot longitudinal profiles of labor and pension incomes and net tax flows. Figure 15 plots total nonasset income, com-

Figure 10. Average Propensity to Save Out of Conventional and Alternative Disposable Income, 1987–90

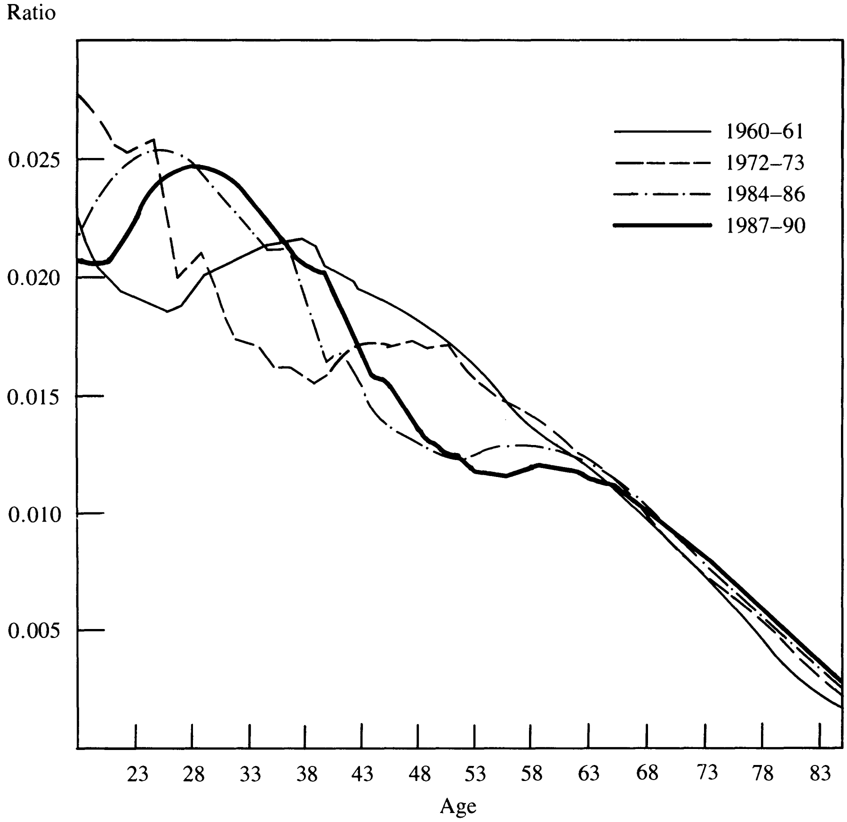


Source: Authors' calculations, using the data sources for tables 5 and 6.

puted as labor plus pension income minus the net tax flow. The profiles are shown for cohorts at ten-year intervals, beginning with the cohort aged eighteen in 1920. The labor and pension income profiles exhibit the expected hump shapes. Labor incomes peak at middle age and decline sharply at retirement ages. Pension incomes increase steeply at retirement ages.[20] The longitudinal net tax profiles, however, show an

20. Pension incomes include survivor, disability, and retirement benefits from private and government employee pension plans, workers' compensation, and veterans' benefits.

Figure 11. Ratio of Cohort Population to Total Population



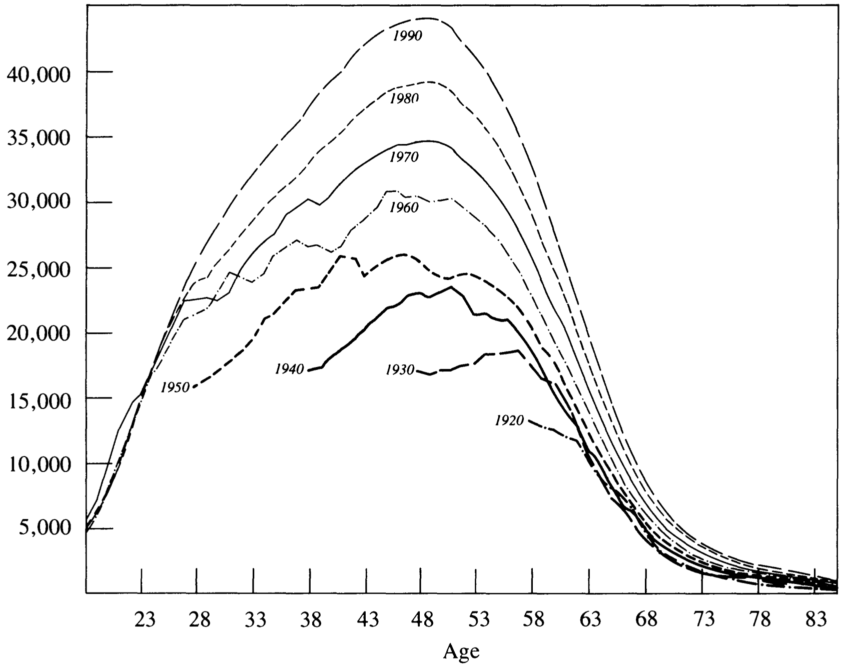
Source: Unpublished data provided by the SSA.

interesting pattern. Generations that reach middle ages later in time pay substantially more in net taxes than those that reached these ages earlier. However, cohorts that retire later in time receive substantially greater net benefits from the government than do those that retired earlier.

The total nonasset income profiles are dominated by labor income during youth and middle age. After retirement, however, they are dominated by higher pension incomes and negative net taxes. As a result, nonasset incomes rise sharply at retirement and continue on an upward course thereafter. As was true for those who retired in the 1940s, 1950s, and 1960s, future retirees will receive nonasset incomes that are higher

Figure 12. Longitudinal Profiles of Labor Income, Selected Cohorts[a]

1993 dollars



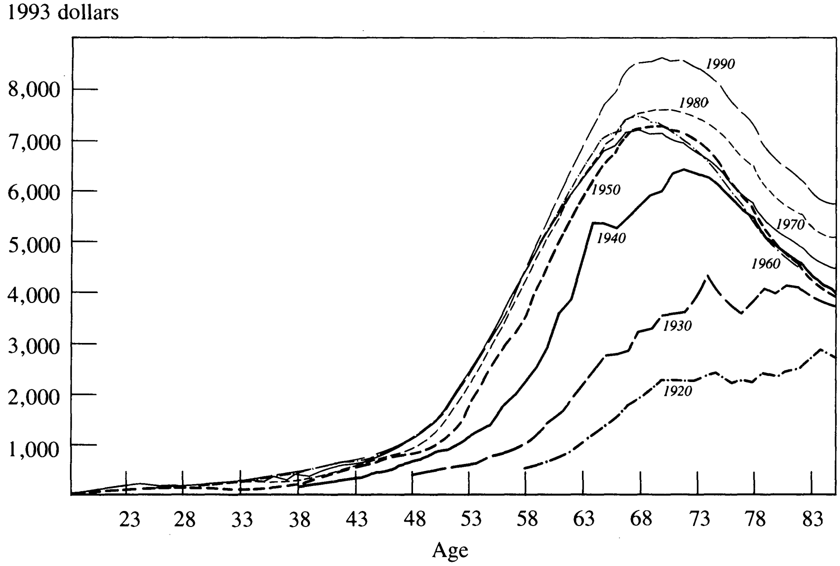
Source: Authors' calculations, based on the data sources for figure 5.
a. Cohorts are determined by the year in which they were aged eighteen.

than their peak nonasset incomes when they were working. This picture differs dramatically from the textbook illustration of life cycle age–nonasset income profiles.

Explaining the Postwar Decline in U.S. Saving

Table 7 examines the effect on U.S. saving of changes in the five factors mentioned above: the age distribution of resources, propensities to consume, the ratio of resources to output, the age distribution of the population, and the rate of government spending. The factors involving

Figure 13. Longitudinal Profiles of Pension Income, Selected Cohorts[a]



Source: Authors' calculations, based on the data sources for figure 5.
a. Cohorts are determined by the year in which they were aged eighteen.

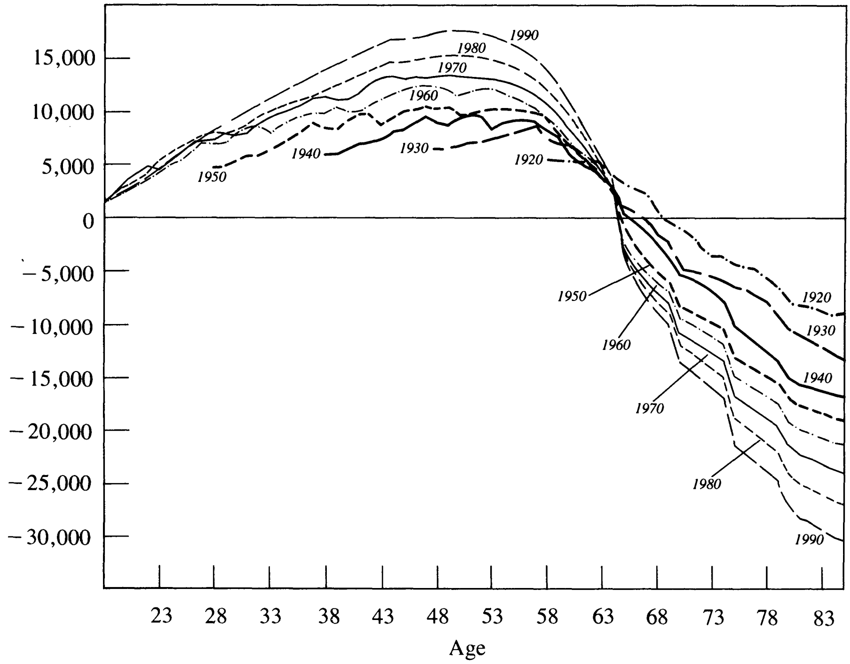
resources and consumption propensities are calculated using a real discount rate of 6 percent.

In each panel of table 7, the numbers along the diagonal are the observed rates of U.S. net national saving in the row period. The other numbers indicate the saving rate that would have been observed in the row period, had the specified saving factor taken its value from the column period.

The counterfactual analysis undertaken here is partial-equilibrium in nature. For example, in asking how much higher U.S. saving would have been in the late 1980s, had cohort-specific consumption propensities been the same as those of the early 1960s, we are ignoring other factors that might have changed as a consequence of a change in consumption propensities. The following exercises are meant to convey the potential importance of various determinants of saving, rather than to indicate precisely what the U.S. saving rate would have been if the world had evolved differently.

Figure 14. Longitudinal Profiles of the Generational Account, Selected Cohorts[a]

1993 dollars



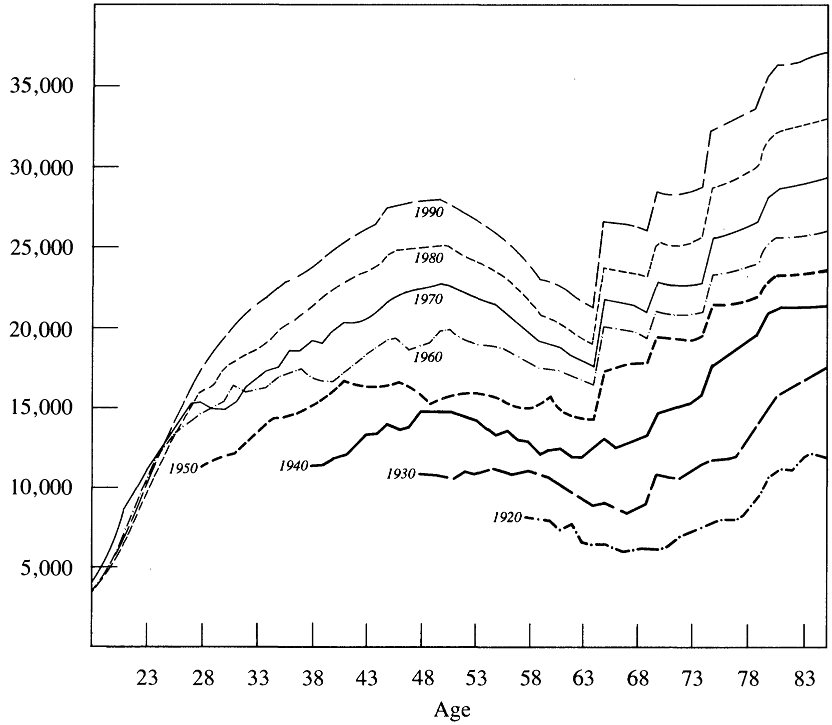
Source: Authors' calculations, based on the data sources for figure 8.
a. Cohorts are determined by the year in which they were aged eighteen.

Changes in the Age-Resource Distribution

The first panel of table 7 shows the effect on the U.S. saving rate of changes over time in the age distribution of resources. The first number in the last row (4.97) is the saving rate that, ceteris paribus, would have been observed in 1987–90, had the age-resource distribution of 1960–61 prevailed during this period. Since the actual saving rate observed in 1987–90 is 3.38 percent, the saving rate would have been 47 percent higher had the age-resource distribution of the late 1980s been that of the early 1960s. Comparison of the last number in the first row of the first panel of table 7 (5.53) with the actual saving rate in 1960–61 (7.85), provides another way to assess the importance of the change in the age-resource distribution. It shows that the saving rate would have been 30 percent lower if the age-resource distribution had changed as

Figure 15. Longitudinal Profiles of Nonasset Income, Selected Cohorts[a]

1993 dollars



Source: Authors' calculations, based on the data sources for table 6.

a. Nonasset income is labor income plus pension income less net tax flow. Cohorts are determined by the year in which they were aged eighteen.

it did over the three decades, but everything else had remained as it was in 1960–61. The finding that the shift in the age-resource distribution contributed to a decline in the national saving rate is robust to alternative discount rate assumptions.[21]

The changes in the age-resource profile observed between the late 1980s and the early 1960s did not occur overnight. Figure 4 points this out, and table 7 shows that the shifting age-resource distribution has been responsible for a steady decline in the U.S. national saving rate.

21. This result is sustained under the alternative discount rate assumptions of 3 and 9 percent. The results from all the counterfactual experiments under these alternative discount rates are available from the authors upon request.

Table 7. The Effect on the Net National Saving Rate of Counterfactual Factor Values[a]
Percent

Factor and period of counterfactual saving rate	Period of counterfactual factor value			
	1960–61	*1972–73*	*1984–86*	*1987–90*
Age-resource distribution (r_i/r)				
1960–61	7.85	6.21	5.54	5.53
1972–73	11.10	9.87	9.42	9.37
1984–86	5.87	4.72	4.51	4.38
1987–90	4.97	3.74	3.51	3.38
Consumption propensity (α_i)				
1960–61	7.85	5.01	8.45	6.85
1972–73	12.49	9.87	12.86	11.22
1984–86	4.04	0.98	4.51	2.80
1987–90	4.85	1.73	5.06	3.38
Age distribution (P_i/P)				
1960–61	7.85	9.60	9.01	8.57
1972–73	7.97	9.87	9.23	8.69
1984–86	2.93	4.89	4.51	3.85
1987–90	2.44	4.24	4.01	3.38
Resources-to-output ratio (R/Y)				
1960–61	7.85	11.84	4.33	5.42
1972–73	5.75	9.87	2.11	3.24
1984–86	8.03	12.01	4.51	5.60
1987–90	5.90	10.01	2.26	3.38
Government spending rate (G/Y)				
1960–61	7.85	8.16	8.03	8.27
1972–73	9.57	9.87	9.74	9.98
1984–86	4.33	4.64	4.51	4.75
1987–90	2.96	3.27	3.14	3.38
Addendum	*1960–61*	*1972–73*	*1984–86*	*1987–90*
Actual ratios[b]				
R/Y	12.53	11.82	13.15	12.96
HW/Y	11.45	10.38	11.59	11.31
NHW/Y	3.69	3.20	3.21	3.18
PW/Y	0.95	1.10	1.37	1.36
GA/Y	3.56	2.86	3.02	2.88
G/Y	21.59	21.28	21.41	21.17

Source: Authors' calculations, using the data sources for tables 5 and 6.

a. In each panel except the last, the numbers along the diagonal are the observed rates of net national saving in the row period. The other numbers indicate the saving rate that would have been observed in the row period if the specifed saving factor had taken its value from the column period.

b. $R/Y = (HW + NHW + PW - GA)/Y$, where R is total resources, HW is human wealth, NHW is nonhuman wealth, PW is pension wealth, GA is the generational account, and Y is the net national product. G denotes government purchases of goods and services.

Table 8. The Effect on the Net National Saving Rate of Counterfactual Propensities to Consume of the Old and the Young[a]
Percent

Cohort and period[b]	*Period of counterfactual factor value*			
	1960–61	*1972–73*	*1984–86*	*1987–90*
Old				
1960–61	7.85	7.30	6.61	6.28
1972–73	10.52	9.87	9.06	8.70
1984–86	6.22	5.45	4.51	4.03
1987–90	5.74	4.91	3.88	3.38
Young				
1960–61	7.85	5.57	9.69	8.42
1972–73	11.84	9.87	13.67	12.40
1984–86	2.33	0.03	4.51	3.28
1987–90	2.50	0.21	4.57	3.38

Source: Authors' calculations, using the data sources for tables 5 and 6.
a. See table 7, note a for organization of this table.
b. Old cohorts are defined as those aged sixty-five or older and young cohorts as those younger than age sixty-five.

Changes in Average Propensities to Consume

The second panel of table 7 shows the effect on the net national saving rate of changes over time in the average propensities to consume of both young (aged under sixty-five) and old (aged sixty-five and over) cohorts. The last number in the first column (4.85) indicates that, other things equal, the net national saving rate in 1987–90 would have been 43 percent higher had consumption propensities equaled those of 1960–61. This increase in the saving rate is not surprising, given the much larger consumption propensities of elderly cohorts in 1987–90 that are displayed in figure 9. However, the result that changing consumption propensities contributed to the decline in the national saving rate is not robust to the choice of the discount rate: at 3 percent, substituting the consumption propensities of 1960–61 for those of 1987–90 produces a lower saving rate (2.55).

Table 8 decomposes these changes in saving into those due to changes over time in the consumption propensities of the young and of the old. The first panel of table 8 shows the effect on saving rates of changing the consumption propensities of older generations. Had only the consumption propensities of older generations remained at their level in 1960–61, the saving rate would have been 5.74 percent in 1987–90, instead of 3.38 percent. The conclusion that sharp increases in older generations' propensities to consume are partly responsible for the decline in national saving is sustained under alternative rates of discount.

The second panel of table 8 shows that replacing the consumption propensities of younger generations in 1987–90 with their values in 1960–61 would actually slightly lower the saving rate—from 3.38 percent to 2.50 percent. The somewhat higher consumption propensities of those in their twenties and early thirties in the early 1960s, compared with the late 1980s, is responsible for this result. This finding is strengthened if one discounts at 3 percent, but reversed if one discounts at 9 percent.

Changes in the Age Distribution of the Population

The third panel of table 7 shows the effect on U.S. saving rates of changes over time in the age composition of the population. As indicated, had the age distribution of the population in 1960–61 prevailed in 1987–90, the U.S. saving rate would have been 2.44 percent, rather than 3.38 percent. This result can be understood by recalling that the propensity to consume rises with age and, as shown in figure 11, that the age distribution of the early 1960s featured relatively more middle-aged individuals and relatively fewer younger individuals than did the age distribution of the late 1980s.

These results are independent of the choice of discount rate. To see why, note that the product $\alpha_{it}(r_{it})$ in equation 3 equals the per capita consumption of cohort i in year t, which is the same regardless of how one decomposes this quantity between α_{it} and r_{it}. Further, R_t/r_t equals P_t, which is also independent of the discount rate. Hence the effect of changes in the ratio P_{it}/P_t on the national saving rate will be the same for all discount rates.

Changes in the Ratio of Resources to Output

Values of R_t/Y_t and its components for the four periods are reported in the bottom of panel of table 7. This ratio rises over time, from 12.53 in the early 1960s to 12.96 in the late 1980s. As the table shows, the principal reason for the rise is the decline in the ratio of aggregate generational accounts to income (GA_t/Y_t). In other words, the government's redistribution of resources from future to living generations is the main reason for the increase in the resources-to-income ratio.

Recall that, ceteris paribus, a higher ratio of resources to output means a higher rate of consumption out of net national income and a lower net national saving rate. The fourth panel of table 7 shows the effect of changes over time in the resources-to-output ratio (R_t/Y_t). The number in the last row of the first column number (5.90) indicates that saving rates would have been 75 percent higher if the 1960–61 ratio had prevailed in 1987–90. The number in the first row of the last column (5.42) shows that if the 1987–90 ratio had prevailed in 1960–61, the saving rate would have been one-third smaller. The magnitude (but not the sign) of the effect on saving of the increase in the resources-to-output ratio is sensitive to the choice of discount rate.[22]

Changes in the Government Spending Rate

The fifth panel of table 7 considers how changes in the government spending rate (G_t/Y_t) have affected national saving. As reported in the bottom panel of table 7, this rate fell slightly, from 21.6 percent in 1960–61 to 21.2 percent in 1987–90. Had G_t/Y_t taken its 1960–61 value in 1987–90, the U.S. saving rate would have been 12 percent smaller; that is, the change in the rate of government spending during the last three decades was not responsible for the low rate of national saving in the late 1980s.

The Annuitization of the Elderly's Resources and Their Increased Propensity to Consume

One likely explanation for the postwar increase in the propensity of the elderly to consume is the remarkable increase in the extent to which the elderly's resources are annuitized. Moreover, a significant share of these annuities are medicare and medicaid benefits that are provided in kind, in the form of the consumption of medical goods and services.

The data in tables 9–12 are similar to those reported by Auerbach and others.[23] Tables 9 and 10 decompose total resources into bequeath-

22. Assuming a discount rate of 3 percent yields a saving rate of 7.49 percent when the 1960–61 value of R/Y is substituted for the 1987–90 value; using a 9 percent discount rate produces a saving rate of 4.46 percent.

23. Auerbach and others (1995).

Table 9. Decomposition of Total Resources into Annuitized and Bequeathable Resources, Males
Population weighted averages in thousands of 1993 dollars

Measure and period	Age group 20–29	30–39	40–49	50–59	60–69	70–79	80–89	20–89	65–89
Total resources									
1960–61	269.6	273.4	259.9	224.1	178.6	142.0	103.4	239.6	146.8
1972–73	316.4	338.9	335.2	307.9	255.8	201.1	130.0	304.8	205.3
1984–86	349.5	379.2	394.9	379.3	339.9	259.7	141.3	356.4	265.6
1987–90	364.5	393.6	410.0	399.3	362.3	281.3	154.6	373.6	286.0
Percent change[a]	35.2	44.0	57.8	78.2	102.8	98.1	49.5	55.9	94.8
Annuitized resources[b]									
1960–61	239.8	203.0	153.8	94.2	42.5	19.2	9.9	149.4	23.0
1972–73	281.5	250.3	196.5	138.2	80.7	53.2	39.3	194.1	57.0
1984–86	313.7	282.0	237.7	181.8	138.0	97.6	66.1	237.4	103.7
1987–90	323.6	286.4	240.6	188.9	149.3	111.4	75.7	243.9	116.2
Percent change[a]	35.0	41.1	56.4	100.4	251.0	479.9	660.7	63.2	406.1
Bequeathable resources[c]									
1960–61	29.8	70.5	106.1	129.8	136.1	122.8	93.5	90.2	123.8
1972–73	35.0	88.6	138.8	169.7	175.1	147.8	90.6	110.7	148.3
1984–86	35.8	97.2	157.1	197.5	201.9	162.1	75.2	119.0	161.9
1987–90	40.9	107.3	169.4	210.4	213.0	169.9	78.9	129.8	169.8
Percent change[a]	37.4	52.2	59.7	62.1	56.5	38.4	−15.5	43.9	37.1

Nonhuman wealth									
1960–61	11.8	44.1	81.1	111.3	125.4	118.2	91.8	70.8	118.0
1972–73	13.1	48.9	99.7	141.1	159.7	142.2	88.7	83.4	140.8
1984–86	14.5	50.5	109.1	163.6	185.1	157.0	73.6	87.8	154.5
1987–90	15.5	52.9	113.3	170.8	193.6	164.0	77.0	92.6	161.3
Percent change[a]	31.2	20.2	39.7	53.5	54.4	38.8	−16.1	30.8	36.7
Term value of life insurance									
1960–61	18.0	26.4	24.9	18.6	10.7	4.6	1.6	19.4	5.8
1972–73	21.9	39.7	39.0	28.6	15.4	5.7	1.9	27.3	7.5
1984–86	21.3	46.7	48.1	33.9	16.8	5.1	1.6	31.2	7.3
1987–90	25.4	54.3	56.1	39.6	19.4	5.9	1.9	37.2	8.5
Percent change[a]	41.4	105.7	124.7	113.1	81.7	29.0	16.4	91.3	45.8

Source: Authors' calculations, using the data sources for tables 5 and 6. Life insurance relative profiles by age and sex are based on the SCF, using aggregate life insurance estimates from American Council of Life Insurance, *1993 Life Insurance Fact Book Update* (Washington, 1993).

a. Percent change is calculated from the first period (1960–61) to the last (1987–90).

b. Total resources less bequeathable resources.

c. Nonhuman wealth plus term value of life insurance.

Table 10. Decomposition of Total Resources into Annuitized and Bequeathable Resources, Females
Population weighted averages in thousands of 1993 dollars

	Age group								
Measure and period	*20–29*	*30–39*	*40–49*	*50–59*	*60–69*	*70–79*	*80–89*	*20–89*	*65–89*
Total resources									
1960–61	247.7	255.1	255.4	222.3	166.4	119.3	92.4	223.1	127.0
1972–73	296.3	319.0	323.2	297.3	246.2	181.8	106.3	282.8	183.7
1984–86	346.1	380.7	378.1	357.8	325.4	234.0	105.2	337.8	229.7
1987–90	365.8	399.6	397.5	378.3	346.7	253.2	116.8	357.3	247.3
Percent change[a]	47.7	56.6	55.7	70.2	108.3	112.3	26.4	60.2	94.8
Annuitized resources[b]									
1960–61	221.8	187.7	142.6	90.4	46.1	17.4	3.3	134.5	22.3
1972–73	261.1	227.5	184.5	136.4	91.8	64.2	39.5	175.9	65.7
1984–86	304.5	272.9	228.9	181.5	147.6	110.5	75.2	224.2	111.5
1987–90	318.4	281.8	237.1	191.0	159.7	124.3	85.4	234.2	124.2
Percent change[a]	43.6	50.2	66.3	111.2	246.4	613.0	2449.0	74.1	456.9
Bequeathable resources[c]									
1960–61	25.9	67.4	112.8	131.9	120.3	101.9	89.1	88.6	104.7
1972–73	35.2	91.5	138.7	160.9	154.4	117.6	66.8	106.8	118.0
1984–86	41.6	107.8	149.2	176.4	177.8	123.5	30.0	113.6	118.3
1987–90	47.4	117.8	160.4	187.4	187.0	128.9	31.4	123.1	123.2
Percent change[a]	82.9	74.7	42.2	42.1	55.4	26.6	−64.8	39.0	17.7

Nonhuman wealth									
1960–61	7.1	42.6	91.1	117.1	112.8	99.1	87.7	71.6	101.0
1972–73	12.3	54.7	105.6	138.9	144.4	114.7	65.7	83.9	114.0
1984–86	19.7	65.6	109.1	151.2	167.8	121.7	29.6	88.2	115.3
1987–90	21.4	68.7	113.6	157.9	175.5	126.8	31.0	93.0	119.8
Percent change[a]	202.3	61.4	24.7	34.8	55.5	28.0	−64.7	29.9	18.6
Term value of life insurance									
1960–61	18.9	24.9	21.6	14.8	7.5	2.8	1.3	17.0	3.7
1972–73	22.9	36.7	33.1	22.0	10.0	2.9	1.1	22.9	4.0
1984–86	21.9	42.2	40.1	25.2	10.0	1.8	0.4	25.4	3.0
1987–90	26.1	49.1	46.8	29.5	11.5	2.1	0.4	30.1	3.4
Percent change[a]	38.2	97.4	116.2	99.8	53.0	−25.5	−68.5	77.5	−7.3

Source: Authors' calculations, using the data sources for table 9.

a. Percent change is calculated from the first period (1960–61) to the last (1987–90).

b. Total resources less bequeathable resources.

c. Nonhuman wealth plus term value of life insurance.

able resources and their components, nonhuman wealth and the term value of life insurance, and annuitized resources, which equal the difference between total resources and bequeathable resources. Tables 11 and 12 report these components as a fraction of total resources. The extent of resource annuitization (R^a) is computed as the ratio of annuitized to total resources, that is

$$R^a = 1 - \frac{TERM + NHW}{HW + NHW + PW - GA}, \tag{9}$$

where *TERM* stands for the average term value of life insurance, *HW* stands for average human wealth, *NHW* stands for average nonhuman wealth, *PW* stands for average private pension wealth, and *GA* stands for the generational account.

Table 11 shows that for males aged sixty-five and over, R^a was two-and-a-half times larger in 1990 than it was in 1960, reflecting an increase from 0.16 to 0.41. For elderly females, the increase was even bigger—from 0.18 in 1960 to 0.50 in 1990 (table 12). This larger share of elderly persons' annuitized resources implies an equal and opposite decline in their share of bequeathable resources.

Increased annuitization of resources means that the elderly have less reason to fear that they will run out of resources if they live longer than expected. Consequently, they are likely to choose to consume at a higher rate. As demonstrated by Kotlikoff and Avia Spivak, the availability of annuities can make a great difference to the consumption levels of the elderly, even when the elderly are not very risk averse.[24] For example, according to their simulations, moderately risk-averse elderly persons with no bequest motive, nor any explicit or implicit means of acquiring annuity insurance will, on average, fail to consume a third of their resources before they die.

Assuming that individuals do not have access to annuity insurance, either explicit or implicit, at the margin, they will likely plan to spend down their net wealth to zero and then consume their annuity income. At this point, their average propensity to consume is mechanically determined and is guaranteed to rise with age. This is because consumption equals annuity income, and resources equal the present expected value of annuity income. So the average propensity to consume

24. Kotlikoff and Spivak (1981).

Table 11. Share of Annuitized and Bequeathable Resources in Total Resources, Males

	Age group								
Measure and period	*20–29*	*30–39*	*40–49*	*50–59*	*60–69*	*70–79*	*80–89*	*20–89*	*65–89*
Annuitized resources[a]									
1960–61	0.89	0.74	0.59	0.42	0.24	0.14	0.10	0.62	0.16
1972–73	0.89	0.74	0.59	0.45	0.32	0.26	0.30	0.64	0.28
1984–86	0.90	0.74	0.60	0.48	0.41	0.38	0.47	0.67	0.39
1987–90	0.89	0.73	0.59	0.47	0.41	0.40	0.49	0.65	0.41
Bequeathable resources[b]									
1960–61	0.11	0.26	0.41	0.58	0.76	0.86	0.90	0.38	0.84
1972–73	0.11	0.26	0.41	0.55	0.68	0.74	0.70	0.36	0.72
1984–86	0.10	0.26	0.40	0.52	0.59	0.62	0.53	0.33	0.61
1987–90	0.11	0.27	0.41	0.53	0.59	0.60	0.51	0.35	0.59
Nonhuman wealth									
1960–61	0.04	0.16	0.31	0.50	0.70	0.83	0.89	0.30	0.80
1972–73	0.04	0.14	0.30	0.46	0.62	0.71	0.68	0.27	0.69
1984–86	0.04	0.13	0.28	0.43	0.54	0.60	0.52	0.25	0.58
1987–90	0.04	0.13	0.28	0.43	0.53	0.58	0.50	0.25	0.56
Term value of life insurance									
1960–61	0.07	0.10	0.10	0.08	0.06	0.03	0.02	0.08	0.04
1972–73	0.07	0.12	0.12	0.09	0.06	0.03	0.01	0.09	0.04
1984–86	0.06	0.12	0.12	0.09	0.05	0.02	0.01	0.09	0.03
1987–90	0.07	0.14	0.14	0.10	0.05	0.02	0.01	0.10	0.03

Source: Authors' calculations, using the data sources for table 9.
a. Total resources less bequeathable resources.
b. Nonhuman wealth plus term value of life insurance.

Table 12. Share of Annuitized and Bequeathable Resources in Total Resources, Females

	Age group								
Measure and period	*20–29*	*30–39*	*40–49*	*50–59*	*60–69*	*70–79*	*80–89*	*20–89*	*65–89*
Annuitized resources[a]									
1960–61	0.90	0.74	0.56	0.41	0.28	0.15	0.04	0.60	0.18
1972–73	0.88	0.71	0.57	0.46	0.37	0.35	0.37	0.62	0.36
1984–86	0.88	0.72	0.61	0.51	0.45	0.47	0.71	0.66	0.49
1987–90	0.87	0.71	0.60	0.50	0.46	0.49	0.73	0.66	0.50
Bequeathable resources[b]									
1960–61	0.10	0.26	0.44	0.59	0.72	0.85	0.96	0.40	0.82
1972–73	0.12	0.29	0.43	0.54	0.63	0.65	0.63	0.38	0.64
1984–86	0.12	0.28	0.39	0.49	0.55	0.53	0.29	0.34	0.51
1987–90	0.13	0.29	0.40	0.50	0.54	0.51	0.27	0.34	0.50
Nonhuman wealth									
1960–61	0.03	0.17	0.36	0.53	0.68	0.83	0.95	0.32	0.80
1972–73	0.04	0.17	0.33	0.47	0.59	0.63	0.62	0.30	0.62
1984–86	0.06	0.17	0.29	0.42	0.52	0.52	0.28	0.26	0.50
1987–90	0.06	0.17	0.29	0.42	0.51	0.50	0.27	0.26	0.48
Term value of life insurance									
1960–61	0.08	0.10	0.08	0.07	0.05	0.02	0.01	0.08	0.03
1972–73	0.08	0.12	0.10	0.07	0.04	0.02	0.01	0.08	0.02
1984–86	0.06	0.11	0.11	0.07	0.03	0.01	0.00	0.08	0.01
1987–90	0.07	0.12	0.12	0.08	0.03	0.01	0.00	0.08	0.01

Source: Authors' calculations, using the data sources for table 9.
a. Total resources less bequeathable resources.
b. Nonhuman wealth plus term value of life insurance.

(APC) is equal to one divided by the actuarial value of $1.00. Assuming that survival probabilities decline with age, this ratio will rise with age. For example, if the discount rate is zero, the APC will simply equal the individual's life expectancy. This line of argument suggests that the government's annuitization of the resources of the elderly has, in effect, forced the elderly to consume a larger share of their resources in each successive year.

Questioning the Findings

This section addresses various questions about the reliability of our findings.

Allocating Couples' Incomes to Nominal Recipients

The results presented above are based on income, tax, and transfer profiles that were constructed from microeconomic data sets. In the case of married households, we allocate equal amounts of these flows to each spouse. An alternative procedure would be to allocate income to the person who nominally received it. Table 13 shows that the results produced by implementing the latter method are almost identical to those in the earlier tables. For example, the saving rate for 1987–90 with the resource distribution of 1960–61, all else remaining the same, is 5.07 under the alternative method, instead of 4.97 (see the first panel of table 7). Using the consumption propensities of 1960–61 yields a saving rate of 4.93 in 1987–90 under the alternative method, compared to 4.85 under the former procedure (see the second panel of table 7). Finally, using the ratio of resources to output of 1960–61 produces a saving rate of 5.81 in 1987–90 under the alternative method, instead of 5.90 under the former procedure (see the fourth panel of table 7).

If There Were No Annuity Markets

The base case assumes that individuals can convert future income flows into current consumption at actuarially fair rates of discount—that is, using the pretax rate of interest and the probability of death conditional on age. This is equivalent to assuming the existence of actuarially fair annuity insurance, whether explicit or implicit. To in-

Table 13. The Effect on the Net National Saving Rate of Counterfactual Factor Values—Allocating Income to Nominal Recipients[a]
Percent

Factor and period of counterfactual saving rate	*Period of counterfactual factor value*			
	1960–61	*1972–73*	*1984–86*	*1987–90*
Age-resource distribution (r_i/r)				
1960–61	7.85	6.19	5.52	5.55
1972–73	11.16	9.87	9.39	9.36
1984–86	6.00	4.75	4.51	4.40
1987–90	5.07	3.75	3.49	3.38
Consumption prospensity (α_i)				
1960–61	7.85	4.88	8.39	6.78
1972–73	12.59	9.87	12.94	11.32
1984–86	4.10	0.92	4.51	2.81
1987–90	4.93	1.68	5.05	3.38
Resources-to-output ratio (R/Y)				
1960–61	7.85	11.98	4.46	5.51
1972–73	5.59	9.87	2.07	3.16
1984–86	7.91	12.05	4.51	5.57
1987–90	5.81	10.08	2.29	3.38
Addendum	*1960–61*	*1972–73*	*1984–86*	*1987–90*
Actual ratios[b]				
R/Y	12.68	11.94	13.29	13.10
HW/Y	11.56	10.45	11.66	11.39
NHW/Y	3.69	3.20	3.21	3.18
PW/Y	0.96	1.11	1.37	1.36
GA/Y	3.53	2.82	2.95	2.82

Source: Authors' calculations, using the data sources for tables 5 and 6.
a. See table 7, note a, for organization of this table.
b. See table 7, note b, for definitions of variables shown.

vestigate the robustness of our results to this assumption, we now consider the opposite assumption—that no annuity insurance is available at the margin. In this case, the appropriate rate for discounting future flows is simply the pretax rate of interest.

Table 14 shows average resources for ten-year age groups in the four periods under the assumption of no annuity markets. Compared to the results of tables 3 and 4, total resources are higher under the no annuity markets assumption, as would be expected from the lower rate of discount. Also, because of the greater annuitization of the resources of older cohorts in the late 1980s, compared to the early 1960s, for older

Table 14. Total Resources—No Annuity Markets
Population weighted averages in thousands of 1993 dollars

	Age group								
Sex and period	*20–29*	*30–39*	*40–49*	*50–59*	*60–69*	*70–79*	*80–89*	*20–89*	*65–89*
Males									
1960–61	290.6	314.0	317.6	291.4	245.0	199.8	143.0	288.0	205.2
1972–73	336.7	379.3	400.6	395.5	355.3	294.7	205.2	363.0	298.5
1984–86	365.0	422.0	461.6	476.3	464.0	393.4	254.5	419.4	394.8
1987–90	378.4	435.6	478.4	496.9	490.5	423.0	279.5	438.2	422.6
Percent change[a]	30.2	38.7	50.6	70.5	100.2	111.7	95.4	52.1	105.9
Females									
1960–61	256.7	278.7	289.8	264.9	212.2	159.1	117.1	253.1	166.6
1972–73	304.4	342.3	362.7	351.7	312.8	249.8	162.9	320.6	249.6
1984–86	348.3	405.1	419.3	419.0	407.7	328.9	190.6	379.9	320.2
1987–90	364.9	422.0	440.1	439.8	431.6	353.2	211.0	400.2	343.1
Percent change[a]	42.2	51.4	51.9	66.1	103.4	122.0	80.2	58.1	106.0

Source: Authors' calculations, using the data sources for table 6.
a. Percent change is calculated from the first period (1960–61) to the last (1987–90).

cohorts the difference between resources under the two cases is greater in the late 1980s, compared to the early 1960s.

Table 15 indicates that the assumption of no annuity insurance does affect the magnitude, but not the sign, of the saving factors considered in table 7.[25] Under this assumption, applying the propensities to consume of 1960–61 to the cohort-specific resource levels of the late 1980s increases the saving rate from 3.38 percent to 6.23 percent, rather than to 4.85 percent under the base case (see the second panel in table 7). Substituting the age-resource distribution and resources-to-income ratio of 1960–61 in place of their respective 1987–90 values also leads to an increase in national saving. In the case of the age-resource distribution, the saving rate increases from 3.38 percent to 5.23 percent, instead of to 4.97 percent under the base case. Finally, using the ratio of resources to output of 1960–61 in place of that of 1987–90 increases the saving rate from 3.38 percent to 4.60 percent, instead of to 5.90 percent under the base case. Substituting the population shares of 1960–61 in place of those of 1987–90 results in the same saving rate as in the base case (2.44 percent). The reason, as mentioned earlier, is that the rate of discount does not affect the calculated effect on national saving of changes in the age composition of the population.[26]

Future Growth in Medicare and Medicaid

The future course of fiscal policy is uncertain. However, by incorporating federal revenue and outlay projections that differ from the baseline used in our analysis, we can consider the implications of alternative future policies. For example, the resolution considered by the Congress in December 1995 to balance the federal budget by the year 2002 proposed cuts in the growth of medicare and medicaid and in projected government purchases. It also included reductions in taxes, mainly in the form of additional deductions against taxable income. As table 16 shows, projecting future transfer payments on the basis of these budget proposals does not materially alter the level or the distribution of resources across cohorts.

Table 17 shows that under this case, the results of our counterfactual

25. All the results in table 15 use the base case discount rate of 6 percent.

26. In equation 2, $\alpha_{it} r_{it}$ is simply equal to c_{it}, which is independent of the definition of resources.

Table 15: The Effect on the Net National Saving Rate of Counterfactual Factor Values—No Annuity Insurance[a]
Percent

Factor and period of counterfactual saving rate	Period of counterfactual factor value			
	1960–61	*1972–73*	*1984–86*	*1987–90*
Age-resource distribution (r_i/r)				
1960–61	7.85	6.41	5.78	5.97
1972–73	11.06	9.87	9.43	9.57
1984–86	6.29	5.01	4.51	4.61
1987–90	5.23	3.86	3.29	3.38
Consumption propensity (α_i)				
1960–61	7.85	4.40	7.36	5.30
1972–73	12.88	9.87	12.36	10.29
1984–86	5.07	1.57	4.51	2.33
1987–90	6.23	2.71	5.50	3.38
Resources-to-output ratio (R/Y)				
1960–61	7.85	12.19	5.41	6.70
1972–73	5.36	9.87	2.82	4.16
1984–86	6.99	11.39	4.51	5.82
1987–90	4.60	9.16	2.03	3.38
Age distribution (P_i/P)				
1960–61	7.85	9.60	9.01	8.57
1972–73	7.97	9.87	9.23	8.69
1984–86	2.93	4.89	4.51	3.85
1987–90	2.44	4.24	4.01	3.38
Addendum	*1960–61*	*1972–73*	*1984–86*	*1987–90*
Actual ratios[b]				
R/Y	14.56	13.66	15.06	14.80
HW/Y	11.91	10.64	11.70	11.38
NHW/Y	3.69	3.20	3.21	3.18
PW/Y	1.45	1.54	1.82	1.78
GA/Y	2.49	1.73	1.67	1.54

Source: Authors' calculations, using the data sources for tables 5 and 6.
a. See table 7, note a, for organization of this table.
b. See table 7, note b, for definitions of variables shown.

saving rate exercises are quite similar to those reported in table 7. The second panel of table 17 shows that the saving rate would be 5.52 percent if the consumption propensities of 1987–90 were replaced by those of 1960–61. This is a bigger effect than under the base case. The reason is that lower spending on medicare and medicaid under the balanced budget scenario reduces the resources of the middle-aged and elderly in 1987–90 and raises their consumption propensities. Also,

Table 16. Total Resources—Balanced Federal Budget by 2002
Population weighted averages in thousands of 1993 dollars

	Age group								
Sex and period	*20–29*	*30–39*	*40–49*	*50–59*	*60–69*	*70–79*	*80–89*	*20–89*	*65–89*
Males									
1960–61	268.6	272.7	259.6	224.0	178.6	142.0	103.4	239.2	146.8
1972–73	314.9	337.0	333.4	307.1	255.7	201.1	130.0	303.5	205.2
1984–86	347.0	376.2	390.9	374.9	337.2	258.8	141.2	353.5	264.4
1987–90	361.6	390.2	405.6	393.6	357.8	279.3	154.0	369.9	283.5
Percent change[a]	34.6	43.1	56.2	75.7	100.3	96.7	49.0	54.7	93.1
Females									
1960–61	246.6	254.2	254.9	222.2	166.4	119.3	92.4	222.5	127.0
1972–73	294.6	316.8	321.1	296.1	245.9	181.8	106.3	281.3	183.6
1984–86	342.8	377.4	373.9	352.9	322.0	232.6	104.9	334.4	228.2
1987–90	361.8	395.7	392.8	372.2	341.5	250.5	115.9	353.0	244.4
Percent change[a]	46.7	55.7	54.1	67.5	105.1	110.0	25.4	58.6	92.5

Source: Authors' calculations, using the data sources for table 6 with budget plan figures from Congressional Budget Office, *Economic and Budget Outlook: December 1995 Update*.
a. Percent change is calculated from the first period (1960–61) to the last (1987–90).

Table 17. The Effect on the Net National Saving Rate of Counterfactual Factor Values—Balanced Federal Budget by 2002[a]
Percent

Factor and period of counterfactual saving rate	*Period of counterfactual factor value*			
	1960–61	*1972–73*	*1984–86*	*1987–90*
Age-resource distribution (r_i/r)				
1960–61	7.85	6.23	5.59	5.59
1972–73	11.10	9.87	9.45	9.41
1984–86	5.89	4.72	4.51	4.40
1987–90	4.98	3.73	3.50	3.38
Consumption propensity (α_i)				
1960–61	7.85	4.82	7.94	6.19
1972–73	12.65	9.87	12.54	10.75
1984–86	4.56	1.33	4.51	2.64
1987–90	5.52	2.24	5.21	3.38
Resources-to-output ratio (R/Y)				
1960–61	7.85	12.00	4.85	6.06
1972–73	5.58	9.87	2.46	3.72
1984–86	7.54	11.71	4.51	5.73
1987–90	5.25	9.57	2.12	3.38
Addendum	*1960–61*	*1972–73*	*1984–86*	*1987–90*
Actual ratios[b]				
R/Y	12.50	11.77	13.03	12.82
HW/Y	11.45	10.38	11.59	11.31
NHW/Y	3.69	3.20	3.21	3.18
PW/Y	0.95	1.10	1.37	1.36
GA/Y	3.59	2.92	3.14	3.02

Source: Authors' calculations, using data sources for tables 5 and 16.
a. See table 7, note a, for organization of this table.
b. See table 7, note b, for definitions of variables shown.

relative to the base case, post-1990 reductions in federal health outlays have a smaller effect on the resources of most middle-aged and elderly generations in 1960–61. Consequently, the increases in the consumption propensities of these age groups associated with the alternative fiscal policy are larger for the late 1980s than they are for the early 1960s. This, in turn, means that substituting consumption propensities from the early 1960s for those of the late 1980s has a larger effect on saving rates.

Replacing the age-resource distribution of 1987–90 with that of 1960–61 results in a saving rate of 4.98 percent, which is very close to the base case rate of 4.97 percent (table 7). Applying the ratio of resources to output of 1960–61 in the period 1987–90 results in a saving rate of 5.25 percent. This increase is less than that in the base case because, in this case, the aggregate generational account component of the resources-to-output ratio only falls from 3.59 to 3.02 over the period, instead of from 3.56 to 2.88.

Bias from Error in Measuring Resources

Given income uncertainty, our preferred resource measure would be expected, rather than actual realized, resources. But, as indicated above, our measure of a cohort's resources is not exactly actual realized resources. In fact, it is based partly on the cohort's actual realized future income streams and partly on projections of its income streams from the mid-1990s onward. Assuming that our method of projecting cohorts' future incomes properly captures cohorts' own expectations about future incomes, we would expect the error in measuring expected resources to be smaller in the later periods than in the earlier periods. Since the measurement error we introduce by using actual incomes is an expectation error, it has a mean of zero. Thus its presence will impart an upward bias to our measurement of average propensities to consume, because of Jensen's inequality and the fact that this error shows up in the denominator of the APC formula. And since this bias is likely to be greater in the earlier period than in the later period, our analysis likely understates the relative importance of rising APCs over time to reducing U.S. saving rates.

Myopic Expectations

Our measure of a cohort's resources in a given period assumes that members of the cohort, on average, accurately foresaw the nonasset income that they would receive and the net taxes that they would pay through 1993. In addition, the measure assumes that their expectations of nonasset income and net taxes after 1993 correspond, on average, to the values that we project. These assumptions may, of course, be invalid.

An alternative is to assume myopic expectations concerning future nonasset income and net taxes. Under this case, we assume that cohorts expect, on average, to receive the same nonasset income and pay the same net taxes at future ages as do cohorts of the same sex at those ages currently, except for an adjustment for growth; that is, we assume that cohorts expect the current cross-sectional age–nonasset income and age–net tax profiles to shift proportionally through time due to economic growth, but not to twist.

The rate of economic growth projected for each period is assumed to equal the average growth rate of output per hour over the ten years before the period. Thus the growth rate is 2.79 percent for 1960–61, 2.71 percent for 1972–73, 1.09 percent for 1984–86, and 1.03 percent for 1987–90. Table 18 shows total resources for different age groups under myopic expectations. For all except the youngest generations, total resources are somewhat lower under myopic expectations than under the base case (tables 3 and 4).[27]

Table 19 shows that when resources are computed under the assumption of myopic expectations, the base case conclusions from our counterfactual saving rate experiments are sustained for changes in the age-resource distribution and the resources-to-output ratio. Substituting the age-resource distribution of 1960–61 in place of that of 1987–90 produces a saving rate of 5.05 percent under myopic expectations, compared to 4.97 percent in the base case. Using the resources-to-output ratio of 1960–61 instead of that of 1987–90 produces a saving rate of 6.77 percent, which is even higher than the 5.90 percent rate under the base case. The same experiment with consumption propensities produces a saving rate of 3.44 percent under myopic expectations, which is only slightly larger than the actual saving rate of 3.38 percent.

27. Levels of human wealth for both male and female working generations are higher for the 1960–61 period under myopic expectations than under the base case. This results from the high growth rate used to compute 1960–61 human wealth under myopic expectations, relative to the actual growth of labor income in subsequent years. The actual growth of pension income in later years, however, was more rapid than that used to form pension wealth under myopic expectations. In addition, the generational accounts of all cohorts are much higher in 1960–61 under myopic expectations, primarily because the creation and growth of the medicare and medicaid programs were excluded when forming myopic generational accounts for that period. For the 1960–61 period, the lower cohort pension wealth and higher generational accounts more than offset the higher cohort human wealth for all except the youngest generations. For 1987–90, cohort pension and human wealth are not much different under myopic expectations, compared to the base case. Detailed data on the components of resources under myopic expectations are available from the authors upon request.

Table 18. Total Resources—Myopic Expectations
Population weighted averages in thousands of 1993 dollars

	Age group								
Sex and period	*20–29*	*30–39*	*40–49*	*50–59*	*60–69*	*70–79*	*80–89*	*20–89*	*65–89*
Males									
1960–61	280.1	267.6	245.2	208.5	165.4	135.0	101.1	232.9	138.4
1972–73	398.3	384.0	348.7	301.8	247.1	196.4	125.8	335.1	199.5
1984–86	354.7	375.9	381.6	361.6	324.6	251.9	138.9	350.3	256.4
1987–90	367.7	391.0	397.8	379.7	341.3	268.1	148.6	365.9	271.7
Percent change[a]	31.3	46.1	62.2	82.1	106.4	98.6	46.9	57.1	96.3
Females									
1960–61	250.6	239.2	230.1	194.7	142.5	106.9	89.1	206.6	112.5
1972–73	360.4	352.0	325.6	281.3	227.7	166.6	96.8	297.9	168.7
1984–86	326.0	358.7	354.5	336.7	306.8	224.1	99.6	318.3	218.8
1987–90	353.9	384.1	375.8	354.6	324.9	239.7	109.1	340.3	233.1
Percent change[a]	41.2	60.5	63.3	82.2	128.0	124.3	22.5	64.7	107.2

Source: Authors' calculations, using the data sources for table 6. See text for computational details.
a. Percent change is calculated from the first period (1960–61) to the last (1987–90).

Table 19. The Effect on the Net National Saving Rate of Counterfactual Factor Values—Myopic Expectations[a]
Percent

Factor and period of counterfactual saving rate	*Period of counterfactual factor value*			
	1960–61	*1972–73*	*1984–86*	*1987–90*
Age-resource distribution (r_i/r)				
1960–61	7.85	7.45	4.68	4.75
1972–73	10.01	9.87	7.22	7.25
1984–86	5.89	6.07	4.51	4.48
1987–90	5.05	5.26	3.41	3.38
Consumption propensity (α_i)				
1960–61	7.85	13.03	9.44	8.10
1972–73	4.30	9.87	5.78	4.19
1984–86	2.90	8.19	4.51	2.97
1987–90	3.44	8.58	4.89	3.38
Resources-to-output ratio (R/Y)				
1960–61	7.85	2.40	3.71	4.54
1972–73	14.81	9.87	11.06	11.81
1984–86	8.62	3.21	4.51	5.33
1987–90	6.77	1.20	2.54	3.38
Addendum	*1960–61*	*1972–73*	*1984–86*	*1987–90*
Actual ratios[b]				
R/Y	11.97	12.89	12.67	12.53
HW/Y	12.27	13.04	11.28	11.24
NHW/Y	3.69	3.20	3.21	3.18
PW/Y	0.55	0.91	1.23	1.29
GA/Y	4.54	4.26	3.05	3.17

Source: Authors' calculations, using data sources for tables 5 and 18.
a. See table 7, note a, for organization of this table.
b. See table 7, note b, for definitions of variables shown.

Bequests and Inter Vivos Transfers

Our life cycle framework ignores inherited resources and resources received through inter vivos gifts. If we had data on cohorts' expected future receipts of inheritances and gifts, we would include their present expected value in our measure of resources. This would lower cohorts' measured propensities to consume, particularly for young and middle-aged cohorts whose parents and grandparents are still alive, but would raise the aggregate ratio of resources to income.

If, as we suspect, bequests and inter vivos transfers have been declining over time in the United States, relative to the size of the economy, our failure to include the present expected value of future inheritances and gifts in measured resources would mean that propensities to consume are biased upward by more in the earlier periods than they are in later periods. Consequently, we may overstate the degree to which the consumption propensities of the young and the middle-aged have declined and understate the degree to which the consumption propensities of older Americans have increased. We may also understate the degree to which the age-resource profile has tilted toward the elderly. Finally, we may overstate the degree to which the resources-to-output ratio has risen.

Accounting for Uncertainty

An obvious criticism of our analysis is that it ignores the fact that consumption decisions are made under uncertainty. As Angus Deaton and Carroll point out, propensities to consume out of certain resources will, in general, exceed those out of uncertain resources.[28] This is only true in general, because there are utility functions, specifically quadratic and constant absolute risk aversion functions, for which current consumption is a linear function of the present expected value of future resources.

But even if utility is of a different form than quadratic or constant absolute risk aversion (for example, isoelastic), one can still define the propensity to consume out of total expected resources. The difference is that this propensity to consume will depend on the degree of uncertainty that consumers face. It follows that the changes in propensities to consume out of expected resources that we have reported may reflect changes in the degree of resource uncertainty. This, indeed, is the point we argue above, when relating the rise in the propensity of the elderly to consume to the increased annuitization of their resources.

Furthermore, uncertainty (for example, in the context of isoelastic preferences) requires one to think somewhat differently about our counterfactual saving rate experiments. In addition to all the other factors that these experiments implicitly hold constant, they should also be understood to hold constant the degree of resource uncertainty.

Considerations of uncertainty, however, do not alter our conclusion that the government's intergenerational redistribution has been the ma-

28. Deaton (1992); Carroll (1992).

jor cause of the postwar decline in U.S. saving. Although this redistribution has undoubtedly altered the nature and degree of resource uncertainty, government policy has produced a major systematic change in the distribution of expected resources among current and future generations. This intergenerational redistribution of resources would produce a predicted decline in national saving in any life cycle model, with or without uncertainty. Indeed, since the social insurance policies that have effected the redistribution are likely, on balance, to have raised, rather than lowered, consumption propensities, the effect of these policies on U.S. saving rates is probably understated by our findings that focus on changes over time in the age-resource distribution and the ratio of resources to output.

Do Future Resources Affect Consumption?

A final concern is whether, in our analysis, cohorts are consuming in accordance with the life cycle model. There is a voluminous literature testing the life cycle model, most of which seems to be highly supportive. Can our data also be used to test this model? The answer appears to be no.

The tests that immediately come to mind involve regressing cohort consumption against variables that capture the level, composition, and timing of cohort resources. The life cycle model under certainty predicts that the level, but neither the composition nor the timing, of resources matters to current consumption. This point can be seen in the following linear model of cohort consumption:

$$c_{it} = h(i) + g(i)r_{it}, \tag{10}$$

where $h(i)$ and $g(i)$ are functions of age, and $g(i)$ represents the marginal propensity to consume out of resources. This model is appropriate if, first, there is no uncertainty; second, preferences are identical across cohort members; and third, preferences are either homothetic, or quadratic, or exhibit constant absolute risk aversion.[29] In this case, since consumption depends on resources only through r_{it}, regressing consumption on a polynomial in age and the components of resources (human wealth, net wealth, pension wealth, and the generational account) interacted with a polynomial in age will yield the same propen-

29. The function $h(i)$ is equal to zero if preferences are homothetic.

sity to consume out of each component of resources. Furthermore, if one decomposes those components of resources that involve present values into a current flow and the present value of future flows, the propensities to consume out of the current flows and the present value of future flows will be identical. For example, if human wealth is divided into current labor earnings and the present value of future labor earnings, the propensity to consume out of current labor earnings will equal the propensity to consume out of the present value of future labor earnings.

Although testing the equality of marginal propensities to consume out of the various components of resources seems simple enough, one practical difficulty of a cohort data set is that the components of resources are, themselves, nonlinear functions of age and other data, and therefore are highly colinear. Current labor earnings, for example, is large and positive at young and middle ages and essentially zero at older ages; so this variable has a definite pattern with age. Furthermore, if the cross-sectional age-earnings profile is fairly smooth between ages eighteen and sixty-five, the current earnings for all cohorts under age sixty-five at a point in time will be proportional to a polynomial in age. As a second example, the present value of future social security benefits (excluding current benefits) also has a definite pattern with age; it is small for young cohorts that are years away from collecting benefits, large for middle-aged cohorts that are approaching retirement, and small for old cohorts that are approaching their maximum lifespan. Moreover, although variables such as current earnings and the present value of future social security benefits exhibit variation over time, our data set contains only four periods.

Without the assumption of certainty, the difficulty in using our data to test the life cycle model is compounded. First, if preferences are neither quadratic nor exhibit constant absolute risk aversion, the propensity to consume out of resources will depend not only on age, but also on the composition of resources, in terms of those that are safe, like current net worth, and those that are risky, like future labor earnings.[30] Since we do not know the form of this dependence, we have no

30. More precisely, the propensity to consume will depend on the amount of safe resources and the distribution of risky resources.

way to control for it when testing for equality of marginal propensities to consume.

If preferences are quadratic or exhibit constant absolute risk aversion, consumption is linear in the expected value of resources, and therefore the propensity to consume depends only on age. But in our model, the present value of the variable for future flows of resources incorporates the actual realized values of these flows, rather than the expected values. Consequently, our present-value realized resource components will differ from their expected-value counterparts by component-specific expectation errors. Hence our use of realized rather than expected resources in a consumption regression introduces classical measurement error in the variables. This problem will contaminate not only the coefficients on the present values of future resource flows, but also the coefficients on current flows. Indeed, one can show that the coefficients on current flows will be biased upward. Thus coefficients on current flows may be much larger than those on the present values of future flows not because cohorts ignore the future or fail to optimize intertemporally, but simply because current flows are, in part, proxying for expected future flows.

In principle, one can instrument the variables measured with error to avoid these biases. Lagged income variables, such as a cohort's lagged labor earnings, represent natural instruments since they are, presumably, correlated with individuals' expected future incomes but not with their expectation errors. However, the orthogonality of lagged incomes and expectation errors is a time-series property, and we have only four time-series observations.

Notwithstanding this litany of admonitions, table 20 presents marginal propensities to consume out of alternative resource variables at ages twenty, forty, sixty, and eighty, as predicted by four ordinary least squares (OLS) regressions, estimated separately for males and females. Each regression includes an intercept, age, age squared, and a third-order polynomial in age interacted with each of the resource variables.

Regression 1 considers only total resources; as indicated, marginal consumption propensities are flat at around 6 percent for males and females through age sixty, and rise to 10 percent for males and 8 percent for females at age eighty. Regression 2 breaks total resources into net worth, human wealth, pension wealth, and the generational account.

Table 20. Marginal Propensities to Consume Out of Specified Resource Components at Selected Ages[a]

Equation	*Sex and age*	*Total resources*	*Net worth*	*Human wealth*	*Pension wealth*	*Genera-tional account*	*Current human wealth*	*Current pension wealth*	*Current net taxes*	*Future human wealth*
	Males									
1	20	0.06	...	...	...	...	...	...	...	...
	40	0.06	...	...	...	...	...	...	...	...
	60	0.06	...	...	...	...	...	...	...	...
	80	0.10	...	...	...	...	...	...	...	...
2	20	...	0.23	0.09	0.14	−0.18	...	...	...	...
	40	...	0.22	0.07	0.02	−0.15	...	...	...	...
	60	...	0.12	0.00	−0.01	−0.07	...	...	...	...
	80	...	0.05	−0.02	0.40	−0.10	...	...	...	...
3	20	...	0.07	...	...	...	−0.50	−2.19	1.12	0.18
	40	...	0.05	...	...	...	0.10	−0.59	0.70	0.09
	60	...	−0.02	...	...	...	0.38	1.87	0.25	−0.05
	80	...	−0.11	...	...	...	−1.12	2.29	1.29	−0.05
4	20	...	−0.03	...	...	...	−0.60	−0.25	...	0.05
	40	...	−0.21	...	...	...	−0.02	1.21	...	0.02
	60	...	−0.44	...	...	...	0.17	2.37	...	0.24
	80	...	−0.62	...	...	...	−1.65	1.25	...	1.02
	Females									
1	20	0.06	...	...	...	...	...	...	...	...
	40	0.06	...	...	...	...	...	...	...	...
	60	0.05	...	...	...	...	...	...	...	...
	80	0.08	...	...	...	...	...	...	...	...
2	20	...	0.04	−0.01	0.49	0.07	...	...	...	...
	40	...	0.05	0.02	0.27	−0.02	...	...	...	...
	60	...	0.02	0.07	0.00	−0.12	...	...	...	...
	80	...	−0.04	0.10	0.35	−0.07	...	...	...	...
3	20	...	0.00	...	...	...	−0.04	4.20	−0.09	−0.01
	40	...	0.00	...	...	...	0.51	4.42	−0.32	0.00
	60	...	0.00	...	...	...	1.00	3.03	−0.36	−0.01
	80	...	−0.02	...	...	...	0.74	2.40	0.14	−0.10
4	20	...	−0.09	...	...	...	−1.55	−1.58	...	0.08
	40	...	−0.13	...	...	...	−0.97	−1.39	...	−0.06
	60	...	−0.13	...	...	...	−0.86	0.42	...	−0.37
	80	...	−0.11	...	...	...	−3.84	3.69	...	−0.78

Table 20. (*continued*)

Future pension wealth	*Future net taxes*	*Current social security benefits*	*Current medicare & medicaid benefits*	*Current welfare benefits*	*Current tax payments*	*Future social security benefits*	*Future medicare & medicaid benefits*	*Future welfare benefits*	*Future tax payments*
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
0.14	−0.43	...	...	...	...	...	...	...	...
0.10	−0.31	...	...	...	...	...	...	...	...
−0.08	−0.17	...	...	...	...	...	...	...	...
−0.39	−0.53	...	...	...	...	...	...	...	...
0.25	...	−10.48	−1.12	−2.43	0.73	−0.80	0.29	0.79	−0.03
0.14	...	−3.00	2.26	4.77	2.01	−0.60	0.16	−0.52	−0.10
0.11	...	8.80	8.72	9.42	4.22	−1.02	−1.28	−4.15	−0.71
0.57	...	11.29	16.83	−0.66	7.72	−3.69	−4.94	−10.31	−2.37
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
0.45	0.06	...	...	...	...	...	...	...	...
0.15	0.01	...	...	...	...	...	...	...	...
−0.20	−0.07	...	...	...	...	...	...	...	...
0.10	−0.10	...	...	...	...	...	...	...	...
−0.33	...	19.17	0.06	13.72	5.08	−0.37	0.01	−0.58	−0.27
−0.22	...	14.49	3.01	7.57	4.27	0.10	0.47	−0.49	0.01
−0.03	...	6.11	7.01	2.30	2.82	0.80	1.01	2.14	0.45
−0.11	...	14.17	10.23	18.71	5.99	1.10	1.30	9.18	0.63

Source: Authors' calculations, using the data sources for tables 5 and 6.

a. The dependent variable is consumption (c_{it}). Each regression includes an intercept, age, age squared, and a third-order polynomial in age interacted with each of the resource variables that appear in the table.

Although an F test strongly rejects equality of marginal propensities to consume out of these components of resources, certain results (such as the generally negative predicted marginal propensities to consume out of the generational account) provide support for the life cycle model.

This support evaporates when we further disaggregate the four main components of resources and the components of the generational account into current flows and the present value of future flows (regressions 3 and 4, respectively). As the table shows, both the signs and the magnitudes of calculated marginal propensities to consume are highly sensitive to the precise combination of variables that are included in the regressions. These basic findings also pertain to regressions using data constructed under the assumptions of 3 and 9 percent discount rates; data constructed using simple, rather than actuarial, discounting; and data constructed under the assumption of myopic expectations. Finally, the findings also pertain to instrumented regressions, using as instruments age and age squared interacted with six lagged values each of per capita labor earnings, pension benefits, social security benefits, and other per capita taxes and transfers.[31]

From these results we must conclude that our data are not up to the task of testing the life cycle model. This does not, however, invalidate their use for the main purpose of this study, namely, decomposing changes over time in U.S. saving rates.

Implications of Projected Demographic Change for Future U.S. Saving Rates

One final issue is the prognosis for U.S. saving rates in light of projected demographic change. To consider this issue, we use the consumption propensities, relative resource profiles, and resources-to-output ratios of the late 1980s to calculate the national saving rate for alternative projections of the future age structure of the population.

Table 21 shows that, all else equal, projected changes in the population structure will produce a further decline in the U.S. saving rate. The projected rate for 2000 is only 1.7 percent. Over the period 2000–20, the saving rate will oscillate around this value. But after 2020,

31. We do not have lagged values of resource flows on a generation-specific basis for the years before 1960 that we could use as instruments.

Table 21. The Effect of Demographic Change
Percent

Year	*Saving rate*	*Year*	*Saving rate*
1995	2.1	2025	1.4
2000	1.7	2030	1.3
2005	1.7	2035	1.3
2010	1.9	2040	1.3
2015	1.9	2045	1.3
2020	1.7	2050	1.3

Source: Authors' calculations, using the data sources for tables 5 and 6.

when the baby boom generation has completely retired, the saving rate is predicted to decline to 1.3 percent.

Conclusion

This paper traces the dramatic postwar decline in U.S. saving to two factors: government redistribution from current young and future generations to current older ones, and a sharp increase in the propensity of older Americans to consume out of their remaining lifetime resources. Absent these factors, the current U.S. rate of national saving would be roughly three and a half times as large. The increase in the resources of the elderly relative to those of younger generations, as well as the increase in their propensity to consume out of their resources has produced a remarkable increase in their relative consumption. Today, seventy-year-olds are consuming, on average, roughly one-fifth more than thirty-year-olds; in the early 1960s, they were consuming slightly more than two-thirds as much. The increase in the relative consumption of the elderly is dramatic even if one considers only nonmedical consumption.

The fact that propensities to consume were not systematically larger, and indeed, were smaller for most young and middle-aged cohorts, in the late 1980s than in the early 1960s indicates that ''spendthrift'' young and middle-aged Americans are not to blame for the decline in U.S. saving. This is not to say that young and middle-aged Americans are saving enough. Given the severe imbalance in long-run U.S. fiscal policy, these groups need to save significant amounts simply to safeguard themselves against future tax increases or reductions in transfer payments.[32]

Since there is every reason to believe that intergenerational redistribution will continue apace in the United States, at least through the turn of this century, there is every reason to believe that U.S. saving rates will remain extremely low, if they do not decline even further. Anemic rates of saving will spell anemic rates of domestic investment, labor productivity growth, and real wage growth. This is the legacy of the uncontrolled intergenerational redistribution from young savers to old spenders that has been fueling ever-higher rates of consumption in the United States.

APPENDIX A

Data Construction

IN ALLOCATING income, taxes, and benefits to household members, we distribute various income, tax, and transfer aggregates according to age-sex relative profiles obtained from various microeconomic surveys described below. Two methods are followed in constructing the relative profiles for the various types of payments and receipts. In both methods, children's amounts are attributed equally to the head and the spouse (if present). In the primary method, nominal receipts and payments by married individuals are divided equally between the head and the spouse before averaging within each age-sex category. This is done for labor income, all tax payments, and all benefit receipts except for medicare and medicaid—which are in-kind benefits and cannot be shared with the spouse. The other method involves allocating the amounts to the nominal recipient before averaging within each age-sex category. The detailed description of data sources and construction that follows should be read with these alternative methods of allocating payments and receipts within the household in mind.

32. See, for example, Auerbach and Kotlikoff (1994) and Bernheim (1993).

Labor Income

Aggregate labor income between 1960 and 1993 is calculated as labor's share of national income as reported in the NIPA. For each of these years, labor's share of national income is calculated under the assumption that it is the same as its share of proprietorship income.[33] Relative profiles of labor income by age and sex are calculated for each year between 1963 and 1993, using CPS data. The 1963 profile is used to distribute aggregate labor income for earlier years. Per capita labor income for years beyond 1993 is projected under the assumption that, except for an adjustment for growth, cohorts of a given age and sex earn the same average labor income in future years as cohorts of that age and sex earned in 1993. For example, males who are aged 50 in years after 1993 are assumed to earn the same amount, on average, apart from an adjustment for growth, as males who were aged 50 in 1993. The growth adjustment is 1.2 percent per year. Thus the projected average earnings of males aged fifty in 1996 equals the average earnings of males aged fifty in 1993 multiplied by $(1.012)^3$.

Pension Benefits

Pension benefits include private pension benefits, workers' compensation, veterans' benefits, and government employee pension benefits. Aggregate private pension benefits for the years 1960–88 are taken from Park (1992). In this case, we use the NIPA estimates primarily because estimates based on administrative reports are generally deemed more reliable than those based on household surveys. The estimates for the years through 2030 are derived by assuming that the ratio of pension benefits to GDP remains at its 1988 level. Actual GDP through 1993 and unpublished GDP projections made by the Office of Management and Budget (OMB) through the year 2030 are used to extrapolate aggregate private pension benefits into the future. The aggregates for the other three types of benefits through 1993 are taken from SCB, and the

33. The share of labor income in national income is ϕ, where ϕ satisfies $C + \phi PI = \phi NI$. In this equation, C is compensation paid to employees less employer contributions to employee pension plans, PI is proprietorship income, and NI is national income. The calculated values of ϕ are quite stable over the period 1960–92, ranging between 0.76 and 0.82.

same procedure is used to extrapolate these aggregates through the year 2030.

The relative profiles for all four types of pensions are computed from the March CPS for the years 1972–93. This survey contains information on various types of pension income, including company or union pensions, workers' compensation, veterans' benefits, and government employee pensions, and receipts from annuities and other regular contributions. For all categories, retirement, disability and survivor benefits are included. The 1972 profile is used to distribute the aggregates in earlier years, and the 1993 profile is used to distribute the projected aggregates through 2030. For years after 2030, it is assumed that real average pension benefits for a given age and sex equal their 2030 values adjusted for growth at an annual rate of 1.2 percent, as assumed in the base case.

Social Security Benefits

Aggregate social security benefits between 1960 and 1993 are those reported in the NIPA. For the years between 1993 and 2030, we use unpublished projections (on a NIPA basis) provided by the Office of Management and Budget. Relative profiles of social security benefits by age and sex, obtained from the CPS for the years 1968–93, are used to distribute aggregate benefits in those years. Aggregate benefits in earlier years are distributed according to the relative profiles for 1968, and the OMB's projected benefits for the years 1994 through 2030 are distributed according to the relative profiles for 1993. Per capita benefits by age and sex beyond the year 2030 equal those in that year, adjusted for productivity growth at an annual rate of 1.2 percent.

Medicare and Medicaid Benefits

Aggregate medicare and medicaid payments are reported in the NIPA from the inception of these programs through 1993. The OMB has provided us with unpublished projections (on a NIPA basis) of aggregate medicare payments for the years 1994 through 2030. In the case of medicaid, we apply the OMB's projected annual growth rates for grants in aid to state and local governments between 1994 and 2030 to the aggregate value of medicaid for 1993 from the NIPA. For each year beyond 2030, total medicare and medicaid payments to individuals of a given age and sex are calculated by multiplying the projected number of individuals of that age and sex for the year by the per capita level of benefits to individuals of that age and sex in 2030, adjusted for post-2030 growth in the level of per capita benefits (using the 1.2 percent productivity growth rate of the base case). Relative profiles of medicaid benefits are based on HCFA data on average benefits by age and sex. Relative profiles of medicare benefits are based on data from McClellan and Skinner (1996).

Unemployment Insurance, Aid to Families with Dependent Children, Food Stamps, and General Welfare Benefits

Aggregate values of these federal, state, and local transfers are reported in the NIPA. General welfare benefits include federal black lung benefits, state general assistance, state energy assistance, education benefits, and other federal, state, and local transfers. The age-sex relative profiles used to distribute these benefits are obtained from March CPS data on public assistance for the years 1972 and 1993. These relative profiles are used to distribute their respective aggregate expenditures for each year between 1960 and 1993, and the 1972 profiles are used to distribute benefits in the years before 1972. For future years, we assume that the age- and sex-specific values of each type of transfer payment keep pace with productivity growth of 1.2 percent.

Labor Income Taxes

Aggregate federal, state, and local income taxes for 1960 through 1993 are reported in the NIPA. For 1993 through 2030, we use unpublished projections of federal income tax revenues provided by the OMB. State and local income taxes for 1993 through 2030 are projected by using the OMB's unpublished forecast of GDP and assuming that the ratio of state and local income taxes to GDP in 1993 prevails between 1993 and 2030.

Aggregate labor income taxes in each year are calculated as the product of total federal, state, and local income taxes and labor's share of national income. We distribute aggregate labor income taxes on the basis of the CPS profiles of labor income described above. For the years after 2030, we assume that age- and sex-specific values of labor income taxes keep pace with productivity growth of 1.2 percent.

Payroll Taxes

The NIPA reports aggregate values of payroll taxes from 1960 through 1993. The OMB has provided us with projections of aggregate federal payroll taxes from 1994 through 2030. Aggregate state and local payroll taxes for 1994 through 2030 are calculated on the basis of the OMB's projection of GDP between 1994 and 2030 and the assumption that the ratio of state and local payroll taxes to GDP in 1993 prevails through 2030. Aggregate payroll taxes in the years 1960–2030 are distributed by age and sex, according to CPS profiles of covered earnings (that is, labor earnings subject to social security payroll taxes) from 1963 through 1993.[34] Age- and sex-specific values of payroll taxes beyond 2030 are assumed to equal their values in 2030, adjusted for growth at 1.2 percent.

Excise and Sales Taxes

The NIPA is our source for aggregate excise tax (including property tax) and sales tax revenue from 1960 through 1993. For the period 1994–2030, we use unpublished projections of federal excise and sales tax revenues provided by the OMB. State and local excise and sales tax revenues between 1994 and 2030 are calculated by using the ratio of these revenues to GDP in 1993 and applying the OMB's unpublished forecasts of GDP through 2030.

Age-sex relative profiles of excise and sales taxes are calculated from the 1960–61, 1972–73, 1984–86, and 1987–90 CEXs. Separate profiles are constructed for tobacco, alcohol, property taxes, and all other sales and excise taxes. The 1960–61 profiles are used for the years before 1966; the 1972–73 profiles are used for the years 1967 through 1978; the 1984–86 profiles are used for the years 1979 through 1986; and the 1987–90 profiles are used for 1987 and beyond. Age- and sex-specific values of sales and excise taxes beyond 2030 are assumed to equal their values in 2030, adjusted for growth at 1.2 percent.

34. The data do not permit the calculation of separate profiles for state and local payroll taxes, which are not necessarily subject to earnings ceilings. However, payroll taxes other than social security are a small fraction of the total (less than 30 percent), so the bias associated with using profiles of covered earnings is likely to be quite small.

Capital Income Taxes

Aggregate capital income taxes between 1960 and 2030 are calculated as capital's share of national income multiplied by actual or projected values of aggregate federal, state, and local income tax revenues. Relative profiles for capital income taxes come from the 1962 and 1983 SCFs. These profiles are based upon weighted (SCF person weights) average net worth holdings, by age and sex. This procedure could not be applied to individuals over age eighty because of the paucity of data. The profile of average net worth holdings by age and sex are smoothed and extrapolated through age one hundred using a fourth-order polynomial. Age- and sex-specific values of capital income taxes after 2030 are assumed to equal their values in 2030, adjusted for growth at 1.2 percent.

Nonhuman Wealth

Age- and sex-specific values of nonhuman wealth for each year between 1960 and 1993 are constructed by distributing by age and sex the total private net wealth in that year. Aggregate private net wealth for these years is reported in the Flow of Funds.[35] The relative profiles of wealth holding by age and sex are calculated with data from the 1963 and 1983 SCFs. The 1963 profiles are used for the years before 1963, and the 1983 profiles for years after 1983. The profiles for intermediate years are constructed by interpolating linearly between the profiles for 1963 and 1983.

Determining Average Consumption by Age and Sex

The data used to determine average consumption by age and sex for the years 1960–61, 1972–73, 1984–86, and 1987–90 are from the NIPA; the 1960–61, 1972–73, and 1984–90 CEXs; and the 1977 and 1987 NMESs. Aggregate NIPA household consumption expenditure is allocated to adults on the basis of four relative profiles of consumption by age and sex—for the years 1960–61, 1972–73, 1984–86, and 1987–90.

To use the 1960–61 CEX, we have to impute particular demographic

35. Our aggregates are net of the Flow of Funds's estimate of the value of residential structures, plant, and equipment owned by nonprofit institutions.

information to its households. The reason is that this CEX provides only general indicators of the ages and sexes of household members other than the head and spouse. We impute this information by means of a statistical match with the 1960 decennial census. Specifically, we sort the census data by a set of variables that are also available in the CEX. These include demographic variables such as the number of children under age eighteen, the ages and sexes of the household head and spouse, household income, the sex and marital status of the household head, an urban versus rural indicator, region, and housing tenure. For each 1960–61 CEX household with members other than the head and spouse, we randomly select a census household from the set of census households with the same matching data. The ages and sexes of census household members other than the head and spouse are then attributed to the CEX household.

Each of the four age-sex relative consumption profiles is formed in a similar manner. First, we divide the NIPA consumption aggregates into thirty-five separate components. For most of these components, such as clothing, there are corresponding data in the CEX that can be used to distribute the aggregate values of these components. For three components, imputed rent, financial services, and expenditures by charitable institutions, there is no corresponding direct measure in the CEX, but there are other variables that can be used for purposes of distribution (for example, house value in the place of imputed rent). However, there is no CEX variable that is comparable to the NIPA's health care component, so we use the NMES to distribute health care.

The second step in forming the age-sex relative consumption profiles involves benchmarking the distribution data to the relevant component of the NIPA consumption aggregate. For example, we divide the NIPA clothing component by the total CEX clothing expenditure, computed using the CEX household weights. The resulting ratio is used to rescale the clothing expenditure of each household in the CEX. Clothing expenditure is rescaled separately for each of CEX surveys used in the study, based on the contemporaneous value of clothing from the NIPA. This procedure is used to rescale the CEX data for each of the NIPA components for which there are also direct CEX measures. The rescaling factors for easily verified or remembered spending categories, like automobiles and rent, are generally very close to one. CEX aggregates for spending on other goods and services, such as food and alcohol, are generally underreported by roughly 20 percent.[36]

In the case of imputed rent, we calculate the ratio of the NIPA aggregate imputed rent to total CEX reported house values (again, computed using the CEX household weights). We then multiply each household's reported house value by this ratio to produce a NIPA-benchmarked estimate of the household's imputed rent. This procedure is also used in the case of financial services, expenditures by charitable institutions, clothing provided by the military, net foreign remittances, and food produced and consumed on farms, using, respectively, CEX reported totals for checking plus saving accounts, charitable contributions, number of members in the military, and other consumption, and a dummy variable equal to one if the household owned a farm and equal to zero otherwise.

In the case of health care expenditure, we benchmark the NMES data using the five broad components in the NIPA: physician's services, hospital services, private health insurance, prescriptions, and other medical. Specifically, we form the ratio of each of these components to the corresponding NMES totals (based on the NMES population weights) and then rescale the NMES data on the basis of these ratios. We use the 1977 NMES for the years 1960–61 and 1972–73, and the 1987 NMES for the years 1984–86 and 1987–90.

As the third step in forming the age-sex relative consumption profiles, we allocate the rescaled (NIPA-benchmarked) actual or imputed CEX data to individuals within the CEX household. (This was not necessary for the NMES data because this survey takes the individual as the unit of observation.) For certain types of expenditure, the method of allocation is fairly clear. For example, expenditure on boy's clothing is divided evenly among the household's male children, and pipe tobacco is divided evenly among the household's adult males. For other types of expenditure, we have developed particular rules. Housing expenditure, including imputed rent, is allocated evenly to the head and spouse. Food, vacations, and other items of expenditure that are not readily allocable are divided evenly among the household's adult equiv-

36. See Bosworth, Burtless, and Sabelhaus (1991) for a general comparison of CEX and NIPA aggregates.

alents, where adults (those aged eighteen and over) have an equivalency factor of 1.0, and children have an equivalency factor that increases linearly from 0.3 for newborns to 1.0 for eighteen-year-olds.

The fourth step entails using the NIPA-benchmarked NMES data to calculate age- and sex-specific weighted average values of each of the five types of health care expenditure. These values are then attributed to individual members of the CEX households, on the basis of their age and sex. We also allocate to individual members of the CEX households, on the basis of their age and sex, average values of privately paid educational expenditure. These average values are determined by calculating average elementary and secondary school expenditures per child aged five through eighteen and average college expenditures per person aged eighteen through twenty-four.

In the fifth step, we reallocate all of the children's expenditure from the CEX, including the imputed health care expenditure, evenly to the head of household and spouse. We then combine these NIPA-benchmarked, actual or imputed CEX data for particular years (1960–61, 1972–73, 1984–86, and 1987–90) to form the ratio of the average value over these years of the total expenditure of adults of a particular age and sex to that of forty-year-old males. This provides our four age-sex relative consumption profiles.

We use our four age-sex relative consumption profiles and our age- and sex-specific population data to allocate total NIPA consumption over the four periods by age and sex. This may seem an unnecessary second round of benchmarking of aggregate NIPA consumption, but in so doing, we ensure that our final calculated values of average consumption by age and sex are consistent with the census population data that we use to calculate age- and sex-specific values of average remaining lifetime resources. In particular, we avoid the under- or overestimates of average age- and sex-specific consumption that would arise if the CEX household weights were systematically too high or too low.

Comments and Discussion

Barry Bosworth: This is a most interesting addition to the literature on the decline in the U.S. saving rate. It is useful both as an illustration of the use of generational accounting to analyze saving behavior, and for the clarity of its conclusions: namely, that the decline in national saving is due, first, to a large redistribution of claims on resources from the young and unborn to the old, and second, to a marked increase in the propensity of the elderly to spend the resources under their control.

The analysis is somewhat unconventional in the focus on the national, as opposed to the private, saving rate as the basic behavioral variable. The authors employ a strict version of Ricardian equivalence. However, anyone familiar with Kotlikoff's mantra about the arbitrary nature of current measures of the public budget balance should not be surprised.

First, the authors develop a new data set of the age distribution of total consumption that is consistent with the aggregates of the national accounts. The results indicate a dramatic shift in the distribution of total consumption toward the elderly. Since 1960, individuals aged sixty-five and above have seen their real consumption increase at a rate more than twice that of the population as a whole. By the late 1980s, the consumption of the elderly had grown to the extent that consumption per capita was nearly flat across age groups (tables 3 and 4). This is particularly striking given that the consumption of the young includes the cost of raising their children.

Second, the authors develop another data set on the age distribution of aggregate resources. Resources consist of the standard components of human and nonhuman wealth less the generational account as defined by Kotlikoff and others. While these results show a large redistribution of resources toward the elderly, the shift is less than that for consumption, which implies a significant rise in the ratio of consumption to wealth for the elderly.

The authors use these data sets to decompose the change in aggregate consumption, and hence the national saving rate, into the contribution of changes in the age distribution of resources; age-specific spending propensities (out of resources); the age distribution of the population; and the government spending rate. The authors focus on the consumption-to-wealth ratio because they expect it to be more stable, or amenable to greater interpretation, than the consumption-to-income ratio.

While some of their results are sensitive to the choice of a discount rate, using a 6 percent discount rate the decline in the national saving rate between 1960–61 and 1987–90 (table 7) can be allocated as follows:[1]

Component	*Percentage point change*	
Changes in resources		−4.1
Overall accumulation	1.5	
Transfers from the unborn to the living	−4.0	
Transfers from the young to the old	−1.6	
Changes in spending propensities		−1.5
Old	−2.4	
Young	0.9	
Changes in age distribution		0.9
Changes in government spending		0.4
Total		−4.3

First, wealth transfers from the unborn (the generational account) are the overwhelming source of the decline in the national saving rate: 4.1

1. Ignoring a small interaction term.

percentage points.[2] In fact, exclusive of the generational account, the living population has a lower wealth-to-income ratio than in 1960–61, which should have raised the national saving rate by 1.5 percentage points. Second, among the living population there is a large redistribution from the young to the old. However, despite the large growth in their resources, the aged consumed their wealth at a greatly accelerated pace during the period 1987–90, implicitly reducing their bequests. The behavior of the aged reminds me of the owner of the Washington Redskins who complained that his manager was given an unlimited budget and still managed to exceed it. Were it not for the transfers of the wealth to the elderly and their spending profligacy, the national saving rate would have increased by half, instead of falling by half.

Is this a plausible story? Have the authors explained the decline in saving? Certainly there has been a huge transfer of resources to the aged, but can this really account for the drop in national saving? Are present definitions of public and private saving as meaningless as the authors suggest? Everything depends on the quality of the two data sets that they develop and on their model, in which consumption is related to a definition of total resources that embodies Ricardian equivalence.

Their data on the age distribution of consumption differs from that obtained from normal surveys in three major respects. First, the Consumer Expenditure Survey includes only out-of-pocket medical expenses, whereas the national accounts measure both government and insured health care payments in private consumption. Second, the surveys exclude imputed rent on owner-occupied housing, which is included in the national accounts. And third, the ratio of expenditures of the national accounts to the total of the survey varies substantially across categories and time. The authors use the survey data to distribute the national accounts data on consumption by age. Separate information is used to compute the age pattern of medical care and imputed rent. The most serious potential objection to their procedure lies in the assumption that the errors in the survey responses are distributed on a proportionate basis—that those who report zero expenditures do so with

2. It is interesting to note that while the young complain that the old have borrowed from the future, these data imply that they are doing the same. The real losers are the unborn, not the young.

zero error. In addition, the CEX, as a source of information on the consumption-income balance, is a very low quality data set.

In an earlier study, Burtless, Sabelhaus, and I decided not to use the CEX to analyze saving behavior after 1986 because the time series of the saving rate computed from the survey was uncorrelated with the saving rate of the national accounts.[3] Sabelhaus's own analysis also showed large fluctuations in the ratio of the survey aggregates to those of the national accounts. It would be useful if the authors would show, beginning with the survey data, how the successive adjustments affect the age distribution of consumption. They do provide information on the role of medical care, which is responsible for 60 percent of the change in the age distribution of overall consumption. It would be useful to have similar information on the role of imputed rent and the coverage adjustments. Their basic conclusion that there has been a large shift in the age distribution of consumption seems plausible, but it is basically a medicare story.

The calculation of the age distribution of resources seems more questionable, however, if for no other reason than that the basic survey data on wealth are so bad. Furthermore, while the shift from a measure of income to a wealth concept is quite straightforward for labor income, it results in an age distribution of tangible capital much different than that of capital income because the rate of return is not the same across all types of capital. The accuracy of the age distribution of wealth is important because if the shift of consumption toward the elderly were matched by an equally large shift of resources among the living, and marginal propensities were similar, there should be no implication of a decline in saving.

I am left with two major sources of doubt as to whether the authors have really provided a causal explanation for the decline in the national saving rate. Both arise from the question whether their concept of wealth is really a driving determinant of consumption. First, there is the issue of timing. The bulk of the decline in saving is attributed to the change in the generational account, but that change was largely completed during the 1960s or early 1970s—the introduction of medicare and medicaid, and the expansion of social security benefits. Yet the national saving rate did not begin to decline until the 1980s. Second,

3. Bosworth, Burtless, and Sabelhaus (1991).

the authors' regression analysis produces no evidence that changes in the future component of wealth affect consumption; yet in their decomposition the transfer from unborn generations to the currently living is the bulk of the story. While I agree with their recitation of the problems involving such a regression analysis, a positive association would have been very powerful support for the basic story. We still have no evidence that the generational account is relevant to explaining household consumption decisions.

Furthermore, the value of factoring the consumption-to-income ratio into ratios of consumption to wealth and wealth to income would have been greatly enhanced if the consumption-to-wealth ratio was found to be more stable over time than the consumption-to-income ratio. In fact, the two ratios seem equally unstable and difficult to explain. They could have obtained a very similar story by simply adding medical care and imputed rent to the standard consumption-income survey.

One important contribution of this paper lies in highlighting the role of the medical programs. How should one treat medical care when it is provided on demand, at near-zero cost to the recipient? Is it really "consumption" if the elderly are not free to reallocate the funds to other forms of consumption? In a standard consumption-income analysis, the payments would be added to both the numerator and the denominator, producing very little effect on the overall ratio of consumption to income. In switching to a consumption-resources concept, however, one needs to know if the ratio of the capitalized value of future medicare payments to current medicare payments is similar to that for other forms of income received by the elderly. Furthermore, what about the counterfactual case? What would have happened to the spending of the elderly on health care and other consumption if the medicare program had not been created?

Finally, the authors raise a very interesting issue about the increased annuitization of wealth as a possible source of the decline in saving. They show a very large rise in the annuitized proportion of their wealth concept. That is largely due to the expanded role of medicare, rather than an increased tendency to convert private wealth to annuities.

In summary, this paper makes a substantial contribution by documenting the extent of the shift in consumption and resources from the young and unborn to the aged. I am less convinced that it provides a plausible explanation for the decline in saving.

Robert Haveman: Gokhale, Kotlikoff, and Sabelhaus present a national accounts-based, life cycle framework for decomposing the decline in U.S. *household* saving (defined such that net national saving equals NNP less consumption less government exhaustive expenditure) into a set of factors defined as "determinants" of household consumption spending (and hence, household saving). Their analysis is both provocative and enlightening. I concentrate on the decomposition analysis that underlies their primary policy conclusion.

The following equation forms the basis for their decomposition calculations:

$$C_t/Y_t = [\Sigma(c_{it}/r_{it})(r_{it}/r_t)(P_{it}/P_t)]\ R_t/Y_t,$$

where C_t, Y_t, R_t, and P_t are aggregate consumption, net national product, "resources," and population, respectively, in year t; and c_{it} and r_{it} are the per capita components of the corresponding aggregate values, in which i designates the cohort. It is important to note the resource variables in this equation, r_t and r_{it}, at the outset; resources are defined as the present value of all remaining lifetime assets or income flows.

Given this framework, the change in the national saving level can be decomposed with period-specific information on four variables: the discounted present value of each cohort's remaining lifetime resources, r_{it}; the level of consumption of each cohort, c_{it}; the size of each cohort, P_{it}; and Y_t. (Note that the level of exhaustive public spending, G_t, is subtracted from Y_t in this definition of saving; hence the level of this component of Y_t must also be known.)

With this information, responsibility for the *change* in saving can be assigned to the following determinants:

—change in the age-cohort propensities to consume ($c_{it}/r_{it} = \alpha_{it}$);

—change in the relative level of resources available to each cohort (r_{it}/r_t), referred to as the "age-resource profile";

—change in the relative size of each cohort (P_{it}/P_t); and

—change in the ratio of resources to net national product (R_t/Y_t), referred to as the "resources-to-output ratio."

The authors use this accounting framework, with the appropriate estimated time- and cohort-specific values, to investigate the effect of intergenerational resource redistribution (IRR) on the national saving rate ($[Y_t - C_t - G_t]/[Y_t - G_t]$). IRR is characterized by changes in both the age-resource profile and the resources-to-output ratio.

They ask, for example, how changes in the distribution of resources among age cohorts (r_{it}/r_t) from young to old, which distribution is clearly affected by governmental policy, have caused the national saving rate to change. And, how redistribution from future to current generations (raising r_t/Y_t) has affected national saving. They conclude that the decline in national saving is primarily due to these two components of IRR, in particular, the latter (in combination with an increased propensity to consume out of resources). They consider the increases in social security, medicare, and medicaid benefits, which are increasingly annuitized and paid in kind, as the underlying culprits in generating the measured changes in both the age-resource profile and the resources-to-output ratio.

The clue to understanding both the authors' procedure and their conclusion is their concept of "cohort resources," defined as

$$r_{it} = nw_{it} + hw_{it} + pw_{it} - ga_{it},$$

where *nw* is nonhuman wealth, *hw* is human wealth, *pw* is pension wealth, and *ga* is the "generational account." Within this equation, the definition and construction of ga_{it} is the central issue.

The authors document that these cohort-specific components of resources have changed remarkably over time. For example, for young cohorts, the relative level of hw/r has declined substantially, reflecting the secular downward trend in the ratio of the earnings of younger relative to older workers. Similarly, for older cohorts, the relative value of pw/r has risen, reflecting the substantial growth in the level of pension assets.

Much of the time-related action in these cohort-specific components comes in the generational account term (ga_{it}), and it is shown in figure 8 (see also table 14). To understand what is happening in this figure, remember that the generational account of a particular cohort is the present value of the stream of net taxes (taxes less public transfers) for which its members are liable. Hence the positive values in the figure, for example, for young cohorts, represent net *liabilities*: they are projected to pay more in taxes than they will receive in transfers over their remaining lifetime. On the other hand, the negative values for older cohorts represent net *assets*: they will receive more transfers during their remainng lifetime than they will pay in taxes. As the figure shows, ga_{it}/r_{it} (so defined) has fallen for nearly all cohorts, implying that for younger cohorts, net tax liabilities have fallen, while for older cohorts, net transfers have risen. The increase in the net transfers to older cohorts is remarkable. It is largely this change that underlies the authors' fundamental conclusion that it is "the uncontrolled intergenerational redistribution from young savers to old spenders" that has been fueling ever lower rates of U.S. saving.[1]

Having identified the secular fall in ga_{it}/r_{it}, especially among older cohorts, as a source of this central conclusion, one can begin to inquire into the underlying basis for the estimated change in ga_{it}, and ask whether, in fact, consumption (saving) behavior is likely to be governed by the value of this component.

To begin, recall what the cohort-specific generational account represents. For any age group, this dollar amount is the present value of the expected stream of tax liabilities less the present value of the expected stream of public transfer income (primarily, welfare, social security retirement and disability, medicare, and medicaid benefits, and food stamps). It is taken to represent the net present value (positive or negative) of the burden of the public sector on individuals of various ages, including those as yet unborn.

In a long series of related papers, Auerbach, Gokhale, and Kotlikoff have presented their estimates of the generational account, so defined. As with many of the values necessary for the estimates in this paper, the construction of the generational account requires numerous conventions and assumptions, many of which are arbitrary and artificial. Listing a few will reiterate the fragility of such estimates of the cohort-specific net fiscal burden:

—The structure of tax-transfer policy as it currently exists (including the relationship between aggregate public transfers and taxes, which could be labeled the "net tax-transfer deficit") is projected into the indefinite future, as if future policy would fail to respond to imbalances or changed circumstances. The estimated generational account does not allow for future economic growth, macroeconomic changes in policy, or microeconomic changes in labor supply, bequests, or population in response to the presumed intergenerational imbalance.[2]

1. Note that both the numerator and the denominator of ga_{it}/r_{it} are determined by the estimated value of the generational account.

2. Similarly, the observed cohort profile of labor income (that is, relative age-specific wages) in the latest year is reproduced in each future year; neither economic

—The burden of covering both the shortfall in the present value of net taxes paid by generations currently living and the present value of the fiscal liabilities generated by all future generations is carried only by generations as yet unborn; members of currently living generations bear none of it. This is the main reason for the very large growth in net "benefits" to older generations (and the smaller reduction in net burdens borne by younger generations) observed in figure 8.[3]

—The effect of public nontransfer expenditures (for example, exhaustive expenditure on public physical and human capital, farm policy, and environmental regulation) on young and old cohorts is totally excluded from the calculation of the generational account; hence the large and growing public expenditure on education and child care—expenditure that accrues to young cohorts—is ignored in the intergenerational pattern of the *ga* component of cohort-specific resources.

—The estimates of generational imbalance assume that there is no behavioral response to fiscal measures—that the estimated flow of dollars also reflects the ultimate disposition of funds and the incidence of the burden and benefit of government programs. For example, the growth of medicare and social security retirement benefits is assigned only to the elderly; their adult children, who would otherwise have had to shoulder some of this burden, are assigned no benefit.

The estimate of ga_{it} depends on the choice of the discount rate; the authors take it to be 6 percent, but also provide estimates based on 3 and 9 percent. The conceptual basis of this rate is nowhere defined, and its empirical basis is opaque, at best.[4]

Given these concerns regarding the reliability of this central component of cohort resources, the reasonableness of this concept of resources—which serves as the basic force driving consumption (and hence, saving) decisions—is not obvious. This is especially true given that several of the components of the authors' accounting framework

growth nor change in the structure of the economy are allowed to change the shape of this profile in the future.

3. This conclusion would be clear if the generational account for unborn future generations were shown, since this account is necessary to satisfy the present value budget balance constraint that is an essential element in the construction of the generational accounts.

4. The discount rate is described as the "pretax real rate of return" and is defined as [(net worth *less* income from earnings and pensions *plus* the sum of consumption spending and net tax payments)/prior period's net worth] − 1.

are directly determined by this definition of cohort resources. From above, note that the cohort-specific propensities to consume, the age-resource profile, and the resources-to-output ratio, all of which are period-specific, are all directly determined by the measure of cohort resources. And changes in the value of this variable are dominated by changes in the generational account. Is it reasonable to believe that in a regime in which the current structure of policy remains fixed beyond the limit of their short-term projections, individuals base their consumption decisions on this arbitrarily defined and measured concept of resources that both rests on, and secures the bulk of its time-related variation from, the estimation of the lifetime trajectories of the taxes to be paid and the transfers to be received (that is, ga_{it})?

The above discussion suggests that the authors' basic conclusion regarding the cause of the decline in national saving may be too facile. With their decomposition procedure, those components that are correlated with the variable whose time trend is being analyzed (aggregate saving) will be assigned the primary causal responsibility for the observed trend in this variable. In this exercise, the central causal component is IRR, in the form of both r_{it}/r_t (the age-resource profile) and R_t/Y_t (the resources-to-output ratio). And in turn, the time-related patterns of both these components are dominated by the measured trends in ga_{it}. Given the arbitrary nature of this concept of the generational account and its measurement, I remain a skeptic as to their conclusion.

In addition to the potential problems with the definition of cohort resources that drives the calculation, the framework for decomposition has questionable characteristics. In essence, the authors' procedure is akin to what has been referred to as "shift-share" analysis in other contexts. It requires simulating changes in one of the variables while holding constant the others. Because most of the components of the decomposition exercise are dependent on the estimate of cohort resources, r_{it}, if one component is changed, the others cannot be fixed. For example, given their definitions, if the resources of the aged are increased, the consumption propensity profile, $c_{it}/r_{it} = \alpha_{it}$, and the resources-to-output ratio, R_t/Y_t, must also change. If this is so, what interpretation can be placed on the counterfactual simulation exercises on which their conclusions rest?[5]

5. Perhaps this interdependence lies behind a puzzling pattern in the estimates.

I have a couple of additional puzzles to be addressed. First, when the ratio of consumption to resources (the average propensity to consume out of resources) has grown so little over the thirty-year period (excepting for the very oldest cohorts), how can it account for such a large share of the decline in the saving rate—from about one-third to one-half (at the 6 percent discount rate, see table 8)? Is it conceivable that changes in the average propensity to consume of this relatively small group alone could account for such a large share of the decline in the saving rate? Second, to what extent does the allocation of 100 percent of medical care expenditure to consumption (as opposed to investment in health capital) drive the authors' result? How would their conclusions regarding the magnitude of the decline in the saving rate—and the allocation of this decline to its various components—change, for example, if one-half of the increase in medical care services was defined as contributions to health capital (and hence, saving) and one-half to consumption; or, if such expenditure was defined as saving or investment for individuals less than fifty years old, but as consumption for older citizens?

One final thought: although they describe their framework as deriving from the life cycle model, the assumptions necessary to make this linkage—no uncertainty and smoothly functioning annuity markets—make the claim less than convincing. Moreover, these assumptions are required to obtain their empirical measure of cohort-specific resources, r_{it}, which, as I emphasize above, is central to their analysis.

These concerns and puzzles notwithstanding, I stand in admiration of the empirical effort that this paper represents. It is a tour de force in terms of data assembly and analysis, and in its tracing of NIPA-consistent time trends. The authors' analysis of these trends, apart from the decomposition analysis, does support several of their basic conclusions. For example, if medical care services represent consumption, the increasing consumption propensity of the elderly seems indisputable, and the contributions of both medicare and social security retire-

Referring to table 7, the authors state that if the ratio of resources to output in 1960–61 had prevailed in 1987–90, saving rates would have been 75 percent larger. Yet in the lower bank of that table, the underlying ratio of resources to output is shown to have risen from 12.53 to 12.96 over this period, an increase of 0.43, or about 3 percent. It is not clear how such a small change in this component of IRR could generate such an enormous change in saving.

ment benefits to consumption, so defined, are clear from their series. And it is quite plausible that this increase in spending propensity stems from the fact that these benefits are either annuitized or paid in kind. It is less clear whether this increase in consumption by the elderly is attributable to "the government's redistribution of resources toward older generations," or whether, whatever its source, it can explain the bulk of the decline in national saving.

General discussion: Several participants commented on the degree to which resources of the elderly have become annuitized, and the implication of annuitzation for saving. Social security benefits represent a much larger proportion of U.S. personal income today than in the 1960s, and the role of medicare in providing medical coverage for the elderly has substantially expanded. While some thought that the trend toward annuitized wealth is responsible for increasing consumption propensities among the elderly, others suggested that the private sector might provide the same sorts of annuities in the absence of programs like social security. Therefore they concluded that the role of social security and medicare in contributing to the elderly's spending rate is ambiguous. Still others, while believing that social security and medicare have had a negative impact on national saving, questioned whether the higher saving rate that would occur in the absence of these programs would represent a welfare improvement.

Charles Schultze noted that the impact of social security and medicare on national saving depends crucially on the alternative to these programs. He suggested that the most likely response of economic agents to the absence of government-provided longevity insurance and old age health care would be some combination of risk pooling, changed savings behavior, and increased reliance on adult children in old age. He concluded that the effect on national saving of eliminating the social security and medicare programs is therefore ambiguous. William Dickens agreed, observing that the growth in medicare reflects, in large part, the demand for new medical technology that, in the absence of medicare, would most likely have been provided by some form of old age health insurance. Household saving behavior in that situation would probably not differ greatly from what is observed. He speculated that employers would probably offer this kind of health insurance to their employees on a pay-as-you-go basis, unless constrained by the ERISA.

Kotlikoff expressed reservations about these arguments, noting that evidence in favor of intergenerational altruism is very weak, which suggests that the level of support for the elderly in the absence of government-run programs would be substantially less than it is currently. Kotlikoff pointed out that firms that try to finance health insurance on a pay-as-you-go basis will see their stock values decline, so there is no net wealth effect, and thus no stimulus to aggregate consumption as would arise under unfunded social security. Matthew Shapiro suggested that the elderly do not value a dollar in the form of medicare as much as a dollar in cash from social security or other sources. As a consequence, medicare may be one of the reasons behind the high measured consumption propensities of the elderly, and their high spending rates raise questions about the efficacy of the medicare program.

James Tobin thought it likely that the increased annuitization of wealth among the elderly does, in fact, reduce national saving and thereby might be affecting capital formation. However, he questioned the wisdom of trying to raise national saving by abandoning government-run longevity insurance because the resulting increase in national saving would not be welfare improving. Unless there are other, offsetting reasons for undersaving, the abandonment of such insurance would lead to excess capital formation. Tobin noted that when insurance can take the place of capital formation, the outcome can represent a welfare improvement. Conversely, abandoning social security to raise national saving is questionable on efficiency grounds. Gregory Mankiw noted that Tobin's analysis holds for a first-best world without distortions, but observed that in a second-best world with capital income taxation, there is probably too little capital. Under these circumstances, longevity insurance would reduce saving further and exacerbate the existing distortion. Kotlikoff responded that he was not concerned with the effects of longevity insurance per se, but rather with the pay-as-you-go nature of the social security program that transfers resources from the young to the old. Further, he noted that this approach to longevity insurance clearly depresses national saving, and that politicians should be cognizant of this fact. Kotlikoff proposed tax reform as a way to raise national saving under the current social security system.

A number of speakers discussed the role of imperfections in annuities markets and their possible repercussions for the bequest motive. Benjamin Friedman noted that imperfections in annuities markets are, in fact, severe. He reported that the pricing of nongroup annuities in the United States, as opposed to annuities bought through corporate pension plans, have loads on the order of 30 percent, even from the best providers. He concluded that the imperfections in the single-life annuities market in the United States are considerable. In addition to high loads for the population that buys annuities, he believed that adverse selection problems are substantial, noting that the subpopulation that buys single-life annuities has very different mortality schedules than the general population. Kotlikoff concurred, explaining that data on bequests indicate that a large fraction of these transfers are made involuntarily, because large insurance premiums make it impossible for people to annuitize their wealth. Tobin remarked that the effects of market imperfections in annuitization would be exacerbated if agents were risk averse, increasing the size of involuntary bequests.

Mankiw was critical of Kotlikoff's view that bequests are mostly accidental and that intergenerational altruism is weak. He noted that under these circumstances, the only way to explain observed bequests is to assume that annuities markets are highly imperfect, so that economic agents cannot annuitize their wealth. While he conceded that high insurance premiums in annuities markets are likely because of adverse selection problems, he observed that estate planning attorneys prosper precisely because people care about leaving bequests. Mankiw suggested that the analysis should distinguish between the wealthy, who have access to sophisticated legal and financial advice, and the rest of the population. In his view the wealthy, who control most of the nation's wealth, leave largely voluntary bequests, while the rest of the population makes involuntary bequests as a result of imperfections in the annuities market. He concluded that taking account of these two tiers would provide a more satisfactory explanation of intergenerational transfer.

A number of participants thought that measurement error might be to blame for the high estimates of the consumption propensities of the elderly, although Kotlikoff did not. Friedman observed that one of the most interesting trends over the last two generations has been the increase in the number of retired people who live independently, rather than with their adult children. He noted that the authors treat the expenses of living alone strictly as consumption by the retired elderly, although it is apparent that today's adult working population values the independence of their elderly parents. John Helliwell suggested that the elderly's consumption might be overestimated because a larger proportion of their consumption on housing consists of imputed rents based on the market value of houses, which are themselves inaccurately measured. He suggested that insofar as imputed rent is responsible for the high spending rate of the elderly, it appears less alarming.

Robert Hall was concerned that too much importance is placed on the fall in national saving, warning that the link between national saving and the U.S. capital stock is tenuous. He explained that in a simple Tobin-style model of the life cycle, the effect of a reduction in national saving on capital formation would depend on the degree of international capital mobility and on agents' elasticity of intertemporal substitution, both of which affect the slope of the supply of funds schedule. In the extreme case of perfect capital mobility, and under the small country assumption, the supply of funds schedule is horizontal at the world interest rate, so that a decline in national saving shifts ownership of the capital stock away from domestic citizens and toward foreigners, while leaving the size of the capital stock unchanged. He conceded that the small country assumption is unrealistic, given that the United States constitutes about a third of the world's wealth, but nonetheless believed that this example demonstrates that a reduction in U.S. national saving need not have a substantial impact on U.S. capital formation. However, Kotlikoff noted that national saving is of prime importance for future national saving.

Edmund Phelps thought that the decline in national saving can be motivated by an unexpected productivity slowdown during the 1970s and 1980s. He argued that during that period economic agents were repeatedly surprised by negative productivity shocks, and as a result, were saving too much in relation to their realized incomes. With time, their nonhuman wealth became large relative to their human wealth, and economic agents started to spend down excess nonhuman wealth because the excess was inconsistent with their expectations of future income. Phelps concluded that the decline in saving rates is due to people trying to return to their optimal ratio of nonhuman to human wealth.

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