Assessing Savings Sufficiency at the Time of Retirement and Ten Years Later: Implications for Social Security and Pension Reform

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ABSTRACT

The adequacy of personal retirement savings in the U.S. is central to the debate over the effect on economic well being of both Social Security reform that would introduce individual accounts and the shift from employer-provided defined benefit to defined contribution pension plans. In this paper, we contribute to this discussion by examining the extent to which individuals maintain initial levels of resource adequacy over the first decade of retirement. We examine the retirement savings adequacy of a sample of Social Security retired-worker beneficiaries., drawn from the U. S. Social Security Administration's New Beneficiary Study. The survey data are matched to Social Security administrative earnings and benefit records. We estimate the annuitized wealth for each individual and couple both at the time of retirement and ten years into retirement. At both points in time we compare the annuitized wealth with two standards of adequacy—a measure of preretirement earnings and a poverty threshold. We analyze the relationship of a variety of individual characteristics to the change in resource adequacy over the period. We test whether initial "adequacy" status persists into retirement, or if differential consumption, changes in family structure (e.g., death of a spouse), or post-retirement savings and work alter that status over time.

I. INTRODUCTION

There is considerable public policy concern regarding the savings behavior of U.S. citizens, specifically the low level of personal savings and the ability to accumulate retirement assets sufficient to sustain economic well-being after retirement.[1] In the United States, Social Security benefits are expected to provide only a base level of support.; individuals are responsible for accumulating additional retirement assets in the form of employer-provided pensions, housing, and financial assets if pre-retirement living standards are to be maintained. Considerable research and policy attention has been paid to the extent to which private wealth holdings at retirement (which reflect consumption-savings decisions during preretirement years) would enable retirees to meet particular levels of consumption adequacy during their expected retirement years.[2] Governmental agencies, policy research organizations and the popular press have commented extensively on this issue, and researchers have reached quite different conclusions regarding the adequacy of the resources available to those who are at or on the verge of retirement.[3]

In this paper, we analyze the maintenance of resource adequacy during retirement; our data allow us to look at resources at retirement and ten years later. We adopt two standards of 'adequacy,' and then study the evolution of retirement resources from the

[1] The 1965 Older Americans Act stipulates the following objective. "An adequate income in retirement in accordance with the American standard of living."

[2] The motivation and basis for consumption-savings choices during preretirement years is a basic and much-studied issue. The earliest empirical contributions to this literature include Modigliani and Brumberg (1954) and Kotlikoff and Summers (1981). Recent contributions to this debate are Banks, Blundell and Tanner (1998), Bernheim, Skinner and Weinberg (2000), Hurd and Rohwedder (2003), and Venti and Wise (2000); see also Bloom. et al (2002).

[3] See Engen, Gale, and Uccello (1999) for references to media and governmental analyses of this issue. A report of the U. S. Congressional Budget Office (2003) summarizing recent findings highlights the current policy interest in this issue.

time of retirement (when most respondents are in their mid-to-late sixties) to a date ten years later (when most are in their mid-to-late seventies). One adequacy criterion is private or individual; using it, we compare the annual lifetime income stream that can be supported by retirement assets to an indicator of the actual standard of consumption attained by these retirees during their preretirement years. The other standard is 'social;' here we compare the available annual lifetime income stream to a social-minimum standard of consumption based on the nation's poverty line. Using these two standards, we provide evidence regarding the evolution of 'adequacy' during the first decade after retirement for both the entire group of retirees and various subgroups (e.g., those with low levels of resources at the time of retirement, those whose retirement assets are concentrated in financial holdings, those who work after retirement, and those experiencing health problems during retirement). To our knowledge, ours is the first study focused on the evolution of available resources after the retirement decision.

II. PREVIOUS LITERATURE

Other studies have analyzed the 'adequacy of savings' of people at or near to their retirement, using a variety of approaches. All of them assess adequacy by comparing the level of assets held by these older people to a variety of standards (typically tied to consumption levels prior to retirement), taking account of the number of years of remaining life over which support is required. They reach quite different conclusions.[4]

For example, Engen, Gale, and Uccello (1999) develop a stochastic life cycle model, in which families save both for retirement and as a precaution against

[4] We review this literature in Haveman, Holden, Wolfe and Sherlund (2005).

uncertainty.[5] Adequate wealth accumulation is defined to be an amount sufficient to enable smoothing of the marginal utility of consumption over the life cycle, a standard that implies the ability to sustain the level of preretirement consumption into retirement years. They find that the retirement resources of over 60 percent of married couples exceed this target (relative to an expected 50 percent in a stochastic model), implying that on average the level of private resources is 'optimal', or adequate.[6] They also calculate the ratio of annuitized wealth to final earnings, indicating an overall average replacement rates of between 70 and 80 percent. After accounting for decreases in consumption needs in moving from preretirement years to postretirement (due to reductions in work related costs, mortgage interest expenses, and the costs of supporting children), they conclude that the overall wealth accumulation of older Americans is "adequate."

Wolff (2002), who uses the Survey of Consumer Finances for years 1983, 1985, 1989 and 1998 to examine the savings adequacy question, reaches a rather different conclusion. He calculates "expected retirement income"—a rough estimate of annuitized wealth at the expected age of retirement—for each household in each of several annual demographic groups. For those aged 47–64, expected retirement income increases over the period studied, while the share of those whose expected retirement income falls below the nation's poverty line increases from 17 to 19 percent. Similarly, the share of those whose expected retirement income is equal to less than 50 percent of current income increases from 30 percent to 43 percent. Wolff concludes that there is a serious shortfall

[5] To incorporate uncertainty of earnings in preretirement years, heterogeneous earnings shocks over the preretirement years are introduced. When this stochastic pattern is recognized, some households who have optimal savings will have wealth-earnings ratios below (above) the median and hence be seen as having inadequate (adequate) savings.

[6] However, for those married couples at the 25th percentile or below, the target is not attained, suggesting that about one-fourth of the households are undersaving.

in retirement income at end of the 1990s, and that the problem has increased over time.[7]

The variation in conclusions of these and other studies is caused in part by basic differences in data, assumptions, estimation procedures, and the definition of adequacy used. Engen, Gale, and Uccello (1999), conclude that when a variety of adjustments are made for differences in assumptions and estimating procedures, there may be less disagreement regarding the overall adequacy of retirement savings than is generally recognized. Nevertheless, questions remain regarding how best to define the resources available in retirement, select an adequacy criterion, incorporate changes in household structure over the retirement years (in particular, the probability of widow[er]hood and associated changes in resources and consumption needs), and estimate the number of years of retirement over which retirement resources must be allocated.

All of these studies compare an estimate of available resources at or close to retirement with some standard of adequacy. None of them report on the evolution of resources available during the years after retirement. Indeed, conclusions regarding resource adequacy at retirement implicitly assume the annual consumption stream that is enabled by available resources persists throughout each individual's remaining lifetime. However, such snapshots of savings adequacy ignore variations in adequacy levels during retirement years. Initial levels of adequacy may grow, and intentionally so if individuals included in their retirement plans strategies for continued asset accumulation. Assets may also grow because of the receipt of bequests or survivorship assets, or because post-retirement consumption was slower than expected. Thus, estimates of resource inadequacy at retirement may not persist over retirement years for some individuals. Conversely, the level of available resources may deteriorate during the years after

[7] Note that this conclusion is about cross-cohort differences, not about changes over time for single cohorts.

retirement because of special needs (e.g., health), unwise investment choices or bad luck. Measures of savings adequacy at retirement do not indicate the evolution of consumption possibilities during the retirement period. Our study explores these post-retirement patterns of savings adequacy.

III. OUR RESEARCH APPROACH

By comparing the picture of adequacy of resources both at the time of retirement and ten years later, we are able to assess how individuals (and couples) fare during their retirement years, and to determine if those with adequate (inadequate) resources at the time of retirement maintain that status or change position in systematic ways.

Our sample is from the Social Security Administration's New Beneficiary Survey (NBS), a sample of individuals who first applied for Social Security benefits in 1980-81. The sample of new retired-worker beneficiaries implies a definition of retirement as first receipt of Social Security retired-worker benefits. The NBS is fully matched to Social Security administrative earnings and benefit records for respondents and benefit-eligible spouses, providing accurate measures of both pre-retirement covered earnings and unreduced Social Security benefits. The NBS interviewed respondents shortly after first benefit receipt (in 1982) and the surviving members approximately ten years later (in 1991). With these data we are able to examine the persistence of retirement savings adequacy status over time.

Our use of the New Beneficiary Survey and (1991) follow-up enables us to avoid one of the major issues confronting prior studies. In particular, we have data on the wealth holdings and household structure of a large sample of men and women at the time

of their retirement, and hence do not have to forecast these values from observations at a time prior to retirement.[8] With the matched covered earnings records we are able to estimate permanent preretirement earnings over the prime working years of a new retiree and spouse (if married), rather than relying on single year and possibly transitory values of earnings. Data on earnings in last and longest jobs allow us to estimate covered earnings that exceed the taxable (and reportable) limit as well as uncovered earnings. We include in wealth estimates for couples the survivor benefits from Social Security and pensions for which each spouse is or would become eligible over the remaining expected retirement years.

For each respondent, we use these net wealth data to estimate the annuitized value of wealth holdings (ANW) in both years using projections of remaining years of life. We summarize these patterns and show the contributions to changes in both wealth and ANW over the first decade of retirement of the financial, home equity, pension and Social Security components of these values.[9] We then assess the adequacy of these resources to meet consumption needs over the years of retirement by comparing ANW to two standards of 'adequacy. The first is a widely accepted standard in the literature—having available retirement income (ANW) equal to or greater than 70 percent of preretirement earnings (regarded as the income necessary in order to maintain preretirement consumption). The second is a social criterion of adequacy—having available retirement

[8] Net wealth is the sum of financial and property resources, the net value of own home (home value less outstanding mortgage), and the present discounted values of expected pension benefits and of expected Social Security benefits. Respondent reports provide information on all of these values except Social Security benefits, which are from matched benefits data on both respondents and spouses. Linked Social Security records have been updated through December 2000 and earnings through 1999.

[9] Appendix A describes our data, procedures, and definitions, and presents the characteristics of our sample of "retired" workers. All respondents are workers who have sufficient quarters of work to qualify for Social Security benefits and whose earnings did not disqualify them from beneficiary status. These are "retirees" as defined by the receipt of retired-worker Social Security benefits.

income (ANW) equal to or greater than poverty and near-poverty levels of income. Finally, we study the relationship of a variety of individual characteristics to changes in the level of resources and resource adequacy from the time or retirement to ten years after retirement. In examining changes in adequacy measures over the 10-year period after retirement, we test whether initial "adequacy" status persists into retirement, or if differential consumption, changes in family structure (e.g., death of a spouse), or post-retirement savings and work alters that status over time.

IV. Wealth and ANW: 1982 and 1992

Patterns of Wealth Levels and Change

Table 1 shows mean asset (total net wealth) holdings in 1982 and 1991 (in 1994 dollars) of our sample of retired workers, distinguished by gender and marital status.[10] Table 1 also shows the composition of assets in each year, the percentage change over the period in both total net wealth and its components, and the contribution of changes in the level of each of the components of net wealth to the total change in net wealth.

In 1982, the mean level of assets of both married men and married women exceeds $500,000. The asset value of Social Security benefits is about 40–50 percent of this total, while financial wealth accounts for 20–30 percent. By 1991, mean assets had fallen by about $150,000 (30 percent) for married women, and by $115,000 (22 percent) for married men. The decrease in Social Security wealth accounts for about half of the

[10] We have compared our estimates of asset values for the NBDS sample with those of other studies. Our estimates are generally consistent with those of studies that rely on data from the Health and Retirement Study (HRS), and greater than those based on the Survey of Income and Program Participation (SIPP). However, they are substantially smaller than estimates of asset holdings for households headed by persons aged 62–70 years in the Survey of Consumer Finances (SCF). This difference is likely to be due to the higher proportion of older persons in this age range in the SCF, as well as the substantial efforts of the SCF in collecting wealth data, especially among high wealth individuals. This comparison is available from the authors upon request.

1982–1991 reduction in total assets; a reduction that is largely due to the shorter remaining lifetime in 1991 over which Social Security benefits must be spread in estimating the wealth value of social security benefits.[11] Social Security wealth of married women fell by 37 percent over this period, while for married men it fell by 25 percent, reflecting the greater prevalence of widow(er)hood among women who were married in 1981 than among married men. The wealth value of pensions fell by about 25-30 percent from 1982 to 1991, again reflecting in large part the reduced number of years of remaining life over which a pension benefit would be paid.[12] Financial wealth fell by about one-quarter, suggesting the drawing down of this wealth stock to support living costs during retirement. Interesting, housing wealth remained virtually constant for both married men and women, suggesting that increasing housing values may offset movement out of home ownership by retired couples (including individuals who are widowed over this period). Pensions and financial wealth contributed about the same percentage to the total decline in wealth among married women and men.

A similar pattern is observed for single men and women. In 1982, single men held about $291,000 in assets upon retirement, while single women held $258,000. As with married couples, Social Security wealth accounts for the larger share, just under half, of total wealth. A substantial gender disparity in financial wealth exists, with the holdings of single men ($92,000, or 32 percent of total wealth) nearly double that of single women ($48,000, or 19 percent of total wealth). Conversely, housing wealth accounts for a larger share of the total wealth of single women (18 percent) than of single men (13 percent).

[11] Annual Social Security benefits are a lifetime annuity. The present discounted value of an annuity evaluated over a larger number of years of expected life (as in 1982) will be greater than its present value evaluated over a smaller number of years (as in 1991).

[12] Individual retirement accounts and 401(k) plan accumulations are included in financial assets.

Over the first ten years of retirement, the wealth of both single men and single women fell; the decrease for single women is 22 percent, and for single men is 13 percent. As with married couples, the decrease in pension and Social Security wealth accounts for the bulk of the reduction in wealth over the decade. It is noteworthy that the percent decrease in pension wealth (by 36 percent for single women and 28 percent for single men) is greater than the fall in Social Security wealth for each group.[13] For single men, housing wealth actually increased by more than 10 percent over the first ten years of retirement. However, the value of the housing stock of single women housing stock fell by over 15 percent over the 1982–1991 period, perhaps reflecting a more rapid rate of exiting home ownership or residence in neighborhoods with falling housing prices.

For all of the groups, the change in Social Security wealth accounted for the major share of the decline in net wealth over the first decade of retirement; its contribution ranged from 46 percent of the overall decrease for single women to 60 percent for married women. Across the groups, decreases in financial wealth accounted for between 16 and 25 percent of the fall in net wealth, while pensions accounted for between 19 and 29 percent of the decrease. The fall in housing wealth accounts for about 12 percent of the decline in net wealth for single women; in contrast, the housing wealth of single men increased, offsetting about 12 percent of the decline in net wealth attributable to the decline in other wealth components. For married couples, housing wealth remained nearly unchanged over the first decade of retirement.

[13] This differential pattern of pension and Social Security wealth change is likely due to a combination of factors that have negatively affected expected pension benefits, including only partial price indexing, the loss of benefits over time due to limited period payment (e.g., to survivors), and employer-related pension cutbacks.

Patterns of Annuitized Net Wealth (ANW) Levels and Change

In Table 2 we show our estimates of the annuitized value of net wealth (ANW) in both 1982 and 1991 (again in 1994 dollars).[14] In contrast to net wealth, ANW takes account of the remaining years over which wealth must be spread (thus differentiating between the sufficiency of wealth of older and younger retirees with identical net wealth) and of potential changes in the size of the consumption unit, principally the probability that married couples will be widowed by the death of the husband or wife. The ANW estimates for married couples are single-person equivalent values; the values for single and married individuals are directly comparable.

For couples, mean equivalent ANW is between $23,000 and $25,000 in 1982, less than that of single men ($26,000), but greater than that of single women ($19,000). For all of the groups the mean level of ANW increased over the first ten years of retirement, with the increase for men (about 12 percent) exceeding that for women (2–5 percent).[15]

The percentage increase in annuitized housing wealth is large for all of the groups except single women. These increases are consistent with constraints on reducing net equity in housing without divesting entirely. The relatively constant levels of housing wealth observed in Table 1 result in large increases in housing-based ANW over the first decade of retirement, as housing value is spread over a shorter lifetime. Interestingly, the annuity value of financial assets increased for all of the marital status/gender groups, in

[14] ANW is the constant level of annual real consumption over the remaining expected lifetime that is supported by wealth holdings observed in each year. For married couples, ANW reflects periods when only one spouse survives.

[15] This increase in ANW from the time of retirement (1982) to ten years later (1991) reflects changes in both wealth levels and the number of years of expected life over which wealth is annuitized. The number of years of expected life falls over the 1982–1991 period, resulting in a smaller number of years over which wealth stocks are annuitized. However, a part of this effect is mitigated by the fact that surviving an additional year reduces the expected remaining years of life by less than one year; having survived for ten years, the expected years of remaining life in 1991 is less than 9 years shorter than it was in 1982.

spite of substantial decreases in the wealth value of financial assets. For all but married women, the annuity value of Social Security wealth increased modestly. Because these benefits are both indexed and paid only as an annuity, the small change recorded over the period from 1982 to 1991 is due to changes in either household composition that alter benefits or to benefit payments adjusted for additional earnings.[16] The annuity value of pension wealth fell for all of the groups, and by nearly 13 percent overall, consistent with the large decrease in the wealth value of expected pensions reported in Table 1 partially accounted for by the absence of full indexing of pension benefits. The decrease in the annuity value of pension wealth is greater for women than for men, likely reflecting the loss of husband's pension upon widowhood (for married women in 1982) and the end of period-certain pension payments (for single women).

V. ESTIMATES OF LEVELS AND CHANGE IN RESOURCE ADEQUACY

In this section, we assess the extent to which the resources available to these newly retired workers are sufficient to enable them to meet both a private standard with ambiguous social implications (the level of individually-chosen preretirement consumption) and a standard with clear social implications (a poverty level or twice poverty level standard of living, taken to reflect the meeting of basic needs) over their remaining years of life. We report this assessment both at the time of retirement and ten years later.

[16] While all sample members initiated benefit receipt, some continued to work with earnings under the earnings limit in place at that time. Some in the sample began benefits but because of returns to work temporarily ceased receiving benefits. Additional covered earnings and interruptions in benefit receipt can increase the benefits for which an individual is eligible. The fall in annuitized Social Security wealth for married women most likely reflects the loss of benefits of deceased husbands. While our ANW estimates take account of the smaller consumption needs of a widowed household, the 1.66 couple/individual consumption requirement is on average smaller than the ratio of couple to widow benefits from Social Security.

To address the first standard of individual adequacy, we calculate a replacement rate (RR) defined as the ratio of ANW to "permanent preretirement earnings."[17] In contrast to gauging "adequacy" relative to each individual's own past level of living, we compare the ANW to the poverty line. If ANW exceeds the poverty line standard, the household has sufficient resources to escape poverty throughout their expected remaining lifetime.[18] We calculate these two indicators of resource adequacy both at the time at which respondents first retired and ten years later.

Column 1 of Table 3 summarizes the median levels of the individual adequacy replacement rate (RR) both in 1982 and 1991. Over all households, the median replacement rate was .83 in 1982, indicating that the resources available to the median retiree more than meet the commonly-accepted 70 percent maintenance-of-consumption standard.[19] Over the first decade of retirement, the RR for the median retiree maintained well-being, the RR increasing only slightly from .83 to .84. At the median, then, the initial measure of this standard provides a good estimate of the RR during the early years of retirement. These medians, however, indicate little about the distribution of replacement rates and the prevalence of shortfalls from the .7 standard. In 1982, about 32

[17]The estimation of our preretirement earnings measure, which is average earnings of the individual or couple from age 50 to one year prior to the respondent's first benefit receipt, is described in Appendix A. The estimation of preretirement earnings includes adjustments for covered earnings above the taxable maximum and for earnings in jobs not covered by Social Security. The earnings of couples are the average over the relevant period of the summed earnings for both spouses.

[18] For each household, the single-person equivalent ANW is compared to the single-person poverty line. For a couple a ratio of 1 or greater implies that adjusting for probability of widow(er)hood and accompanying changes in income, annuitized resources provides a level of income persistently above the poverty threshold.

[19] In the literature on savings adequacy, a standard of 70 percent of preretirement earnings is typically used as the level of post-retirement income necessary to maintain consumption. This 70 percent figure is supported by Boskin and Shoven (1987), who estimate that the "required" replacement rate is about 75 percent after adjusting for preretirement expenses in the form of saving, work related expenses, and taxes that are avoided in retirement years. Bernheim, Skinner and Weinberg (2001) using Consumer Expenditure Data, find reductions in "goods that are potentially complementary to work" (purchases of clothing, transportation and food away from home) do not vary substantially in percentage terms across income quartiles. (P. 852), thus supporting a uniform replacement standard across income groups.

percent of the new beneficiaries fail to meet this RR standard. By 1991, ten years after retirement, the overall percentage increases to 35 percent.

The median "poverty replacement rate" and a ratio based upon a standard of two-times the poverty line are also shown in column 1 for both 1982 and 1991. At the time of retirement in 1982, the median poverty replacement rate is 3.05; the rate was slightly higher, 3.17, ten years later. The adequacy ratios based on twice the poverty line standard rose from 1.52 to 1.58 over the first decade of retirement. Using the twice-poverty standard, about 22 percent of all respondents had resources below the cutoff in both 1982 and 1991. It would appear that on average the overall social adequacy of resources is maintained during the first decade after retirement.

These conclusions on resource adequacy are based on the assumption that the adequacy of retirement savings for an individual can be judged using the expected years of life drawn from life tables for persons of their age, race and gender. However, life-table life expectancies are group averages--about 50 percent of individuals will live longer than this expected value of remaining person-life-years, and some of them much longer. If such long-lived individuals develop retirement savings plans based on average life expectancy, they (and researchers estimating adequacy for them) will seriously overestimate savings adequacy. Individuals who understand the chances of their living longer than this expected value are likely to base their financial plans on assumptions that reflect the likelihood of a longer retired life.

To test the robustness of our estimated values of ANW and adequacy, we estimate the ANW over a longer remaining lifetime equal to that of the person of his/her age, race and gender who is at the 70^{th} and 90^{th} percentile of the distribution of remaining years of

life. Columns 2 and 3 of Table 3 summarize these results for all persons for both the year of retirement and ten years later. Using the results based on the 90th percentile of remaining life years, median ANW at both the date of retirement and ten years later is reduced by about $2000 (10-11 percent) relative to assuming the expected value of remaining years of life. The median RR in 1982 (1991) is reduced from .83 (.84) to .76 (.75), and the percent of the sample that fails to meet the .7 standard increases from 31.7 (34.7) to 40.8 (43.6), or by about 30 (26) percent. The percent that fails to meet the twice-poverty standard in 1982 (1991) increases from 21.9 (21.6) to 25.3 (25.2), or by 16 (14) percent.

Adopting this longer lifetime assumption reduces our estimates of the average level of adequacy both at the time of retirement and ten years later, and increases the proportion of new retirees who fail to meet both standards. Thus, what length of life estimates are used makes a difference in judging whether retirement resources are "adequate" for individuals and on average for a group. However, using the longer lifetimes does not substantially alter the basic picture of adequacy and changes in overall adequacy. While the median individual continues to meet the commonly-used standards of adequacy assuming the longer life expectancies, an increased proportion fails to meet them. But that proportion remains steady over time.

VI. ANW GAINERS AND DECLINERS

While Table 3 implies stability in adequacy over the first decade of retirement for our sample, considerable upward and downward shifts in adequacy occur among individuals in our sample over the 1982 to 1991 period. Due to good or bad luck, or to

wise or foolish choices, some individuals increased their wealth over time while others did not. Table 4 shows the percentage of the sample by replacement rate status (RR below and above .7 and ANW below and above twice the poverty threshold) in 1982 and 1991. Of those sample units who were below the .7 replacement rate in 1991, over one-third (39.2 percent) had been above that threshold in 1982. Likewise of those who were below twice the poverty threshold in 1991, 26 percent had been above that threshold in 1982.

In Table 5, we identify a variety of characteristics of our sample of new retirees; the first column shows the percent of the full sample with each of these characteristics. Columns 2 and 3 indicate the extent to which those with the indicated characteristics are represented among those whose ANW increased or decreased by more than 2.5 percent over the first decade of retirement (those for whom ANW remains stable are not separately identified).[20] We label the first group as 'gainers' and the second as 'decliners.' Over the entire sample of individuals and couples, 38 percent experienced a loss in ANW of more than 2.5 percent over the 1982–1991 period, and 53 percent experienced an increase in ANW of more than 2.5 percent.

The bold numbers in columns two and three indicate the higher value for a characteristic that is significantly different for decliner and gainers. For example, those who retired at an older age are more likely to be gainers than those who retired when younger, suggesting a continued disadvantage in the economic prospects of those who receive benefits early.[21] Several other patterns are also noteworthy. Married men

[20] The ANW calculations in both 1982 and 1991 are calculated as single-person equivalents and so the ANW of persons who are married and single can be aggregated and compared.

[21] Haveman, Holden, Wolfe and Wilson (2000) describes the relatively disadvantaged economic status of individuals who took benefits before age 65. The economic status of early retirees in this sample is a

accounted for 47 percent of the entire sample in 1982, but for only 42 percent of those whose ANW fell by more than 2.5 percent over the next ten years, and for a significantly higher proportion (52 percent) of those whose ANW rose by at least this amount. Both single and married (as of 1982) women, on the other hand, are disproportionately represented among those whose ANW declines. Those who changed marital status over the period, widow(er)s as of 1982, and those with little education and health problems (either respondent or spouse) tended to experience substantial declines in ANW. Those who worked more years, either prior to or after retirement, and those with a spouse who worked after retirement tend to be relative gainers; this is as expected since earnings after retirement reduce the need to draw down assets in order to support retirement.

Finally, those with low 1981 ANW relative to the poverty line and those with ANW below the .7 standard are more heavily represented among the gainers. The pattern of gainers and decliners by the composition of wealth holdings is consistent with the different concentration of those with ANW below and above the adequacy standards and by some shift toward the median or average. Those for whom Social Security wealth constitutes a relatively large share of 1982 asset holdings are gainers, while those with larger pension and financial asset shares tended to experience declines in ANW over the first decade of retirement. These patterns are also consistent with the higher risk of wealth declines for those retirees who hold a substantial share of their ANW in the form of more risky financial and pension assets, relative to Social Security wealth.

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consequence of characteristics of these retirees (e.g., low education, or weak labor force attachment) that are related to both early benefit receipt and low economic status. Because the data are for recipients only, they do not permit an analysis of the causal relationship between economic status and retirement timing.

VII. CORRELATES OF CHANGE IN ANW

While the patterns in Table 5 are suggestive, they do not reveal the independent effect of individual characteristics on the change in resources (ANW) over the first decade of retirement. In Table 6, we explore how the change in ANW over the 1982-1991 period is related to the initial composition of assets, controlling for a set of initial retiree characteristics. We subdivide financial assets into three categories—relatively low risk financial assets, high risk financial assets, and equity in businesses and (non-home) property. The share of wealth that is accounted for by pension wealth is the excluded category. [22] Other variables are introduced to control for sample selection and initial characteristics that confound the relationship between asset share and ANW growth.[23]

Having a large share of assets in either Social Security or housing is positively and strongly associated with *the growth* in resources over the first decade of retirement. Over a period during which the Consumer Price Index rose by nearly 50 percent, holding a large share of assets in these forms appears to contribute to both inflation protection and real growth. As was suggested by the simple comparisons in Table 5, those who retired when older, married men, those without health problems, and those with health insurance had statistically significant increases in both net wealth and ANW over the 1982-1991

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[22] We attempt to differentiate higher risk assets from less risky assets. In our grouping we define riskless financial assets as checking accounts, money market accounts, CD's, bonds, life insurance and similar assets. These are 8.4 percent of all ANW. Risky assets (2.1% of ANW) are defined to include stocks, shares in mutual funds, Keogh, IRAs. The third category of financial assets includes equity in housing other than the primary residence, and equity in businesses, professional practices, or farms (4.1% of ANW).

[23] The NBS sampled males and females separately. The unexpected income receipt variable is included to control for asset changes that are not associated with initially held assets.

period..[24]

Table 7 explores the correlates of changes in the log of ANW, focusing on individual characteristics with an a priori expected relationship to changes in ANW. We estimate this model using a 'value added' specification, including the level of ANW in 1982 (in log form) as a right hand side variable. The level of resources in 1982 is significantly associated with the growth in ANW over the period; the coefficient of less than unity suggests a convergence over time as higher ANW is associated with less growth in ANW.

Given initial ANW, what characteristics are correlated with increases or declines in ANW over the first ten years of retirement? For nearly all of the gender/marital status subgroups, the following characteristics are positively and significantly related to the growth of ANW from the time of retirement to ten years later:

- Age of benefit receipt, indicating continuing economic advantages accruing to those receiving benefits (retiring) at older ages
- Higher respondent and spouse education (if married)
- Being white (relative to nonwhite)
- More years worked prior to retirement
- More years worked after retirement
- Having fewer children (if married)
- Having better health, and spouse having fewer health problems (if married)

[24]These wealth-component results are quite robust across marital status and ANW groups. They are strongest for those whose ANW places them (over their remaining lifetime) between 2 and 4 times the poverty threshold, a group that accounts for 50 percent of our sample (estimates available from the authors).

- Having private health insurance
- Being a home owner

Many of these relationships are consistent with the group gain/loss patterns observed in Table 5, and none are particularly surprising. Many of the characteristics are proxies for human capital, and therefore would be positively related to earnings during working years. To the extent that these determine earnings, pension coverage and benefits, and savings, their effect is already present in the 1982 ANW. Their importance in explaining the growth in resources after retirement controlling for the base level of resources suggests a continuing advantage of human capital in shaping post-retirement financial decisions and consumption choices.[25] Other characteristics indicate fewer demands on private resources (e.g., having better health, and having private health insurance).

Interestingly, women whose longest job was not covered by Social Security showed slower growth in ANW over time. This may be a consequence of the noncovered pension offset rule that reduces Social Security spouse/widow benefits when a pension from noncovered work is received by a spouse. A change from being married at the time of retirement to being single 10 years later has a positive significant effect on ANW for men, but a negative significant effect for women. The increase in ANW for men is likely due to the relatively small loss in income when a wife (in contrast to a husband) dies and the fact that the loss of an (on average younger) wife sharply reduces the number of years of expected life (of the household) over which assets need to be spread, increasing their annuity value. Conversely, for women, the decrease in ANW due to the loss of a spouse

[25] Alternatively, retirees with more human capital may hold assets (including pensions) that grow more rapidly, which effect is not captured in our crude measure of base year resources.

after retirement is likely due to the larger retirement income loss suffered when husbands die and the shorter lifetime of the deceased husband compared to the wife.[26] For men, the number of years after retirement that they continued to work is positively associated with increases in ANW over the first decade of retirement, but this relationship is present for only single women. However, for married women the change in ANW is positively and significantly associated with the number of years that their spouse worked after the woman began taking retirement benefits.[27]

VIII. CORRELATES OF CHANGES IN RESOURCE ADEQUACY

The analysis in Table 8 relates the characteristics of retirees to the change in resource adequacy—measured by the replacement rate (RR = ANW/preretirement earnings)--over the 1982-1991 period. We explore 'adequacy' because of both its direct policy relevance and the potential difference in results from Table 7 due to the comparison of ANW to a preretirement standard (RR).[28] We, again, employ a value added approach, including the 1982 RR level. Coefficients indicate a change from that initial level. Statistically significant coefficients are shown in bold in the table.

The results in Tables 7 and 8 are similar. For all of the gender/marital status categories other than single women, the relationship between the base level of adequacy and the change in the RR is positive but less than unity; those with higher replacement rates in 1982 experienced decreases in RR over the first ten years of retirement, again

[26] Parallel results exist for men and women who were single in 1982, and marry after retirement.
[27] This may reflect both post-retirement spousal earnings and the receipt own retired-worker benefits for which wives are eligible (prior to the retirement of their husbands).
[28] Correlates of change in RR (Table 8) may differ from those of change in ANW (Table 7) because of different distributions of ANW and preretirement earnings. Note that the denominator of RR is unchanged between 1982 and 1991 for each individual.

suggesting that those with sufficient resources at the time of retirement were more able and likely to draw down their resources to support consumption during the retirement period. Becoming widowed during the first ten years of retirement diminishes RR for married women, but now for married men as well, while entering a new marriage improves the RR only for women. Married men and women with more children tend to have decreases in RR, suggesting that transfers of resources to offspring over the retirement period are not just from "extra" gains in ANW over this period.[29] Having a college education increases RR, supporting speculation that human capital continues to have value beyond effects on labor market earnings and pre-retirement savings decisions. Consistent with a pattern observed earlier, having a pension is associated with decreases in adequacy over the first decade of retirement. Finally, for single men and women, and for married men, increases in adequacy are positively associated with work after retirement.

IX. CONCLUSION

We have estimated replacement rates based on permanent preretirement earnings both at the time of retirement (1982) and ten years later (1991). While our results have some implications for the measured adequacy of retirement savings, we focus in this paper on the stability of adequacy measures. Average estimates suggest stability in adequacy over the first ten years of retirement. In both 1982 and 1991 approximately the same proportion of our sample was below the RR (.7 of preretirement earnings) and the poverty replacement rate standards. The median replacement rate and ratio of ANW to

[29] An interesting retirement research issue concerns the extent to which such intra-vivos transfers are intended at retirement, implying that measures of savings adequacy may be overstated

poverty thresholds show the same stability.

There is far greater instability in resource adequacy over time than is suggested by median levels. We find considerable shifting across adequacy thresholds; about a quarter of individuals who were below our two adequacy standards ten years after retirement, had been above that standard in the earlier year.

Changes in both the aggregate value of resources (ANW) and the adequacy of assets relative to preretirement earnings are related to the characteristics of these retired people in expected ways. Pre-retirement economic advantages continued into retirement. Even controlling for initial levels of resources (and thus human capital effects on them), individuals who had more education, retired at an older age, had fewer children, were in better health, had private health insurance and owned a home tend to have greater increases in both ANW and the adequacy of resources. However, being widowed after retirement decreases the annuity value of assets and the RR for women, suggesting less provision for survivors than is consistent with continuing consumption needs of the survivor. Importantly, work after retirement increases ANW and RR, implying that this may be an important component of retirement adequacy, perhaps even a planned component. For some individuals assuming that work ceases at retirement may underestimate estimates of retirement adequacy.

Our results have implications for discussion about the role of pensions in retirement adequacy. Our components-of-wealth analysis (Table 6) showed that having a larger share of retirement resources in inflation-adjusted Social Security and non-pension assets contributed positively to ANW and RR over the retirement period.[30]

[30] To some degree the contrast between Social Security and pensions may be a consequence of our assumptions (in estimating wealth and ANW) about imperfect inflation adjustments in pensions over this

Our conclusions about the adequacy of retirement resources for older Americans, and the change in resources during the decade after retirement must be tempered by a number of considerations. We may underestimate preretirement earnings for those with careers in noncovered employment or with deceased spouses. On the other hand, all studies that have covered work histories but not complete histories of earnings in noncovered work will face the same problem. In estimating ANW we used current U. S. life tables (by gender and race) for life expectancies; our estimates of resource adequacy are biased downwards for individuals who expect to live longer and biased upwards for those who expect to die sooner. While these may balance out in estimating average resource adequacy, our over- or under-estimates for individuals bias correlation results.

Further, we note the difficulty of judging "adequacy." The 70 percent of prior earnings criterion is a crude value for gauging the level of available resources that may or may not be useful in private financial planning; it has little normative significance, especially for households with high standards of living (earnings) during preretirement years. Finally, although we observe our cohort of new retirees during the 1980s, we conclude that there is no strong evidence from other studies of wealth increases sufficient to suggest that our results are not still relevant.[31]

We believe that our findings contribute to the growing literature on the adequacy of resources of older Americans by documenting the importance of investigating changes in assets and their adequacy during retirement. Our results also have the potential to

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period. On the other hand, our assumptions about inflation adjustment to pensions were based on data for this sample, could have been off-set by actual increases in pension benefits that were higher than our inflation assumptions, and were consistent with those applied to other assets. Thus, that other assets, subject to the same inflation assumptions, grew faster than pensions suggests that the slower growth in pension income is not purely an artifact of our assumptions.

[31] Using the Survey of Consumer Finance, we estimate that average net wealth in 1998 was no more than 10–20 percent greater than in the early-1980s. (Estimates are available from the authors.). These estimates are consistent with Wolff (2002).

contribute to policy discussions regarding the potential alteration of social insurance programs so as to increase the adequacy of those whose resources fall below their own preretirement consumption patterns and, especially social norms regarding minimal consumption standards. Finally, the strong contribution of Social Security benefits toward establishing resource adequacy at the time of retirement and maintaining it over the following decade has implications for proposals that private retirement accounts substitute for Social Security benefits. The apparent negative impact of private pension shares in ANW on the maintenance of retirement resources also has implications for proposals designed to increase the role of private savings in supporting retirement.

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TABLE 1
Mean Household Net Wealth and Components
New Retired-Worker Beneficiaries, 1982 and 1991

Wealth Component	Mean '82	Mean '91	% Change	Contribution to Total Change
		(thousands of $1994)		
Married Women				
Net Wealth	502.4	350.5	-30.2%	100.0%
Financial	111.8	80.2	-28.3	20.8
Housing	72.1	71.7	-0.5	0.3
Social Security	249.0	157.6	-36.7	60.1
Pensions	69.5	41.0	-41.0	18.8
Married Men				
Net Wealth	534.7	419.3	-21.6%	100.0%
Financial	145.9	117.5	-19.4	24.6
Housing	85.5	83.0	-2.9	2.2
Social Security	230.2	172.9	-24.9	49.6
Pensions	73.2	45.9	-37.3	23.7
Single Women				
Net Wealth	258.0	201.5	-21.9%	100.0%
Financial	$48.0	$38.9	-19.1	16.3
Housing	45.2	38.2	-15.4	12.3
Social Security	125.1	99.1	-20.8	46.0
Pensions	39.7	25.3	-36.4	25.5
Single Men				
Net Wealth	290.8	254.3	-12.6%	100.0%
Financial	91.8	83.4	-9.2	23.0
Housing	38.5	42.7	11.0	-11.6
Social Security	122.2	100.5	-17.8	59.3
Pensions	38.4	27.7	-28.0	29.3

TABLE 2
Mean Household Annuitized Net Wealth and Components
New Retired-Worker Beneficiaries,.**1982 and 1991**

Wealth Component	Mean '82	Mean '91	% Change	Contribution to Total Change
		(thousands of $1994)		
Married Women (N=1,505)				
Net Wealth	22.5	23.1	2.3%	100.0%
Financial	5.3	5.4	1.7	17.7
Housing	3.3	4.9	48.4	307.3
Social Security	10.9	10.2	-6.2	-128.7
Pensions	3.1	2.6	-16.3	-96.3
Married Men (N=2,634)				
Net Wealth	24.9	27.9	12.0%	100.0%
Financial	6.5	7.7	17.8	38.7
Housing	3.7	5.3	40.3	50.5
Social Security	11.1	11.8	6.5	24.1
Pensions	3.6	3.2	-11.1	-13.3
Single Women (N=1,028)				
Net Wealth	19.0	20.0	5.5%	100.0%
Financial	3.5	3.9	10.9	36.6
Housing	3.2	3.7	14.6	45.4
Social Security	9.3	9.9	6.7	59.8
Pensions	3.0	2.5	-14.7	-41.8
Single Men (N=412)				
Net Wealth	25.7	28.7	11.8%	100.0%
Financial	8.2	9.8	19.9	53.7
Housing	3.4	4.7	40.0	44.3
Social Security	10.8	11.2	3.2	11.5
Pensions	3.3	3.0	-8.6	-9.4

TABLE 3
Robustness of Results to Alternative Assumptions of Remaining Life Years, All Households

	Expected Value	70th Percentile	90th Percentile
1982			
Median Annuitized Net Value	$19,040	$18,113	$17,201
Median Tobit Replacement Rate	0.83	0.79	0.76
Median Poverty Replacement	3.05	2.90	2.75
Median Two-times Poverty Replacement	1.52	1.45	1.38
Percent Not Meeting Maintenance of Consumption Standard	31.69	35.94	40.83
Percent Not Meeting Poverty Standard	3.75	3.91	4.12
Percent Not Meeting Two-times Poverty Standard	21.92	23.41	25.35
1991			
Median Annuitized Net Value	$19,785	$18,602	$17,643
Median Tobit Replacement Rate	0.84	0.79	0.75
Median Poverty Replacement	3.17	2.98	2.82
Median Two-times Poverty Replacement	1.58	1.49	1.41
Percent Not Meeting Maintenance of Consumption Standard	34.68	38.81	43.61
Percent Not Meeting Poverty Standard	4.75	5.00	5.29
Percent Not Meeting Two-times Poverty Standard	21.60	23.23	25.20

Table 4
1982-91 Change in Status
(% in 1991 group by 1982 status)

	1991	
1982	<.7	>.7
<.7	60.8	16.2
>.7	39.2	83.8
All	100.0	100.0
	<2*pov	>2*pov
<2*pov	73.6	7.7
>2*pov	26.4	92.3
All	100.0	100.0

TABLE 5
Declines and Increases in ANW 1982-1991, by characteristics of respondent.

	All Respondents	Decliners	Gainers
Number of Observations	5,579	2,144 (38.4%)	2,942 (52.7%)
Age	65.9	65.7	**66.1****
Proportion with Characteristic			
Single men	0.07	0.07	0.07
Single women	0.18	**0.19**	0.17*
Married men	0.47	0.42	**0.52*****
Married women	0.27	**0.32**	0.25***
Below poverty in 82	0.04	0.01	**0.04*****
Below near poor in 82	0.22	0.15	**0.24*****
Replacement rate <.7 in 82	0.32	0.22	**0.38*****
>.7 replacement rate in 82	0.68	**0.78**	0.62***
Nonwhite	0.10	0.09	0.09
Widowed	0.46	**0.51**	0.44***
Separated or divorced	0.32	0.29	0.33
Married in '82; Single in '91	0.14	**0.18**	0.13***
Single in '82; Married in '91	0.01	**0.02**	0.01***
Respondent high school	0.30	**0.32**	0.29**
Respondent some college	0.15	0.14	**0.17*****
Respondent college or higher	0.13	0.12	**0.15*****
Spouse high school	0.34	0.34	0.34
Spouse some college	0.14	0.13	0.15
Spouse college or higher	0.09	0.09	0.10
With Longest Job Uncovered	0.18	0.19	0.18
Have Private Health Insurance	0.82	0.84	0.83
Have Pension	0.54	**0.63**	0.48***
Own Home	0.80	**0.83**	0.81**
Number of Children	2.53	2.5	2.5
Years Worked	31.5	31.0	**31.8****
Respondent Years Worked after Retirement	2.29	1.80	**2.70*****
Spouse Years Worked after Retirement	2.03	1.69	**2.28*****
Number of Health Problems	2.17	**2.23**	2.08***
Spouse Health Condition	0.42	**0.44**	0.40***
% Wealth in 82 Accounted for by Asset Holdings	14.9	**19.2**	12.8***
% wealth in 82 Accounted for by Housing Wealth	15.0	15.3	15.6
% Wealth in 82 Accounted for by Pensions	11.6	**14.5**	9.8***
% Wealth in 82 Accounted for by Social Security	58.4	51.0	**61.8*****
Interaction: Private Health Insurance X Number of Respondent Health Problems	1.8	**1.8**	1.7***

Note: Percentage of gainers and decliners with characteristic is significantly different at * p<.1; ** p<.05; *** p<.01.

Table 6
Contributing Components to Percent Change in ANW
Models with and without initial ANW

	% Change ANW			
Dependent variable	Estimate	t-value	Estimate	t-value
Intercept	-2.18	-7.81	-2.27	-8.10
Share of ANW in risky assets	0.24	1.57	0.38	2.41
Share of ANW in riskless assets	0.37	3.68	0.38	3.74
Share of ANW in equities in property	0.05	0.50	0.13	1.41
Share of ANW in social security	0.69	11.14	0.61	9.22
Share of ANW in housing	0.71	8.31	0.68	7.87
Age in 82	0.03	6.45	0.03	7.00
Single male	0.02	0.63	0.03	0.74
Single female	-0.12	-4.34	-0.12	-4.49
Married female	-0.11	-4.60	-0.10	-4.45
Married in 82, single in 91	0.00	0.16	0.00	0.16
Single in 82, married in 91	-0.15	-1.89	-0.15	-1.82
Unexpected income received	0.16	6.08	0.16	6.08
Number of health problems in 82	-0.01	-2.84	-0.01	-2.85
Additional health problems by 91	-0.02	-2.49	-0.02	-2.50
Spouse health condition in 82	-0.03	-1.48	-0.03	-1.53
Spouse health condition in 91	-0.06	-2.17	-0.05	-2.16
Private health insurance in 82	0.02	0.90	0.02	0.93
Private health insurance in 91	0.09	3.43	0.09	3.42
Annuitized wealth in 82			0.00	-3.91
Number of observations	5579		5579	
F-value (p-value)	17.24	(<.0001)	17.18	(<.0001)
Adjusted R-squared	0.05		0.05	
Mean change in ANW	0.15		0.15	

TABLE 7
Regression Results for 91 LOG of Annuitized Net Wealth, Controlling for Log(ANW'82)

Dependent Variable	Married Men		Married Women		Single Men		Single Women	
	Parameter Estimate	t-Value	Parameter Estimate	t-Value	Parameter Estimate	t-Value	Parameter Estimate	t-Value
Intercept	-0.7022	**-3.08**	-1.3248	**-3.29**	-0.8299	-1.31	-1.6540	-4.34
log(ANW'82)	0.6335	**36.39**	0.6405	**23.51**	0.6891	**14.76**	0.6567	**22.08**
Age in 1982	0.0236	**6.71**	0.0334	**5.30**	0.0258	**2.61**	0.0337	**5.74**
Nonwhite	-0.1044	**-3.44**	-0.0538	-1.29	-0.1147	-1.91	-0.0904	**-2.39**
Widowed					-0.1382	**-2.07**	0.0163	0.43
Separated or divorced					-0.1096	-1.81	0.0156	0.40
Married in '82; Single in '91	0.2445	**10.48**	-0.2995	**-12.16**				
Single in '82; Married in '91					-0.2811	**-4.07**	0.1550	1.87
Respondent high school	0.0433	**2.27**	0.1009	**3.64**	0.1230	**2.12**	0.0653	2.05
Respondent some college	0.1209	**4.84**	0.2134	**5.95**	0.0955	1.29	0.1566	**4.19**
Respondent college or higher	0.2087	**7.81**	0.2529	**5.20**	0.2352	**3.14**	0.1798	**4.06**
Spouse high school	0.0382	**2.08**	0.0096	0.34				
Spouse some college	0.0719	**2.91**	0.0273	0.69				
Spouse college or higher	0.0652	**2.01**	0.1315	**3.04**				
Number of children	-0.0112	**-3.07**	-0.0182	**-3.01**	0.0103	0.90	-0.0084	-1.14
Years worked	0.0039	**3.43**	0.0044	**3.59**	-0.0012	-0.39	0.0059	**3.76**
Resp. years worked after ret.	0.0101	**4.40**	0.0013	0.33	0.0237	**3.31**	0.0271	**6.89**
Sp. Years worked after ret.	-0.0017	-0.69	0.0097	**2.55**				
Longest job uncovered	-0.0186	-0.99	-0.0768	**-2.34**	0.0305	0.52	-0.1083	**-2.68**
Number of health problems	-0.0094	**-2.43**	-0.0179	**-2.86**	-0.0167	-1.58	-0.0069	-1.02
Spouse health condition	-0.0362	**-2.28**	0.0028	0.12				
Private health insurance	0.0550	**2.53**	0.0554	1.74	0.0655	1.22	0.0537	1.61
Pension	-0.0152	-0.89	-0.0238	-0.97	0.0639	1.23	0.0398	1.33
Home ownership	0.1032	**4.43**	0.1151	**3.32**	0.1559	**2.95**	0.0731	**2.45**
Number of observations	2,634		1,505		412		1,028	
F-value (p-value)	215.83	<.0001	108.44	<.0001	58.47	<.0001	125.64	<.0001
Adjusted R-squared	0.62		0.59		0.70		0.67	
Mean log(ANW'91)	3.11		2.90		2.96		2.75	

Note: t values in bold are significant at the 5% level of significance.

TABLE 8
Regression Results for Tobit Replacement Rate in 1991, Controlling for 1982 Tobit Replacement Rate

Dependent Variable	Married Men		Married Women		Single Men		Single Women	
Regressor	Parameter Estimate	t-Value	Parameter Estimate	t-Value	Parameter Estimate	t-Value	Parameter Estimate	t-Value
Tobit Replacement Rate '82	0.9529	**88.35**	0.8174	**27.65**	0.7393	**9.33**	1.0241	**316.64**
Married in '82; Single in '91	-0.2042	**-2.76**	-0.7070	**-6.97**				
Single in '82; Married in '91					0.0699	0.23	1.0860	**2.39**
Respondent some college	0.0806	1.03	0.3684	**2.51**	-0.1093	-0.34	-0.1846	-0.92
Respondent college or higher	0.0964	1.17	0.0664	0.34	0.9176	**2.93**	-0.0678	-0.29
Number of children	-0.0194	-1.68	-0.0542	**-2.17**	0.0093	0.18	-0.0234	-0.58
Years worked	0.0014	0.38	-0.0063	-1.25	-0.0366	**-2.83**	0.0117	1.45
Resp. years worked after ret.	0.0236	**3.24**	-0.0192	-1.15	0.1233	**3.91**	0.0595	**2.76**
Longest job uncovered	-0.0199	-0.33	-0.0228	-0.17	0.2661	1.01	-0.6117	**-2.76**
Pension	-0.1089	**-2.10**	-0.1455	-1.50	0.2269	1.08	-0.0681	-0.45
Number of observations	2,634		1,505		412		1,028	
F-value (p-value)	428.7	<.0001	43.76	<.0001	9.7	<.0001	5983.48	<.0001
Adjusted R-squared	0.7646		0.3625		0.2647		0.9900	
Mean Tobit RR	1.2721		1.1166		1.2772		2.1623	

Note: t statistics in bold indicate statistical significance at the 5% level.

Appendix A

Estimation of Net Wealth, Annuitized Net Wealth, Preretirement Earnings, and the Private and Social Adequacy of Resources During Retirement

In this appendix, we describe the procedures used and assumptions adopted in deriving our estimates of the adequacy of resources at the time of retirement and over the first ten years of retirement.

A. The New Beneficiary Data System

The data that we use are from the New Beneficiary Data System (NBDS), containing information on a sample of individuals who first received Social Security benefits between June 1980 and June 1981 (Ycas, 1992). These new beneficiaries were interviewed first in 1982 and again in 1991. Because this is a sample of new retired-worker beneficiaries, our estimates may not be reflective of the situation of either the population of all retirees. We exclude from our sample individuals who have fewer than 10 years of recorded Social Security earnings data after the age of 50 until one year prior to retirement, as reported earnings history before age 50 do not reflect permanent preretirement earnings.

Administrative data on covered earnings and benefits were linked for all respondents and spouses. These links were updated through 2001. For some spouses of retired-workers, data on earnings and on social security and pension benefits are available only in the updated links. Our sample is drawn from the retired-worker sample and includes individuals aged 62-72 in 1982 who were interviewed both then and in 1991. Because the NBDS is linked to Social Security earnings and benefits records, we have data on Social Security covered earnings histories and retirement benefits for all

individuals in our sample.[32] The Social Security and pension data in the NBDS are gathered and linked for both spouses in a couple, which allows us to estimate pension and social security wealth with some precision. Statistics on the characteristics of our sample are shown in Table A2.

B. Net Wealth

From information contained in the NBDS, we calculate the value of net wealth for each single person and married couple as of 1982 and 1991. We define net wealth to be the sum of financial and property resources, the net value of own home (home value less outstanding mortgage), and the present discounted values of expected pension benefits and of expected Social Security benefits. The 1982 NBDS survey does not contain information on indebtedness other than the mortgage on own home, resulting in some overstatement of net wealth

In the NBDS, wealth in the form of financial, property, and net home equity assets is reported by respondents. In estimating Social Security wealth as of 1982, we project the monthly inflation-adjusted benefits to which each individual is entitled (from the linked Master Beneficiary File) over the individual's expected remaining lifetime using 1982 race- and gender-specific life tables (U.S. Department of Health and Human Services, 1985). We discount this stream to 1982 using a 2.75 percent rate, yielding the wealth value of Social Security benefits.

The value of current (or future expected) pension benefits is provided by the

[32] The full linkage of Social Security earnings and benefits records in the NBDS contrasts with the partial link in the HRS due to the requirement that HRS respondents agree to that linkage. NBDS respondents reported pension income as well as pension benefits expected in the future.

survey respondent and reflects a nominal value of benefits at the time of interview. While few pension plans are fully price indexed, we incorporate a price adjustment estimated from the NBS data. On average pension benefits grew by 3.25 percent between 1982 and 1991 for those receiving benefits in both years, a rate that is .75 percent less than the 4 percent rate of inflation between those years. We thus use a 3.25 percent rate to discount pension benefit streams to 1982 (2.75 percent plus .75 percent).

In calculating Social Security wealth for married couples, we applied Social Security survivorship rules. In calculating couples' pension wealth we account for whether the pension chosen by the recipient would continue to be paid to a surviving spouse. The Social Security plus pension wealth of a couple is the sum of each spouse's wealth where pension and Social Security wealth calculations are over the probable separate and joint survival periods for husband and wife and the benefits expected under each status. [33]

C. Annuitized Net Wealth (ANW)

For both 1982 and 1991, we estimate the annuitized value of *all* assets over the remaining expected lifetime of respondents and, if married, of surviving spouses (again using race- and gender-specific life tables). Because our wealth estimates already reflect differences in inflation indexing, we use a uniform interest rate of 2.75 percent, taken to be the individual rate of time preference. The annuitized values we report are the single-equivalent income that would be received if an individual or couple maintain a steady

[33] Social Security wealth for married couples is the sum of spousal wealth values. Each spouse's benefit is the higher of: 1) their own retired-worker benefit, or 2) the benefit as a spouse/widow. The value of Social Security benefits are estimated conditional upon remaining married or being a sole survivor, using Social Security survivorship rules. Pension benefits for married couples are estimated using answers that indicated whether a single-life or some form of survivor benefit was chosen. If a survivor benefit is indicated, a joint and two-thirds (66 percent) survivor benefit is assumed. For younger spouses and those for whom no age of receipt for an expected pension benefit was reported 1982, we used data from the 1992 survey, if available

level of consumption potential over their remaining lifetimes, including the period when only one partner in a couple is expected to survive.[34]

D. Permanent PreRetirement Earnings

To assess the adequacy of available resources, we relate the ANW of each individual and couple in our sample to their level of "permanent" preretirement earnings—taken to reflect the income flow available to each respondent in the years before they retired. We estimate this indicator of preretirement living standards using the NBDS-linked Social Security records on covered earnings for each respondent (and their spouse, if married) from age 50 to one year prior to the respondent's retirement (first benefit receipt). Because annual covered earnings records are capped at the maximum taxable earnings amount for each year, we use a Tobit estimation procedure to predict the value of 'true' earnings for each year of capped earnings for individuals for whom some capped value is recorded; predicted earnings values are substituted for the capped values. Hence, permanent preretirement earnings equal the average of earnings that are below the cap and predicted earnings (in place of capped values) over the relevant years. For married couples, the recorded/predicted earnings of each spouse are summed for each relevant year.

Consider the total covered earnings for individual *i* at time *t*, y_{it}^*. Social Security contributions are withheld from *i*'s earnings up to some taxable cap, c_t. Unfortunately, when *i*'s covered earnings exceed the cap, we observe $y_{it} = c_t$, rather than $y_{it} = y_{it}^*$. We

[34] Based on the equivalence scale work reported in the National Academy of Sciences study of poverty measurement (Citro and Michael, 1995), a couple is assumed to require 1.6 times the resources of a single person. We annuitize wealth over the life of the retired-worker and spouse assuming this equivalence scale. In effect we assume a joint and two-thirds survivor benefit for all assets, an allocation that reflects consumption needs during both the survival of the couple and the widow(er).

therefore consider a model of the form

$$y_{it} = \begin{cases} y_{it}^* & if\ y_{it}^* \le c_t \\ c_t & if\ y_{it}^* > c_t \end{cases},$$

where y_{it} is the observed covered earnings value for i. In order to estimate total covered earnings, we posit an intertemporal covered earnings profile of the form

$$y_{it}^* = \rho y_{it-1}^* + z_{it}'\delta + \varepsilon_{it}.$$

Here, y_{it-1}^* is lagged (true) covered earnings, z_{it} is a vector of covariates (e.g., age, education, race, region, whether or not i was employed in the previous period, and spouse's age, spouse's education, and lagged spousal earnings, if married), ε_{it} is statistical error, and $[\rho, \delta']'$ are parameters to be estimated.

We estimate the model using a dynamic, rolling-scheme, two-limit tobit approach. The log-likelihood function and the formula for conditional expectations can be found in Maddala (1983). The tobit model is useful in econometric analysis of data that is censored due to corner solutions or top- or bottom-coding. In our case, we observe a corner solution (nonnegativity constraint) at zero earnings and top-coding at the time-varying taxable maximum. We include lagged covered earnings as an explanatory variable in estimation, hence the term "dynamic." Moreover, we include (up to) five lags of total covered earnings as explanatory variables in estimation, hence the term "rolling-scheme." Under this approach, we estimate the model year-by-year, rather than as a panel, proceeding as follows. We first estimate our model for $t = 1$ (year 1951), setting $y_{i0}^* = 0$ and excluding previous-year-employment indicator variables. We then use our parameter estimates to form tobit predictions of total covered earnings, i.e., the conditional expectation of y_{i1}^*. We can then estimate the model for $t = 2$ (year 1952),

using the predicted (lagged) y_{i1}^* and previous-year-employment indicator variables as additional explanatory variables. We use these estimates to form tobit predictions of y_{i2}^*. We continue in this manner through $t = 31$ (year 1981). Note that we are using all earnings data after 1950 even though most individuals were younger than age 50, the first year of the period over which we average preretirement earnings.

We use the following algorithm to estimate total covered earnings. If reported covered earnings lie below the taxable maximum, we use the reported covered earnings value. When reported covered earnings are capped, we use NBS survey data on earnings during the last year on the last and longest jobs, if available *for that particular individual and year*. We assume these self-reported earnings provide better information on earnings in those individual years than do tobit predictions. For years in which earnings are not self-reported, we use the maximum of our tobit prediction and the taxable maximum. The taxable maximum amount, given by Administrative data, will be more accurate than the tobit prediction if the tobit prediction lies below the reported taxable maximum.

At this point, we have two covered earnings profiles: one that uses the observed covered earnings values, and one that replaces capped values with estimates of total covered earnings; for uncapped observations, the two covered earnings profiles are *identical*. Preretirement earnings may now be calculated for the individual or couple as average (strictly positive) earnings between the year the retired-worker was age 50 and one year prior to his or her receipt of retirement benefits. We do not include years in which the individual's (or couple's) earnings are zero in calculating preretirement earnings. For married couples, we sum both individuals' total covered earnings and average couple's earnings over the retired-worker's preretirement years.

Table A1 presents our two estimates of mean and median permanent preretirement earnings; y_i^* estimated with predicted values substituted for capped values and y_i^c estimated using the capped values. Again, the estimates for married couples are single-person equivalent values. Within each cell, the preferred estimate of preretirement earnings (y_i^* estimated with predicted values substituted for capped values) exceeds y_i^c (the recorded capped values), and the standard deviation of y_i^* exceeds that of y_i^c. Mean values range from $20,000 for single women to nearly $27,000 for single men; for married couples equivalent preretirement earnings average $24,000.

E. Measuring Resource Adequacy for Retired Workers

We calculate a replacement rate (RR) defined as the ratio of ANW to permanent preretirement earnings (y_i^*). An alternative adequacy standard compares ANW with a socially accepted, minimum income standard, rather than gauging "adequacy" relative to one's own past level of living. The nation's family-size conditioned poverty lines provide such a standard.[35] For each household, we compare the single-person equivalent ANW with the single-person poverty line; a ratio of these two values in excess of unity indicates that the respondent has sufficient resources to escape poverty throughout their retirement years.

[35] We use the revised poverty lines suggested by the NRC study of poverty (See Citro and Michael, 1995). As of 2000, the absolute poverty line for single individuals is $7255, and for couples the line is $11,786.

Table A1
Permanent Preretirement Earnings ($1994)

		Median	Mean	Std. Dev.
Total	y_i*	$22,900	$23,633	$11,502
	y_i^c	20,635	20,563	8,254
Couples	y_i*	23,485	24,095	10,948
	y_i^c	20,595	20,545	7,772
Single Men	y_i*	25,302	26,878	15,947
	y_i^c	24,801	22,976	9,806
Single Women	y_i*	19,241	20,113	10,167
	y_i^c	19,215	19,424	9,028

Note: y_i^c is based on recorded covered earnings (including the capped value); y_i* is the value adjusting for the capped value. All values are single person equivalent.

Table A2
New Recipients of Social Security Retired Worker Benefits
Characteristics of Sample

Variable Means	Married Men and Women	Single Men	Single Women
Distribution by Respondent type	73.1%	9.0%	17.9%
Age in 1982	65.8	66.2	66.8
% Nonwhite	8.0	18.5	14.9
% Widowed		34.2	50.1
%Separated or divorced		39.7	28.6
%Respondent high school	31.6	21.9	30.0
Respondent some college	13.8	10.3	19.7
Respondent college or higher	12.2	11.8	12.6
Spouse high school	35.1		
Spouse some college	13.6		
Spouse college or higher	9.2		
Number of children	2.7	1.9	1.9
Years worked	32.4	34.9	28.5
% with longest job uncovered	19.2	19.3	10.6
Number of health problems	2.3	2.4	2.24
Spouse has a health condition	41.6		
% with private health insurance	83.7	69.2	76.6
% with Pension	55.8	42.7	45.6
Owning Home	87.2	46.5	56.8
Preretirement earnings (PRE)	$24,095	$26,878	$20,113
Standard deviation	$10,948	$15,947	$10,167
Minimum	$336	$274	$24
Maximum	$113,332	$146,369	$54,554
Annuitized net wealth (ANW)	$24,741	$24,353	$19,509
Standard deviation	$28,041	$25,986	$15,608
Minimum	$2,006	$3,075	$2,687
Maximum	$742,278	$295,385	$167,945
Replacement rate (PRE)	1.26	1.12	1.91
Standard deviation	2.22	1.59	18.91
Minimum	0.11	0.20	0.33
Maximum	79.76	16.51	695.72
Replacement rate (PovLine)	3.96	3.90	3.12
Standard deviation	4.49	4.16	2.50
Minimum	0.32	0.49	0.43
Maximum	118.84	47.30	26.89
Number of observations	5,935	731	1,452