Wealth Distribution and Retirement Preparation Among Early Savers

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Abstract:

This paper develops a new combined wealth measure using data from the Survey of Consumer Finances by augmenting data on net worth with estimates of defined benefit (DB) pension wealth and expected Social Security wealth. We use this combined wealth concept to explore retirement preparation among groups of households in their pre-retirement years (40-49 and 50-59) and also to explore the concentration of wealth. We find evidence of moderate, but rising, shortfalls in retirement preparation. We also show that including DB pension and Social Security wealth results in markedly lower measures of wealth concentration. Trends toward higher concentration over time are also somewhat moderated.

The wealth that households accumulate during their working years – through pensions, housing equity, and other types of assets – is crucial in providing support to sustain them in retirement. There is a large literature evaluating the adequacy of retirement resources among retirees and households transitioning into retirement, and there is also a growing literature using wealth data to explore inequality in the distribution of economic resources – beyond a more traditional emphasis on income and consumption. This paper uses the Survey of Consumer Finances (SCF) to make contributions to each of these areas of research.

The SCF is the only household survey that provides adequate coverage of high net worth households in the U.S. The wealth concept in the survey, market wealth, is incomplete, however, particularly when evaluating retirement resources. Importantly, household wealth in the SCF does not adequately reflect the asset value of defined benefit (DB) pensions, while it does collect asset values of defined contribution (DC) pensions. Further, it does not include the value of the future Social Security benefits that workers accrue over their lifetimes. These additional forms of wealth are important resources to retirees but also affect decisions leading up to retirement. Crucially, they disproportionately benefit households below the top portion of the wealth distribution. As such, they are vital to our understanding of the full distribution of wealth and also in assessing the adequacy of savings of workers who will be transitioning into retirement in the future.

We develop an expanded definition of household wealth ["combined" wealth]. First, we augment the asset and debt information collected in the SCF with estimates of the asset value of both traditional defined benefit (DB) pensions and expected Social Security benefits. Second, we project SCF net worth following income-wealth specific growth patterns observed in the survey, creating a wealth measure with timing in line with the estimation of expected Social Security

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wealth at the early eligibility age. We also project forward our DB estimates to reflect expected accumulation of benefits on one's current job.

We first use this combined wealth concept to evaluate the resources of groups of workers approaching retirement age. Most of the retirement adequacy literature focuses on recently retired or about-to-retire workers. We evaluate preparation among households in their 50s, similar to existing studies, but also among a cohort of "early savers", who are in their 40s. Consistent with much of the existing literature, we find that expected retirement income is adequate for most households, but leaves a substantial – and growing – number expected to be at risk financially during their retirement years.[1]

We next use the expanded resource concept to calculate levels and changes in the distribution of wealth over time. Some of the existing research exploring the distribution of wealth uses data that does not include households in the very top of the wealth distribution, and most of it does not reflect either the implied asset value of DB pensions or Social Security.[2] Incorporating the asset value of expected retirement benefits, particularly Social Security, has a dramatic equalizing effect on the distribution of wealth. For example, among households with heads ages 40-49, the share held by the top five percent ranked by wealth *excluding* retirement plans (DB, DC) and Social Security is 53 percent. Once these assets are included, the top five-percent wealth share falls to 38 percent. There is also a slight moderation in the trend toward greater inequality once we incorporate all forms of retirement wealth.

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[1] Using administrative data, both Bee and Mitchell (2017) and Beshears et al. (2019) find that income in retirement, on average, has not fallen dramatically over the past 10 to 20 years. Beshears et al. (2019) do show deterioration for those below median income.

[2] Wolff (2014, 2015) is the primary exception here, as he also uses the SCF and predicts earnings histories. His focus is primarily on the Gini coefficient and broad inequality trends, not specifically top-end concentration. There are also a number of methodological differences between this paper and Wolff's.

In the remainder of this paper, we:

- Briefly review the retirement adequacy and the wealth inequality literatures, drawing attention to the contributions that we make in this paper;

- Describe the primary data we use in this analysis – the SCF;

- Detail the methods and additional data sources we use in (1) estimating household level earnings histories used to calculate expected Social Security benefits and (2) age forward the private wealth measures to the point of retirement, and;

- Present our findings, both for retirement preparation and for the distribution of wealth.

2. Literature Review

The areas of retirement income adequacy and wealth concentration have each generated extensive literatures. Keeping our focus on identifying the paper's contribution, we provide a very brief overview of each of these literatures.

2A. Retirement Adequacy

The extensive literature evaluating the adequacy of income for current and future retirees has been spurred on by dramatic changes in the demography of an aging country and equally dramatic changes in the retirement system which has transformed from a primarily DB pension system to an overwhelming DC system in just a few decades. The now-ubiquitous 401(k) plan was first introduced into law in 1978. As of the late 1980s, traditional defined benefit pensions were still the typical plan for households with heads between 40 and 59. In 1989, a quarter of these households were covered only by a traditional defined benefit pension, 17 percent by a DC plan only, and 18 percent were covered by both types of plans (Figure 1). By 2016, 7 percent had only a DB plan, 8 percent had both types of plans, and 37 percent relied exclusively on DC plans

for their work-based pensions. This transformation of the pension system has made benefits more flexible and portable, virtues appreciated by many workers. But it has also shifted risk and decision-making from employers to workers, fueling considerable anxiety about retirement preparation, and exposed retirement income to the volatility of investment returns.

As this transformation of the pension system has unfolded, a number of researchers have sought to understand the consequences for the adequacy of retirement income for older Americans. On the central question of the status of the adequacy of retirement income, the literature is divided. Some papers have identified large shortfalls in the adequacy of retirement savings (e.g. Bernheim, 1992; Munnell and others, National Retirement Readiness Index (NRRI), 2006, 2014, 2018, Haveman et al., 2006; Munnell, Orlova, and Webb, 2013). Others have concluded that household financial preparation for retirement is in much better shape, and any shortfalls are largely concentrated among specific, more vulnerable, groups such as single retirees (e.g. Engen, Gale, and Uccello, 1999; Scholz, et al., 2006; Love, McNair, and Smith, 2008).

Defining Adequacy

One of the methodological factors that differentiate these – and other – studies is the way they define "adequacy." Adequacy is typically determined by comparing anticipated household income in retirement to pre-retirement income. Replacement rates are "adequate" if they provide a smoothed level of consumption across working life into retirement with a potential step-down adjustment at the point of retirement.[3] Another approach to defining adequacy assumes declining levels of consumption over the retirement period, based on models where households smooth the marginal utility of consumption over the lifecycle using assumptions on preference

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[3] See Biggs and Springstead (2008) for a discussion of alternative standards of adequacy of replacement rates.

parameters and changes in consumption when children leave home (Scholz, Seshadri, and Khitatrakun, 2006; Engen, Gale, and Uccello, 1999).

Differences in these first two approaches to defining adequacy go a long way to reconciling the competing findings from the more optimistic and pessimistic findings on retirement adequacy. When Scholz et al. (2006) assume a more standard life-cycle rule defining annual retirement consumption as a function of lifetime resources, they find 49 percent of households have inadequate savings as compared to only 16 percent under their declining rate optimized path of consumption. Similarly, when Munnell, Rutledge, and Webb (2014) adjust the adequacy rules in the NRRI to incorporate the same optimal rates of asset drawdown as implied in Scholz et al. (2006), the share of households (heads age 51-61) with inadequate retirement resources falls from 35 percent to 24 percent. When they further incorporate the assumption Scholz et al. (2006) use about the decline in consumption when children leave the home, the share of households with inadequate savings fall further to 11.5 percent.

A third approach is to use an external benchmark to indicate target levels of consumption in retirement (Wolff, 2002; Haveman, Holden, Wolfe, and Romanov, 2006; Love, Smith, and McNair, 2008). One implication of the replacement rate or smoothed consumption approaches to defining "adequacy" is that, because they are determined relative to the household's own income history, poor households who are able to maintain the same poverty-level consumption in retirement are considered to have "adequate" resources. Households with much higher absolute standards of living might be considered to have inadequate resources.

Most studies using external benchmarks to assess adequacy have used the official poverty thresholds, which vary over time and by household composition. Use of the poverty thresholds, however, has been criticized for being too low ($14,507 for an elderly couple in 2016) to

represent a meaningful standard of well-being of retirees. Gould and Cooper (2013) use the Supplemental Poverty Measure (SPM), which reflect health care costs and regional differences in cost-of-living. Mutchler, Li, and Xu (2016) develop the "Elder Index," which is based explicitly on costs faced by seniors and varies by household composition, homeownership status, and regional cost differences. These alternative benchmarks are much higher than the poverty threshold, thus resulting in larger shares of current and future retirees falling below "adequate" levels of retirement income. Hurd and Rohwedder (2011) use observed consumption paths over retirement from panel data as a benchmark, identifying adequacy among recent retirees as sufficient income to afford retirement consumption and still be able to leave a bequest. The official poverty thresholds are much lower than these alternative benchmarks, but they have been produced consistently for decades and can be used to explore changes in adequacy over time.

This study does not take a stand on the optimal definition of adequacy and instead presents a variety of measures that allow one to piece together an overall picture of adequacy.

Measurement of Retirement Income & Assets

Most research on retirement income adequacy uses data from the Health and Retirement Survey (HRS). The HRS is a high quality household survey of older Americans with a battery of questions on household income and resources. In recent years, researchers have been able to link the HRS to individual SSA earnings histories and to employer-specific pension plans. Studies with the HRS either explore adequacy among current retirees (Hurd and Rohwedder, 2011; Moore and Mitchell, 1997) or used self-reported, expected pension and benefits income to explore adequacy for those about to retire (Engen, Gale, and Uccello, 1999; Love, Smith, and McNair, 2008).

The HRS offers many advantages to researchers in this field, but has some limitations as well. Because of the survey design, the HRS cannot tell us anything about the savings or anticipated retirement adequacy among younger workers. A number of studies using the HRS evaluate adequacy among workers as young as 51 (Munnell, Orlova, Webb, 2013; Gustman and Steinmeier, 1999; Scholz, Seshardi, and Khitatrakun, 2006). Ideally, retirement preparation starts much earlier in the life-cycle. Because it does not include high net-worth households, the HRS cannot be used to fully evaluate the implications of Social Security on wealth concentration.[4]

A number of studies have also explored retirement adequacy using the Survey of Consumer Finances. Because the SCF samples the entire age distribution, these studies have looked at retirement income among younger cohorts of savers. Kennickell and Sunden (1997) use the age-earnings profile from one year of the Current Population Survey (CPS) data to predict earnings histories to households under age 65.[5] Wolff (2002, 2006, 2007, 2015) predicts earnings histories within the SCF using an in-sample prediction of future earnings based on a simple human capital earnings regression, in conjunction with respondent-provided current and past-job information. These predicted retirement incomes are used to evaluate adequacy in several years of the SCF among relatively younger cohorts than are evaluated using the HRS (47 to 64 years olds (Wolff 2002, 2006) and 40 to 55 year olds (Wolff, 2007).

The National Retirement Risk Index (NRRI), developed by the Center for Retirement Research, also uses the SCF to evaluate retirement adequacy. The NRRI imputes earnings histories into the SCF through a statistical match to the linked HRS/SSA earnings data. The NRRI calculates

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[4] While the ability to match to SSA earnings is extremely useful, not all respondents agree to the match, and researchers need to estimate earning for the missing records. There is some evidence of bias introduced by the selection of respondents who agree to the match (Bricker and Engelhardt (2014)).

[5] Given the early time period considered, Kennickell and Sunden (1997) show an equalizing effect on wealth distribution of DB and Social Security wealth, but not for DC wealth.

adequacy across the full age distribution. Since the HRS only includes workers in their 50s and above, a number of additional assumptions are need to predict earnings histories and futures for younger workers.

All of the above SCF studies use the self-reported DB pension responses in the SCF and rely on out-of-sample data to predict earnings histories into the survey for calculating future Social Security benefits.   This paper aims to improve both of these measurement challenges to enhance our understanding of retirement preparation across the life-cycle and the distribution of household resources.

A final related area of the literature focuses on the adequacy of retirement income for individuals that have recently retired. Brady, Bass, Holland and Pierce (2017) find that most individuals maintain a high replacement rate of pre-retirement income in retirement, but acknowledge that there is variability across the income distribution.[6] This strand of the literature uses panel tax data to follow the changes in income in pre-retirement and retirement years and is more focused on the contribution of the different types of retirement income (such as Social Security and pensions) to overall retirement income. Given the research design and data source, these studies focus on individuals near retirement age and cannot examine the accumulation of assets prior to retirement.

2B. Wealth Distribution

The fact that wealth – particularly financial assets – is highly concentrated at the top of the distribution has long been acknowledged, and, in fact, is the motivation for the unique sampling strategy employed in the Survey of Consumer Finances. Results from the SCF indicate that the

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[6] Beshears et al. (2019) come to a similar conclusion.

wealth is significantly more concentrated than income (Bricker et al., 2016). Most research exploring the distribution of wealth in the US relies on the SCF (Bricker et al., 2016; Keister and Moller, 2000; Wolff, 1995; Kennickell, 2006). Some wealth distribution research uses the PSID, which also includes questions on assets and debt (Quadrini, 1999; Banks, Blundell, and Smith, 2003; Fisher, Johnson, Latner, Smeeding, and Thompson, 2016). These studies yield lower estimates of wealth concentration because the PSID does not adequately sample high wealth households and it does not ask about some asset-types that are disproportionately held by the wealthy (Juster, Smith, and Stafford, 1999; Pfeffer, Schoeni, Kennickel, and Andreski, 2016). The top 5 percent wealth share for 1989 was 47 percent in the PSID, but 57 percent in the SCF (Wolff, 2006).

Wealth is highly concentrated, and accurate measurement of its concentration is highly dependent on the use of data that includes high wealth households. The extent to which the concentration of wealth has risen over time, however, is in dispute. Analysis of net worth in the SCF suggests top wealth shares have increased somewhat, with the top one percent share climbing to 38 percent by 2016 (Bricker et al., 2017). In an alternative approach, Saez and Zucman (2016) use a capitalization model to predict wealth based on flows of capital income reported on federal income tax forms and rates of return estimated from the Financial Accounts and other macro-data sources. They find that wealth predicted from tax returns rises much faster than reported wealth – with the top one percent share climbing from 28 percent in 1989 to 39 percent by 2016.

Each of these studies improves our understanding of trends in the distribution of wealth, but neither uses a wealth concept that includes the implied asset value of Social Security benefits. Devlin-Foltz et al. (2016) show that inclusion of improved measures of DB pension wealth

results in somewhat lower measures of wealth concentration in the SCF, and we build directly on that work. The absence of Social Security from the discussion of wealth concentration is troubling for a number of reasons. Social Security benefits represent the single-largest source of retirement income for more than 60% of retired households (Social Security Administration, 2016). Since accumulation of wealth to finance retirement is the dominant reason for savings, and Social Security may 'crowd out' private savings or is the primary savings mechanism for many lower income households, discussions of wealth distribution, especially in the context of economic policy, that do not include the value of Social Security are limited at best and potentially misleading.

3. Data and Methods

To improve the measurement of wealth concentration, and extend the research on retirement income adequacy to a younger cohort of households, we use the SCF to develop an expanded measure of wealth that incorporates both estimates of DB wealth as well as the asset value of Social Security among the 40-59 year old population. We directly incorporate the work of Sabelhaus and Volz (2019) who impute the value of DB wealth to current workers in the SCF using labor market and pension plan characteristics in the survey along with high quality external data on DB plan assets. In this section, we discuss the Survey of Consumer Finances and the methods we use in (1) estimating earnings histories of survey respondents, (2) calculating future Social Security benefits, and (3) aging forward SCF net worth to the point of retirement.

This current research also represents an improvement on work by others using the SCF to develop broader wealth measures to assess retirement adequacy (NRRI, various) or the distribution of wealth (Wolff, various). Both Wolff and the NRRI rely solely on self-reported information on pensions in the SCF to estimate DB wealth for future retirees, which results in

levels of predicted pension wealth inconsistent with economy-wide pension assets.[7] Following

Sabelhaus and Volz (2019), we instead combine aggregate data on plan assets with the SCF

survey data to estimate DB wealth of current workers. (See Section 3B, below, and Appendix A

for additional details.) In calculating Social Security wealth of current workers, Wolff estimates

in-sample human capital equations to predict future covered earnings, and the NRRI statistically

matches SCF workers with standardized earnings trajectory based on linked HRS-Social Security

earnings records. The static age-earnings profiles embodied in Wolff's approach fail to capture

how earnings evolve over time for workers, an element we incorporate into our analysis using

cohort earnings trajectories (See Section 3C, below, for details on the approach used here).

3A. SCF

The primary data source we use is the ten waves of the Federal Reserve Board's triennial Survey

of Consumer Finances (SCF) conducted between 1989 and 2016. Several features of the SCF

make it appropriate for exploring retirement income adequacy and the distribution of wealth.

The survey collects detailed information about households' financial assets and liabilities, and

has employed a consistent design and sample frame since 1989. As a survey of household

finances and wealth, the SCF includes some assets that are broadly held across the population

(bank savings accounts) as well some that are held more narrowly and that are concentrated in

the tails of the distribution (direct ownership of bonds).

To support estimates of a variety of financial characteristics as well as the overall distribution of

wealth, the survey employs a dual-frame sample design. A national area-probability (AP)

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[7] Wolff (various) combines self-reported future pension coverage with an estimate of future earnings. The NRRI
studies also make assumptions about declining generosity across cohorts and about future coverage for younger
cohorts without a DB pension.

sample provides good coverage of widely held assets and debts. The AP sample selects household units with equal probability from primary sampling units that are selected through a multistage selection procedure, which includes stratification by a variety of characteristics, and selection proportional to their population. Because of the concentration of assets and non-random survey response rates by wealth, the SCF also employs a list sample that is developed from statistical records derived from tax returns under an agreement with IRS's Statistics of Income (SOI).[8] This list sample primarily consists of households with a high probability of having high net worth.[9] The SCF combines the observations from the AP and list sample through weighting, and the weighting design adjusts each sample separately using the information available for each sample. The final weights are adjusted so that the combined sample is nationally representative of the population and assets.[10] These weights are used in all calculations.

The primary purpose of the SCF is to collect information about household balance sheets. Assets measured in the SCF include the value of all financial and nonfinancial assets, including residential and non-residential real estate and privately held businesses, reported by the respondent at the time of the interview.[11] Questions on household debt reflects all types of debt,

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[8] See Bricker et al. (2014) and Bricker et al. (2017) for recent discussions of the sampling strategy, the list sample, and the weights used in the SCF. See Wilson and William J. Smith (1983) and Internal Revenue Service (1992) for a description of the SOI file. The file used for each survey largely contains data from tax returns filed for the tax year two years before the year the survey takes place.

[9] For reasons related to cost control on the survey, the geographic distribution of the list sample is constrained to that of the area-probability sample.

[10] The SCF weights were revised in 1998 to incorporate home ownership rates by race (Kennickell, 1999). Weights for earlier years were updated to reflect the revised methodology.

[11] Assets do not include – and the SCF does not collect information on the value of defined benefit pensions or the implied annuity value behind future or current Social Security benefits of respondents.

including credit cards, mortgage debt, student loans, business debts, and other miscellaneous forms of debt.[12]

3B. Defined Benefit Pension and Social Security Wealth

One shortcoming of the SCF, for the purposes of measuring both retirement adequacy and wealth concentration, is the omission of current asset values of future DB pension payments and Social Security benefits. Respondents enrolled in DB pension plans are asked questions about expected future benefits. Many workers, particularly those further from retirement age, know less about their plans or future benefits, and the information collected from these questions is not necessarily a good reflection of what they will actually receive (Starr-McCluer and Sunden, 1999).

Instead of relying fully on the expected future benefit responses provided by DB plan participants, we rely on the estimated DB pension wealth for SCF households developed by Devlin-Foltz, Henriques, and Sabelhaus (2016) and Sabelhaus and Volz (2019). Their approach distributes aggregate household sector DB assets from the Financial Accounts of the United States (FA) to both current and future beneficiaries using survey information on benefits currently received for those receiving payments, reported future payments for those with coverage from a past job, wages and years in the plan for those not-yet-receiving benefits. They combine the survey information with real discount rates that fluctuate over time, cohort life tables and differential mortality, and the assumption that current beneficiaries have first claim to

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[12] The unit of analysis in the SCF is the "primary economic unit" (PEU) which refers to a financially-dependent related (by blood, marriage, or unmarried partners) group living together. This concept is distinct from either the household or family units employed by the Census Bureau, but is conceptually closer to the latter, and throughout this paper PEUs are referred to as "families." Single individuals living alone are included and simply considered a "family" of one.

DB plan assets.[13] Devlin-Foltz, Henriques, and Sabelhaus (2016) find that inclusion of the implied assets from future pension benefits modestly reduces inequality in the distribution of wealth, but they do not include implied wealth from future Social Security benefits in their discussion of wealth distribution. To develop estimates of future Social Security benefits, and their implied asset value, we first need to estimate earnings histories and projections of respondents and their spouses for the SCF.

3C. Methodology for Estimating Earnings Profiles in SCF using CPS cohorts

To construct a full earnings history and projections going forward for SCF respondents, we apply the growth in earnings over one's working life implied by the shape of CPS earnings estimates for individuals most similar to the SCF respondent based on birth year, occupation, education level, and sex.

From the 1989-2016 SCF data, we take respondents age 40 and older and up to age 59 at the time of the interview (with spouses being 30 to 65 years old) and use the information reported in the SCF on (1) current occupation, earnings, and tenure, (2) any retrospective occupation, earnings, tenure information, and (3) future work expectations. For each respondent and spouse, we estimate a full history of past and future earnings using regression estimates described below – relying on CPS data from 1964 to 2016.

Individuals are categorized into types by 21 possible birth-year cohorts (three-year cohorts beginning in 1924-26 and ending 1984-86), 3 education levels (less than high school, high school or equivalent, some college/degree), and 5 broad occupation categories ((1) management,

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[13] See Appendix A for more details on DB wealth estimation.

professional, and related, (2) service, (3) sales and office, (4) construction, maintenance, production, transportation, and (5) the self-employed from all occupations).

For some ages, we broaden the categories, defining by education-occupation types instead (for men and women each), when an individual's birth year cohort is *not* observed in the CPS at those ages. For instance, the youngest person whose earnings profile we want to estimate is born in 1986 and 30 years old at the time of the 2016 SCF interview. The estimates will be based on earnings for those born in 1984-6 who are up to age 32 in the 2016 CPS. To forecast earnings growth after age 32, we use coefficient estimates from the education-occupation model. Similarly, for the oldest birth year in the earliest (1989) SCF, 1924, we use the education-occupation model coefficients to fill in earnings at ages that are prior to 1964. Those born between 1942 and 1951 are fully covered by the CPS.

For each of type g, we estimate the following regression on log income in the CPS

$$\ln(y^g) = \beta_0^g + \beta_1^g age + \beta_2^g age^2 + \beta_3^g age^3 + \beta_4^g age^4 + \beta_{PT}^g PartTime$$

and back out an individual's individual effect, β_{0i}, at the time of the SCF survey

$$\beta_{0i} = \ln(y_i) - \beta_1^g age_i + \beta_2^g age_i^2 + \beta_3^g age_i^3 + \beta_4^g age_i^4 + \beta_{PT}^g PartTime_i .$$

The individual effect in any year is a weighted average of the individual and group constants, β_{0i} and β_0^g, respectively, where we place more weight on the group average constant as we estimate periods further out from the reported income in the SCF. Specifically, the constant at time t is $\beta_i^{W,t} = \rho^t \beta_{0i} + (1 - \rho^t)\beta_0^g$, where we set $\rho = .85$.

To predict income, we then apply $\beta_i^{W,t}$, β_1^g, β_2^g, β_3^g, β_4^g, β_{PT}^g for all ages for each individual.[14] Anyone who reports a longest prior occupation type that is different from his current occupation will have different coefficients applied to the relevant years.

As an example, suppose we have a 2013 SCF respondent who is 50 years old at the time of the survey and reports current full-time earnings of $55,000 in his current job of 8 years. The longest prior job he reports, which lasted 12 years, was in a different occupation and ended 14 years ago with his earning $35,000. He reports having worked full-time every year since age 20 and expects to end work at age 65. The earnings history and projection for this individual would look something like what is shown in **Figure 2**.

We assume when estimating an individual's future income that he or she will work until their expected retirement age, reported in the SCF, which will, of course, not be the case for everyone. The CPS income estimated for a person's type will account for relatively short periods of unemployment, as it includes total income for those who were not employed for the entire year prior. However, with these measures, we will not be able to capture losses in income due to long-term unemployment, unanticipated early or partial retirement, or permanent labor force exit through disability, which could be modeled through shocks in future versions.

Our current SCF lifetime income estimates match the CPS well at younger ages, but are relatively high at older ages (see Appendix Figure 1A and 1B for comparisons for two different birth year cohorts of men). We attribute this difference primarily to the lower income due to

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[14] There are 786 possible types: 630 of the more specific cohort-occupation-education-sex combinations, 126 cohort-education-sex combinations (applied when occupation is unclear), and 30 occupation-education-sex combinations (applied when estimating earnings when outside the ages the birth year cohort is observed in the CPS or some information is missing).

partial retirement being captured in the CPS but not in the SCF retirement expectations and, to a lesser extent, the differences in the SCF and CPS sample frames.

3D. Details of Social Security benefits calculations

Armed with an earnings profile for each individual from ages 20 through 61, one can apply Social Security benefit calculations for each household. First, nominal earnings are indexed to age 60, the highest 35 of which are used to calculate each individual's averaged indexed monthly earnings (AIME). The AIME is transformed to a monthly payment using the primary insurance amount (PIA) formula and the cohort-specific actuarial adjustment. We assume all individuals begin benefits at age 62, which provides a lower bound for total household Social Security wealth (SSW). Future benefits are discounted to the survey year using a 3% real discount factor and survival rates which vary by cohort, marital status, race and education (relying on cohort life tables from the Social Security Administration and differential mortality estimates from the Congressional Budget Office).

Wives (using the term generically for clarity, but secondary earners more broadly) are entitled to their own benefits (if eligible) but also spouse and survivor benefits. We assign spouse benefits to the household if expected spouse benefits are larger than the wife's worker benefits at age 62. If current marriages are less than 10 years at age 62, the wife does not receive spousal or survivor benefits.[15]

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[15] The SCF does not collect information about length of previous marriages, thus, some individuals with more than one marriage will not be accurately assigned dependent benefits from a former spouse.

The measure of SSW used is net of expected future employee contributions. Thus, for every year (after the survey), we calculate expected tax payments of 6.2% and subtract the present value of all future contributions from the gross SSW measure calculated (as detailed above).

3E. Creating the combined wealth measure

The combined wealth measure that we analyze below is created by bringing together (1) the implied wealth of Social Security benefits, net of contributions and including future projected work up until the time of retirement, (2) wealth from DB pensions projected to expected job end date and (3) projected future wealth from all assets and debt measured directly in the survey.

To be consistent with the estimates of future Social Security wealth (which reflect expected benefits at age 62, not only those accrued at interview date), we project the anticipated value of SCF sample net worth, not including DB wealth, to age 62 (part (3) above). These projections are based on in-sample estimates of the growth paths of wealth from age 40 to 62 using all 10 SCF cross-sections (1989-2016). We categorize each household into one of nine groups based on its location in the distribution of "usual" income – an income concept included in the SCF that smooths away transitory fluctuations[16] – and current wealth among households in each survey.[17] We then estimate age-wealth profiles separately for each of the nine categories, pooling all surveys, and apply the growth rates from these profiles to project households' survey wealth forward to age 62. Separate profiles are estimated for housing wealth, defined contribution pension wealth, and all other forms of wealth measured in the SCF. The implied

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[16] See Ackerman and Sabelhaus (2012) for further discussion.

[17] The categories are all combinations of the bottom 40 percent, next 40 percent, and top 20 percent for both income and wealth. Households were divided into these categories to estimate the growth in wealth for households showing the most similar wealth-accumulating behavior within their income group. The categories were kept relatively broad, however, to capture the group in which a household would be likely to remain over the ages of 40 to 62. For the years 1995-2016, usual income is used to rank households. For the 1989 and 1992 surveys, which predate the usual income question, we use current income.

annual growth rates of combined wealth for each of the nine income-wealth cohorts over the 40

to 62 year age span are higher for the lowest wealth cohorts (**Appendix Figure 2)**. Among

middle and high wealth households, the growth rate of wealth is highest for those in the top 20%

of both wealth and usual income. Because the annual rate of growth in wealth is higher at

younger ages, and we discount the projected wealth back to the age when we observe households

in the sample, the net effect of the wealth projections are substantially larger for younger

households (**Appendix Figure 3)**.[18]

We also project forward DB wealth to an individual's expected job ending date, or age 59,

whichever comes first. This also brings DB wealth in line with both SSW and projected DC

wealth to acknowledge that individuals may have many more years of accumulating benefits, and

allows us to compare age groups over time better. To do so, we back out of the Sabelhaus and

Volz (2019) accrued DB wealth the "generosity factor" implied by the allocation. The

generosity factor reflects a percentage of final wages given as a DB benefit for each year of

service accumulated. For example, in a plan with a 1% generosity factor, an individual with 30

years of service would receive 30% of their final wages as a DB benefit. With a generosity

factor, one can project a final DB payment for each individual, given their projected wages.

Expected DB payments then are transformed into present discounted value as of the survey date.

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[18] This is a different approach from the one taken by Munnell et al. (2014) in measuring future wealth. As a part of constructing the NRRI, Munnell et al. (2014) measure, for distinct components of wealth, wealth-to-income ratios by age in the SCF. They calculate target age-specific savings rates—for 48 different household types based on income, composition, homeownership status, etc.—that would be required for the households to achieve a level of wealth where post-retirement consumption is equal to consumption just prior to retiring. Making projections for each component separately, as is done to construct the NRRI, will not necessarily be an improvement for the analyses in this paper. Projections based on a single model of total net worth produced similar growth paths to the current approach of separate projections for housing, retirement and remaining wealth. This results from households within given income-wealth category having relatively similar compositions of net worth components.

The "combined wealth" measure we analyze below combines the net present value of projected SCF net worth with projected DB wealth and expected future Social Security wealth.

3F. Retirement Preparation Concepts

We use two simple measures of household preparation for retirement. The first is wealth to income ratios. These divide our expanded wealth concept by the current reported household income. The second is an annuity measure of wealth. We compare the estimated annuity amount to the poverty level for elderly households, either 1 or 2 person households depending on the current marital status of the respondent.[19] We also calculate the share of the population falling below various multiples of the poverty threshold. For both basic measures of adequacy, we explore trends over time and levels among various population sub-groups.

4. Results

In this section, we describe the results for both retirement income adequacy and wealth concentration using our combined wealth measure. We show results over time for each SCF cross-section from 1989 to 2016, and for both the 40-49 and 50-59 year old age groups. We first show means, medians, and total levels of various wealth categories. Next, we show wealth to income ratios, followed by annuitized poverty measures. Then we calculate wealth percentile ratios and concentration measures.

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[19] Our annuity calculation is the same as that used by Love, Smith, and McNair (2008). We divide the present value of our combined wealth measure (net worth, including DC wealth, plus the net present value of Social Security and Defined Benefit pension wealth) by the actuarially fair price of an annuity. The price is the sum of the probabilities of surviving to advanced age levels for both respondent and, if present, spouse, and also assumes a 3 percent discount rate.

4A. Retirement Wealth and Combined Wealth

4A.i. Components of Retirement Wealth

The average wealth in defined contribution plans has followed a familiar path, rising

substantially in the years before the financial crisis, experiencing a period of stagnation, and then

reaching a new peak in the 2016 survey. Mean DC balances were $53,000 in 1989 among 50-59

year olds, rose to $164,000 in 2007, fell back to $146,000 in 2013, and rose to a new high of

$177,000 by 2016 (Figure 3, right panel).[20] Mean DC balances are considerably lower among the

40-49 age group, starting at $35,000 in 1989 and reaching $94,000 in 2016, after hitting a plateau

of around $80,000 between 2001 and 2013 (Figure 3, left panel). As DC accounts were only

introduced in the late 1970s, it is not surprising that there were low average balances in 1989.

The data indicate both substantial preparation prior to age 40 but also a considerable amount of

retirement wealth accumulation taking place as households move much closer to retirement.

 For the 40-49 age group, DB wealth started at $90,000 in 1989, peaked in 2007 at $156,000, and

was $148,000 in 2016 (Figure 3). DB wealth for 50-59 year olds was $278,000 in 2001 and fell

across the remaining waves, hitting $206,000 in 2016. Some of the difference in DB wealth we

observe between the two age groups is mechanical, the same future benefit has to be discounted

further back in time for younger ages. In addition, DB coverage is lower for younger workers,

particularly in later years.

Predicted Social Security wealth (SSW) accounts for the largest portion of retirement wealth for

both age groups in almost all years. Mean SSW rose from $127,000 in 1989 to $150,000 in 2016

among 40-49 year olds, and rose from $189,000 to $238,000 over the same period for 59-59 year

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[20] These figures show averages among households with a head in given age group (40-49 or 50-59) in each survey
year. They do not follow the same individuals or cohorts over time.

olds. SSW rises along with earnings growth in the working population, and has fallen slightly for the older age group since the Great Recession. The broad growth in SSW, particularly in the 1990s, comes generally from two sources: higher real wages and increased labor force participation of women.

4A.ii. Combined Wealth Measures

It is well-known that the 2007 financial crisis and housing market crash led to large losses of wealth throughout the economy. The bulk of these losses occurred in assets that are not specifically identified as forms of retirement saving. "Non-retirement" wealth here includes housing and other forms of financial and non-financial wealth, and excludes DC and DB plan wealth and expected Social Security wealth.

For all comparisons going forward, all wealth is projected forward, to age 62 for non-retirement wealth, DC wealth and housing wealth, and to the age a worker expects to separate from the firm that she is currently working at for those in a DB plan. This puts all wealth measures on equal footing, allowing for better comparisons across age groups and over time. Due to life-cycle patterns, those in their 40s are expected (and shown, in Figure 3) to have less wealth accumulated for retirement. This does not, however, imply that the younger age group is less prepared for retirement.

Looking at the first set of bars in the left and right panels in Figure 4, there is little change in nonretirement wealth over the full period, save for the short-lived run-up in housing wealth leading up to the financial crisis, for the 40-49 age group; among 50-59 year olds, nonretirement wealth increased more substantially. The middle set of bars, which combines non-retirement wealth with private retirement wealth, indicate that when DC and DB pensions are included,

average wealth has increased over time for both age groups, although the growth has been substantially greater for 50-59 year olds, particularly in 2016 in non-retirement wealth.

A similar pattern of growth in mean wealth persists once we incorporate projected net Social Security wealth. For 40-49 year olds, mean combined wealth, including non-retirement wealth, DC and DB pension wealth, and net Social Security wealth rose from $943,600 in 1989 to $1.2 million in 2007, fell to $962,000 by 2010, and then partially recovered to $1 million by 2016 (Figure 4). Among 50-59 year olds, it rose from $900,000 in 1989 to $1.5 million in 2007, before falling to $1.3 million 2010 and recovering to almost $1.5 million in 2016.

Compared with the mean values, the median of the distribution of combined wealth rose less between 1989 and 2007 and fell relatively farther after the financial crisis for both age groups (Table 1). Median combined wealth levels in 2016 are lower than in 1989. Nearly all of the decrease in median combined wealth was due to the decline in nonretirement wealth (Table 2).

4A.iii. Combined Wealth Across the distribution

The individual components of the combined wealth measure have very different distributions. We explore the wealth levels at different points in the distribution in two ways. First, we look at the distribution for each of the wealth components – non-retirement wealth, DC wealth, DB wealth, SSW – and combined wealth by age group and year. This highlights the fact that some components of combined wealth are distributed more equally than others.

Most households have no DB pension wealth, thus, the values at the 10th, 25th, and 50th percentiles of DB pension wealth are zero for both age groups in 2016 (Table 1). Furthermore, more than one quarter of households do not have any DC pension wealth. A majority of households do have a DC plan, but the median of the overall DC wealth distribution was just

$4,200 in 2016 among 40-49 year olds and only $6,400 among 50-59 year olds. Both non-retirement wealth and Social Security wealth are far more broadly distributed than either DB or DC wealth. Non-retirement wealth is very concentrated at the top, but – especially prior to the financial crisis – households at the bottom of the distribution do have some non-retirement wealth. Social Security is the only asset where the lower tail of the distribution contains substantial wealth, with the 10th percentile being valued at $38,000 in 2016 among 40-49 year olds and $76,000 among 50-59 year olds. Among the components of the combined wealth measure, Social Security is by far distributed the most equally.

We next rank households by combined wealth distribution and show the levels of each of the wealth components for different points of the combined wealth distribution. This highlights the wide variation of asset composition across households (Table 2). These results make it very clear that households at the bottom of the combined wealth distribution rely heavily on Social Security, which accounts for almost all wealth at the 10th percentile of the wealth distribution for both age groups and more than half of combined wealth of households at the 25th percentile among 50-59 year olds. The role of non-retirement wealth has fallen dramatically for households in the bottom quarter of the combined wealth distribution since 1989.

To be sure, Social Security continues to account for a considerable portion of combined wealth even for households higher up the wealth distribution. Among 50-59 year olds, SSW accounts for approximately one half of combined wealth at the median of the distribution and one quarter at the 75th percentile. At these points of the distribution, SSW remains dramatically larger than other forms of retirement wealth. It is only at the top of the distribution (the 90th percentile here) that SSW is surpassed by DB and DC wealth. Social Security only accounts for 15% of combined wealth for households at the 90th percentile of the distribution, for both age groups.

4B. Retirement Preparation Measures

4B.i. Wealth to Income Ratios

Between 1989 and 2007, the combined wealth to income ratios (WTI) were generally rising at the upper part of the distribution (P75) and generally flat at the middle of the distribution (median) for both the 40-49 and 50-59 age groups (Figure 5A, B). Toward the bottom of the distribution (P25), the combined wealth WTI declined among the younger group across all years, and was flat for the older age group. Following the financial crisis, median combined WTI fell for both groups. Median total WTI in 2007 was 8.2 among 40-49 year olds and 9.4 among 50-59 year olds. By 2016, these ratios had fallen to 6.1 and 8.2 respectively.

Following the financial crisis, median private retirement (DB + DC) WTI saw only very small changes, dipping slightly for both age groups. These small changes suggest that, on balance, changes in those account balances were of similar magnitude as changes in income experienced by those households. Particularly for the 50-59 year old group, Social Security wealth has counteracted that decline. Thus, overall retirement wealth WTI (DC + DB + SSW) decreased less than private retirement wealth between 2007 and 2016. The decline in the combined wealth (WTI) ratio after 2007 is primarily due to decline in non-retirement wealth.

4B.ii. Annuitized wealth to poverty thresholds

The mean annuitized wealth to poverty ratio was mostly rising in the periods leading up to 2007, but fell sharply in the wake of the financial crisis for both age groups. Among 50-59 year olds, this indicator rose steadily, climbing from 6.0 to 8.9 between 1989 and 2007 (Figure 6A). By 2016, the annuitized wealth to poverty ratio for this group was 8.3. For 40-49 year olds,

movement in this indicator was quite similar, starting at 8.5 in 1989, and rising to 9.5 in 2007, before falling to 7.8 in 2016.

Removing housing from the annuitized wealth measure produces a smaller ratio that follows a parallel path as the original indicator, at least until 2007 (Table 3). The decline in the annuitized wealth to poverty ratio after 2007 is attenuated somewhat once we exclude housing.

When we calculate the share of households falling below various multiples of the poverty threshold, we see loosely consistent patterns, with the "below poverty" share falling in the early 1990s and rising sharply following the financial crisis. One important difference between the two approaches is in the latter 1990s, when the mean annuity to poverty threshold is rising most, we see the share below poverty flattening out and starting to rise (Figure 6B). Among 50-59 year olds, the share below the 150% poverty threshold was 17.2 percent in 1989 and 14.4 percent at its low-point in 2001, before climbing to 23.2 percent in 2016. More than 23 percent of 40-49 year old households fall below the poverty threshold in 2016, compared to about just below 17% in 1989.

The poverty estimates reported here are similar to those found in earlier studies. In their annuitized wealth measure, Haveman et al. (2006) show that the share of Social Security recipient households below twice the federal poverty rate was 22 percent in 1991; using the SCF we estimate 21.5 percent of 50-59 year old households had annuitized wealth below twice the poverty threshold in 1992 (Table 3). Among older households in the HRS, Love, Smith, and McNair (2008) calculated that 18 percent of households had annuitized wealth below 1.5 times poverty between 1998 and 2004; over the same period, we find 16 percent of 50-59 year old households below 1.5 times poverty. Our findings do, however, suggest considerably lower poverty rates than what is reported by Wolff (2002). Wolff reports a poverty rate of 19 percent

in 1998 (among 47-64 year olds) using an annuitized measure of expanded wealth; by contrast we find a poverty rate of 8 percent among 50-59 year olds.[21]

4C. Wealth Distribution

Looking at the ratios of the 90th to the 50th percentiles of the wealth distribution (P90/P50), we see inequality rising over the 1989 to 2016 period, and that inclusion of Social Security and retirement plan wealth has an impact on both the level of inequality and its trend. Among 40-49 year olds, the P90/P50 of non-retirement wealth rose from 2.9 in 1989 to 5.4 in 2016; among 50-59 year olds, it climbed from 4.5 to 7.3 (**Figure 7**). The P90/P50 of combined wealth for the younger age group rose only from 2.4 in 1989 to 4.7 in 2016. For 50-59 year olds, the combined wealth P90/P50 rose from 3.2 in 1989 to 5.7 by 2016.

Including Social Security and retirement wealth results in significantly lower top shares and also shows less growth in top shares. For the entire 40-59 year age range, we estimate that the top five percent of the distribution held 63 percent of non-retirement wealth, but only 51 percent of wealth including DB and DC pensions, and only 45 percent of combined wealth that also includes net Social Security wealth (**Figure 8**). Between 1989 and 2016, the top five percent share of non-retirement wealth rose 22 percentage points, while the share of combined wealth rose 13 points.[22]

5. Conclusion

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[21] Differences between our estimates and those of Wolff could be due to methodological differences described earlier (his use of in-sample data to estimate life-time earning histories in the SCF or his use in-sample data to estimate DB pension wealth) or other differences in the treatment of the data, for example, his decision to exclude vehicles from a household's balance sheet, but to retain the debt related to those vehicles.

[22] Estimates for the top 10% share for the full sample and the top 5% and top 10% for each age group can be found in Appendix Table 6.

In this paper, we create a new combined measure of wealth that adds DB pension wealth and Social Security wealth to the typical wealth measure. We use this new combined wealth measure to analyze the retirement preparation for households near retirement (50-59 years old) as well as a younger group of households (40-49 years old). The results show that a substantial number of households in both groups have expected incomes that are inadequate, based on the annuitized wealth to poverty threshold measure. Furthermore, the share of households in both groups with predicted retirement incomes below the poverty level has risen sharply since the Great Recession, highlighting the lingering effects on household retirement preparations.

In terms of wealth concentration, the combined measure of wealth results in a lower level of wealth concentration than the typical measure of wealth in all years. Wealth concentration is also rising slower for the combined wealth measure, evidence of the importance of including DB and Social Security wealth in discussions of wealth inequality and economic well-being.

Figure 1. Trends in Plan Participation among 40-59 Year Old Household Heads
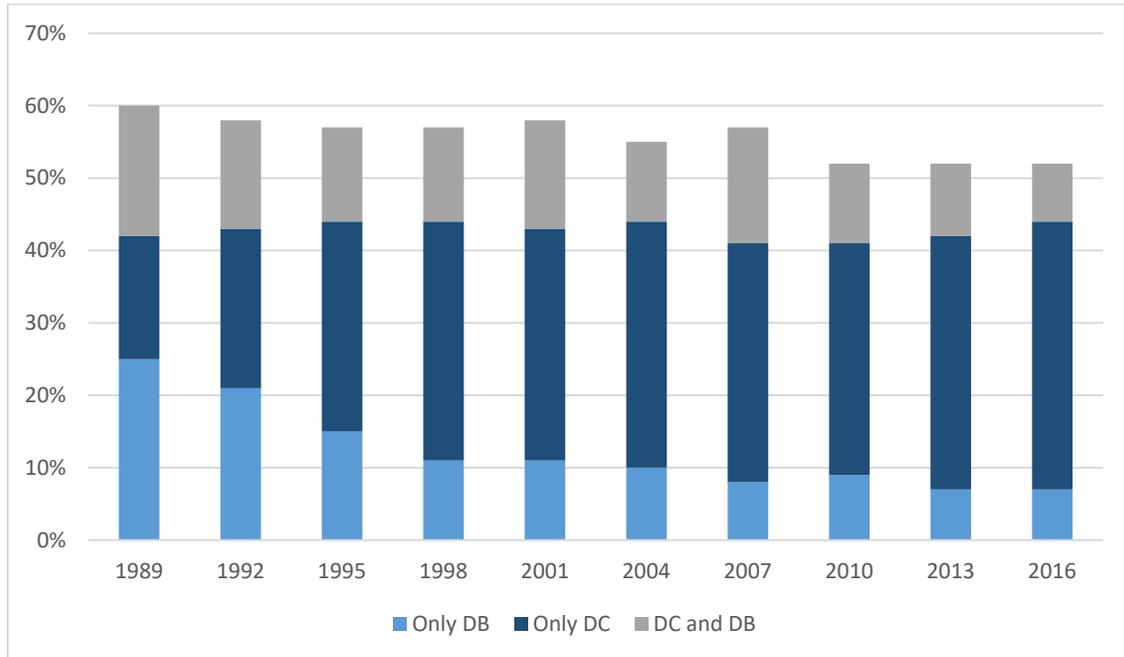
Figure 2. Construction of earnings history for hypothetical household: 50-year old middle income earner
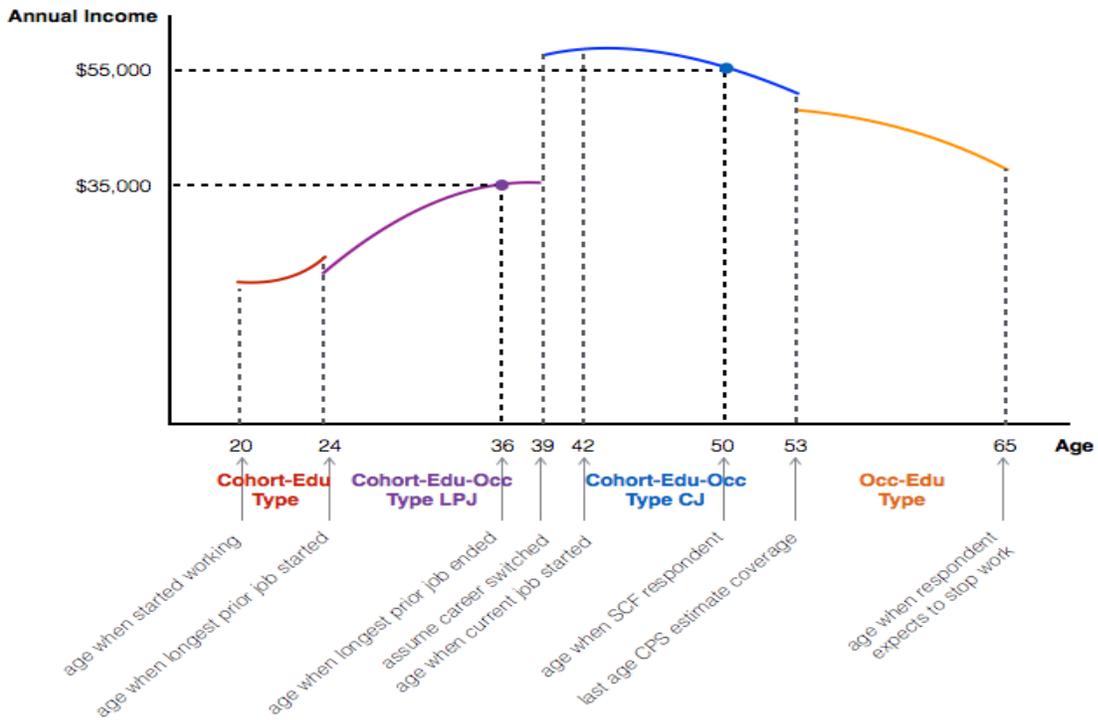
Figure 3. Mean Retirement Wealth by Type, Age Group and Year ($ Thousands)
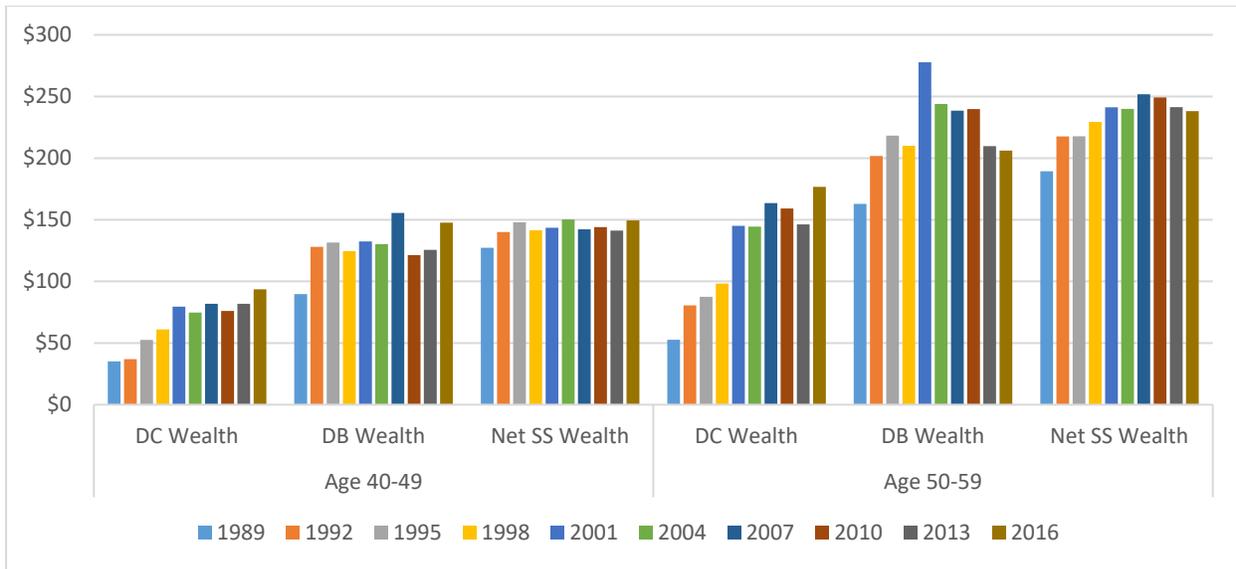
Note: DC and DB wealth are projected values, see Section 3E for methodology. Net SS wealth is future stream of projected benefits at age 62, discounted back to age at survey.

Source: Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances, http://www.federalreserve.gov/econresdata/scf/scfindex.htm.

Figure 4. Mean Wealth by Wealth Concept, Year and Age-Group ($ Thousands)
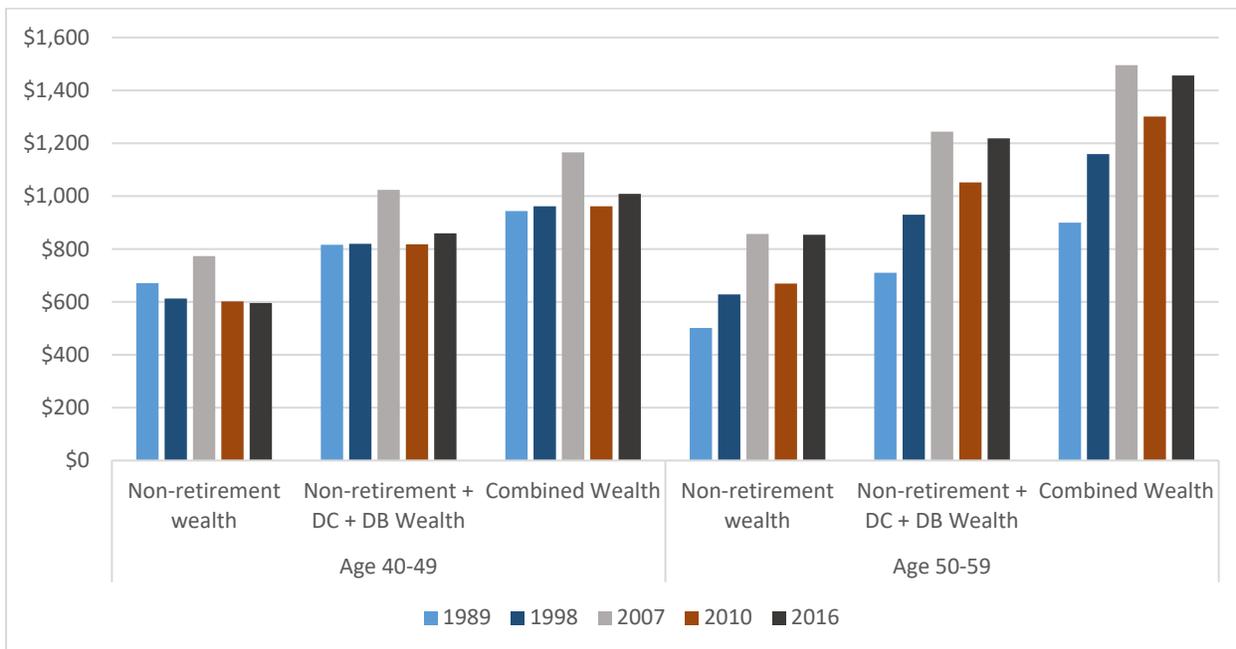
Note: Non-retirement wealth, DC wealth, and DB wealth are projected values, as described in the text. Net SS wealth is future stream of projected benefits at age 62, also discounted back to age at survey.

Source: Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances, http://www.federalreserve.gov/econresdata/scf/scfindex.htm.

Figure 5. Wealth to Income Ratios (Median and Interquartile Range) by Year, Wealth Concept, and Age Group

5A. 40-49 year old household heads
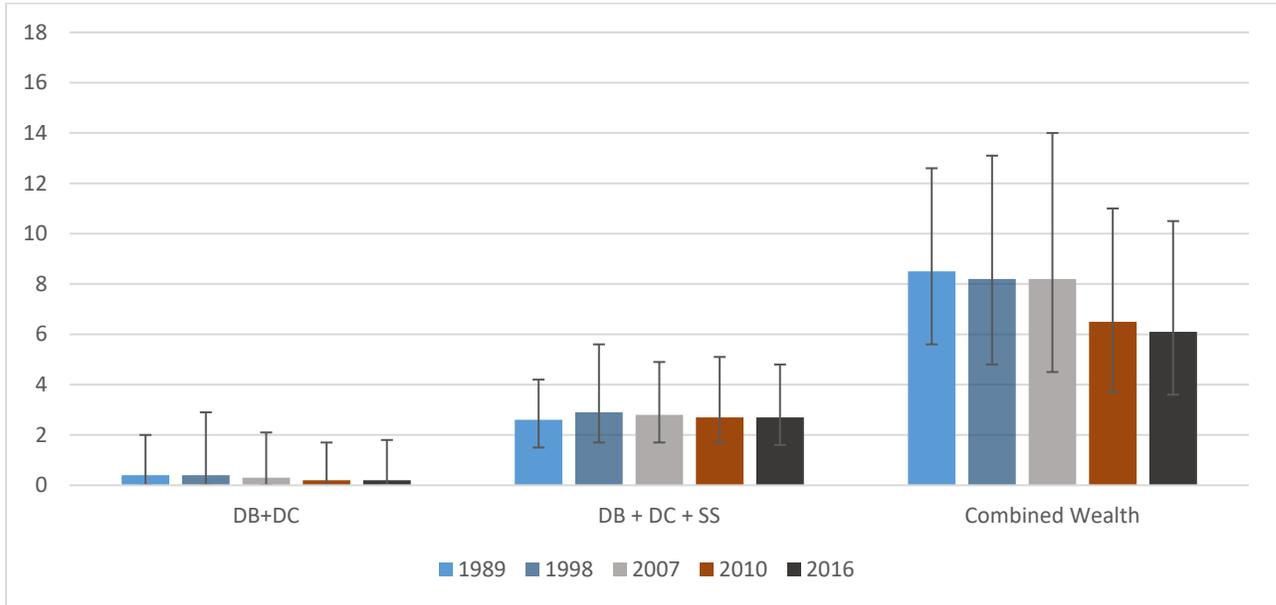
5B. 50-59 year old household heads
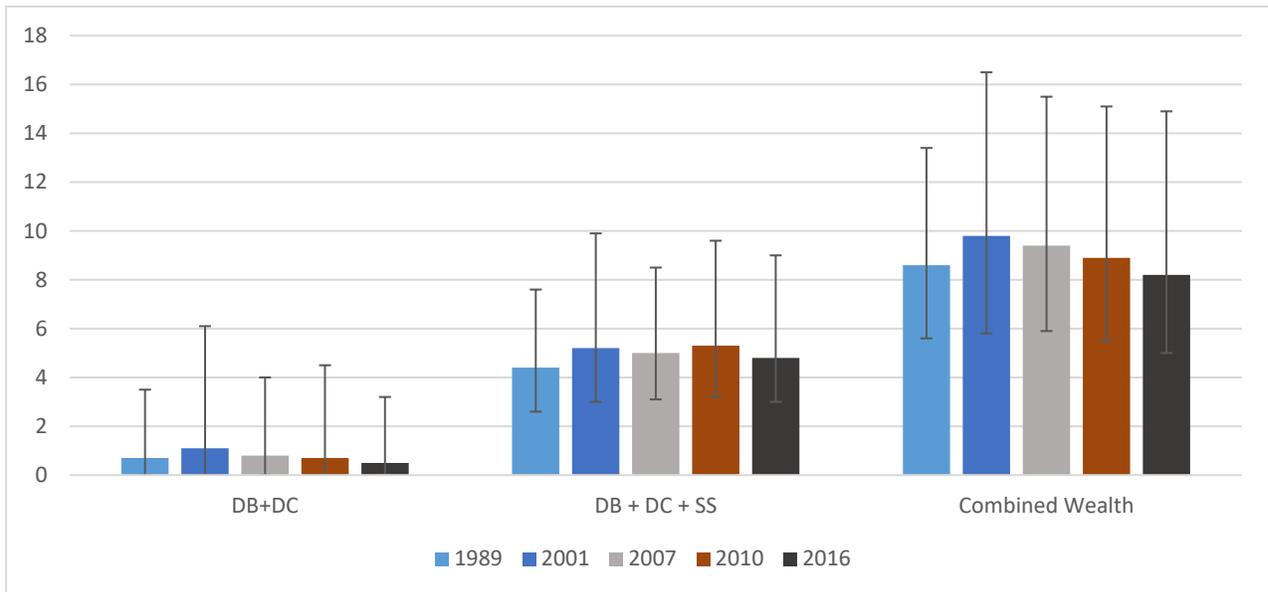
Note: Each bar represents the median WTI, while the whiskers represent the interquartile range for each year and wealth concept.

Source: Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances, http://www.federalreserve.gov/econresdata/scf/scfindex.htm.

Figure 6. Annuitized Stream of Combined Wealth to Poverty Ratio

6A. Mean Ratio
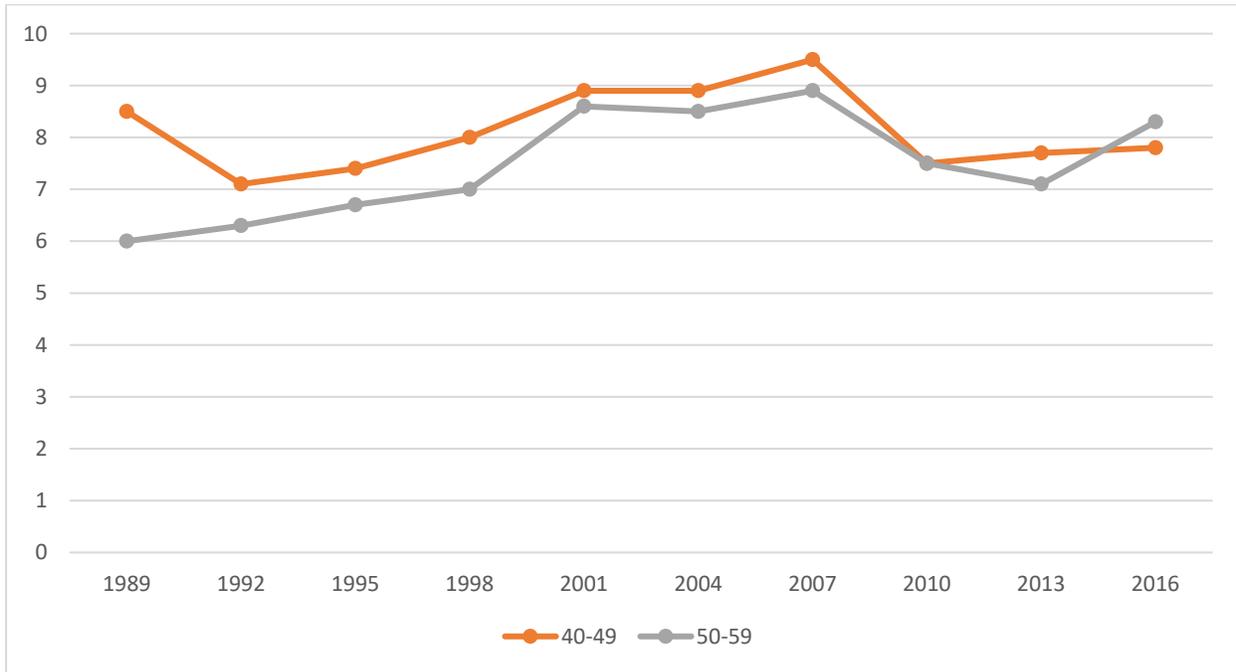
6B. Share of Households with Annuitized Combined Wealth below 150% Poverty Threshold
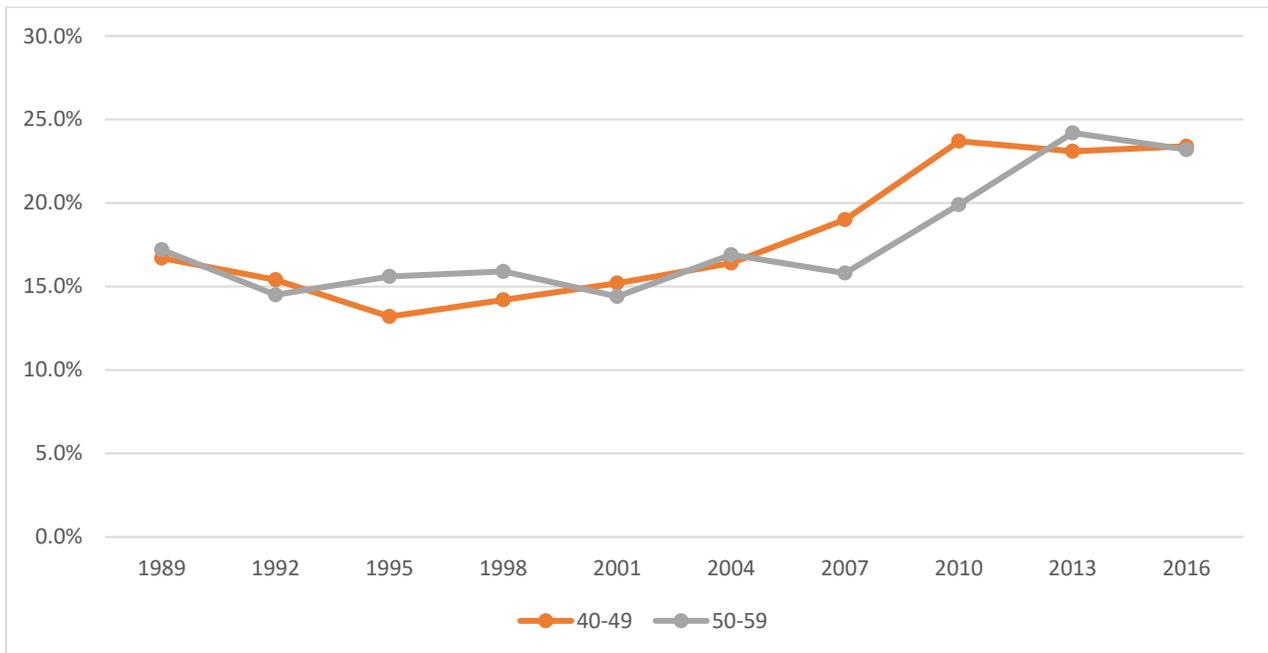
Source: Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances, http://www.federalreserve.gov/econresdata/scf/scfindex.htm.

Figure 7. Distribution of Wealth by Concept, Year, and Age Group:
Ratio of 90th percentile to Median
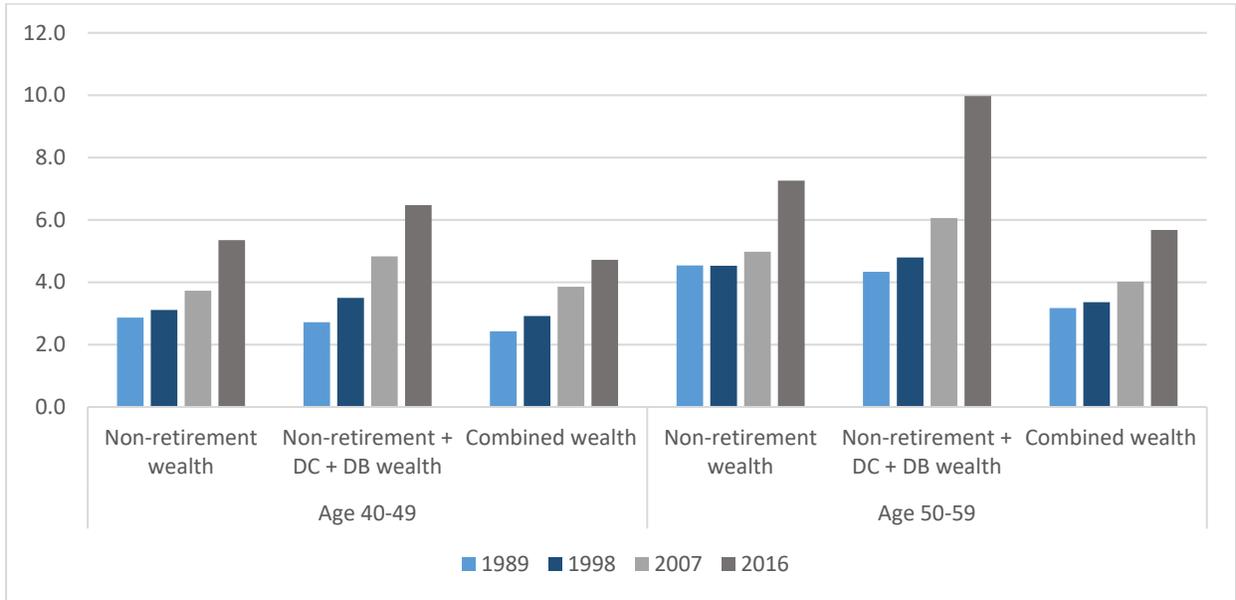
Figure 8. Top 5 Percent Wealth Share by Wealth Concept– Ranked Separately By Wealth
Concept for 40 to 59 year olds
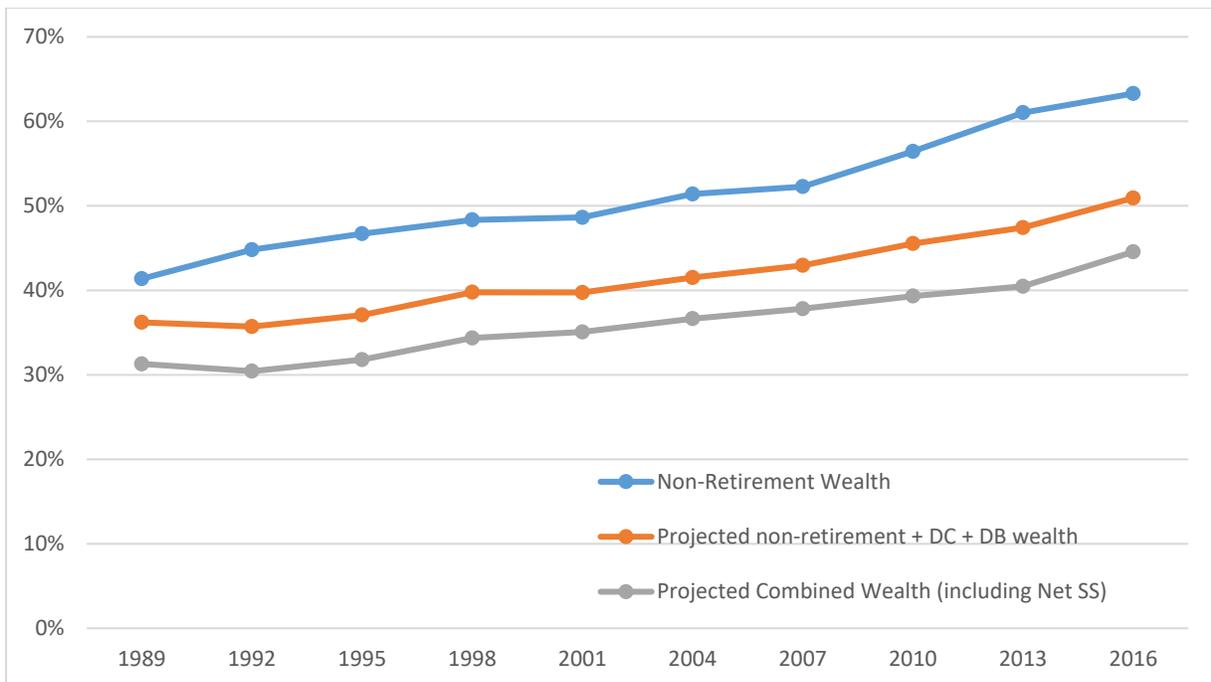
Table 1 Distribution of Combined Wealth Components by Age Group, 1989, 1998, 2007, and 2016, real 2016 $ (thousands)

Age Group:		40-49					50-59				
		Non-retirement Wealth	DC Wealth	DB Wealth	Net SSW	Combined Wealth	Non-retirement Wealth	DC Wealth	DB Wealth	Net SSW	Combined Wealth
p10	1989	2.1	0.0	0.0	30.0	78.6	6.4	0.0	0.0	42.2	105.5
	1998	16.1	0.0	0.0	41.3	96.4	3.2	0.0	0.0	74.6	140.4
	2007	0.7	0.0	0.0	35.0	60.3	4.4	0.0	0.0	84.9	147.1
	2016	-0.1	0.0	0.0	37.9	69.3	0.3	0.0	0.0	75.5	99.0
p25	1989	157.0	0.0	0.0	61.4	312.8	109.3	0.0	0.0	101.1	273.8
	1998	139.4	0.0	0.0	69.0	292.3	79.6	0.0	0.0	119.1	303.4
	2007	106.4	0.0	0.0	63.7	233.8	89.6	0.0	0.0	126.8	315.8
	2016	35.1	0.0	0.0	72.2	174.1	30.8	0.0	0.0	118.6	228.2
p50	1989	395.7	0.0	0.0	118.0	638.6	219.6	0.6	2.0	178.9	571.0
	1998	315.5	3.8	0.0	130.0	595.0	201.0	4.2	0.0	221.1	629.5
	2007	337.8	5.6	0.0	130.9	623.7	255.2	16.3	0.0	233.2	746.9
	2016	194.1	4.2	0.0	141.8	463.2	141.8	6.4	0.0	206.6	492.6
p75	1989	688.0	14.5	121.1	200.9	1,043.7	426.5	35.3	234.5	276.0	1,034.1
	1998	599.7	56.6	82.1	211.4	1,084.0	475.5	56.9	231.7	334.6	1,234.9
	2007	714.4	72.7	0.0	215.8	1,237.7	638.4	113.8	148.2	373.2	1,484.5
	2016	479.5	76.0	0.0	227.0	1,030.8	372.5	91.6	44.6	344.2	1,233.1
p90	1989	1,134.7	86.3	283.5	239.5	1,551.1	996.6	118.2	542.1	343.5	1,812.4
	1998	982.3	198.6	503.6	270.2	1,734.3	910.6	223.9	748.0	399.9	2,115.7
	2007	1,259.8	292.3	539.7	272.6	2,404.5	1,270.9	394.7	749.6	463.3	3,000.7
	2016	1,038.8	415.3	463.5	288.0	2,184.7	1,029.2	439.6	690.6	461.7	2,796.8

Note: each column ranks households by wealth component.

Source: Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances, http://www.federalreserve.gov/econresdata/scf/scfindex.htm.

Table 2. Wealth Levels at Points of the Non-retirement + DB + DC Wealth Distribution, by Age group, 1989, 1998, 2007, and 2016, real 2016$ (thousands)

Percentile of Combined Wealth	Year	Age Group: 40-49					Age Group: 50-59				
		Non-retirement Wealth	DC Wealth	DB Wealth	Net SSW	Combined Wealth	Non-retirement Wealth	DC Wealth	DB Wealth	Net SSW	Combined Wealth
p10	1989	10.3	-	-	50.1	78.6	19.0	-	-	65.9	105.5
	1998	17.2	-	-	65.4	96.4	15.7	-	-	95.6	140.9
	2007	3.0	-	-	50.5	61.6	15.1	-	-	104.3	147.1
	2016	1.5	-	-	58.0	69.4	4.0	-	-	86.6	99.0
p25	1989	183.2	-	-	77.6	315.4	139.9	-	-	120.8	276.7
	1998	183.2	0.5	-	81.7	292.5	108.3	-	-	140.7	303.6
	2007	118.7	-	-	78.0	233.8	110.9	5.2	-	162.2	315.8
	2016	52.7	-	-	94.3	174.3	47.5	-	-	141.3	228.2
p50	1989	419.3	1.3	21.6	140.7	639.4	233.7	1.4	44.3	215.7	571.3
	1998	357.6	3.0	-	167.3	595.0	243.8	8.1	-	264.7	629.5
	2007	377.8	23.0	-	165.6	623.8	293.7	38.4	-	301.7	747.6
	2016	241.9	7.1	-	173.2	463.5	151.9	15.5	-	271.7	492.6
p75	1989	668.8	14.0	102.2	181.4	1,045.2	442.5	23.3	299.8	270.3	1,039.9
	1998	611.0	39.1	50.5	183.2	1,084.4	447.5	31.9	301.2	328.0	1,237.1
	2007	826.2	60.6	-	201.8	1,237.7	637.2	97.9	63.6	344.9	1,488.5
	2016	480.7	46.3	-	206.5	1,030.8	380.6	106.8	45.6	306.7	1,235.9
p90	1989	1,134.7	12.5	133.0	196.6	1,564.7	694.9	68.2	616.8	303.4	1,812.4
	1998	822.6	113.9	474.8	219.1	1,736.6	637.7	80.3	898.6	371.1	2,121.6
	2007	1,121.6	95.7	548.3	212.4	2,404.6	903.8	194.5	804.4	416.6	3,000.7
	2016	979.1	354.3	-	232.3	2,191.3	785.7	301.5	400.6	427.0	2,796.8

Note: Each statistics is calculated as the median of the wealth concept for households (by age group and year) within +/- five percentage points of the cut point of the combined wealth distribution. So, the values for P10 of the combined wealth distribution is the median of the wealth concept for households between the 5th and 15th percentiles of the combined wealth distribution.

Source: Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances, http://www.federalreserve.gov/econresdata/scf/scfindex.htm.

Table 3. Annualized wealth stream to poverty ratio, Mean and shares below poverty, by age group

	1989	1992	1995	1998	2001	2004	2007	2010	2013	2016
Panel A. All Households (40-59)										
Mean Income/Poverty Ratio:										
Annuitized Total Wealth	7.4	6.8	7.1	7.6	8.8	8.7	9.2	7.5	7.4	8.1
Annuitized Wealth Less Housing	5.4	5.3	5.6	6.2	7.0	6.6	6.9	6.0	6.0	6.5
Share of Households below Multiple of Poverty Threshold										
1 X Poverty	11.3%	9.8%	9.6%	8.9%	9.7%	10.6%	10.7%	14.3%	14.8%	15.0%
1.5 X Poverty	16.9%	15.0%	14.1%	14.9%	14.8%	16.6%	17.5%	21.7%	23.7%	23.3%
2 X Poverty	21.7%	20.5%	19.4%	20.0%	20.2%	21.2%	22.4%	29.0%	32.4%	31.6%
Panel B. Age 40-49										
Mean Income/Poverty Ratio:										
Annuitized Total Wealth	8.5	7.1	7.4	8.0	8.9	8.9	9.5	7.5	7.7	7.8
Annuitized Wealth Less Housing	5.9	5.4	5.6	6.3	6.8	6.5	6.6	5.8	6.1	6.0
Share of Households below Multiple of Poverty Threshold										
1 X Poverty	11.2%	9.5%	9.6%	9.3%	10.3%	11.2%	13.3%	16.0%	15.5%	15.6%
1.5 X Poverty	16.7%	15.4%	13.2%	14.2%	15.2%	16.4%	19.0%	23.7%	23.1%	23.4%
2 X Poverty	19.7%	19.8%	17.5%	18.2%	18.9%	20.4%	23.1%	30.1%	31.8%	30.5%
Panel C. Age 50-59										
Annuitized Total Wealth	6.0	6.3	6.7	7.0	8.6	8.5	8.9	7.5	7.1	8.3
Annuitized Wealth Less Housing	4.7	5.3	5.7	6.0	7.3	6.9	7.1	6.2	6.0	7.1
Share of Households below Multiple of Poverty Threshold										
1 X Poverty	11.5%	10.2%	9.5%	8.4%	8.9%	10.0%	7.9%	12.7%	14.1%	14.6%
1.5 X Poverty	17.2%	14.5%	15.6%	15.9%	14.4%	16.9%	15.8%	19.9%	24.2%	23.2%
2 X Poverty	24.2%	21.5%	22.5%	22.3%	22.1%	22.1%	21.7%	27.8%	33.0%	32.6%

Source: Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances, http://www.federalreserve.gov/econresdata/scf/scfindex.htm.

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Appendix A. Distributing Aggregate DB Pension Assets

The SCF does not ask respondents about the present value of expected future defined benefit (DB) pensions, but the survey does collect information about current DB payments of retirees and about the expected future claims of workers from DB pension plans.

First, the aggregate value of DB assets by year is assigned as the value from the Federal Reserve Board's Financial Accounts (FA) of the United States.[23] DB pension wealth is the portion of Total Pension Entitlements (B.101 line 28) not found in Defined Contribution pension assets (Table L.116 line 26). In the first quarter of 2016, this amounted to $15.1 trillion, or roughly one-sixth of total FA household sector net worth. This is defined as the accrued benefit obligation of pension plans to households, and, as such, includes both funded and unfunded assets.

Aggregate DB wealth is distributed across households is a series of steps. We build off the approach used by Bricker, Henriques, Krimmel, and Sabelhaus (2016), which in turn was inspired by the approach used by Saez and Zucman (2016).

The first phase of the micro allocation involves splitting aggregate pension wealth between (1) SCF respondents already receiving benefits or those with coverage from a past job, and (2) those who are currently covered by DB plans on their job but not yet receiving benefits. We effectively assume that current beneficiaries (or those who have coverage from a past job) have a first claim to plan assets, as we solve for the present value of promised benefits for group (1), and subtract that amount from total plan assets to solve for the share to be distributed to those not yet receiving benefits (with coverage from current job). The present value of benefits for those already receiving is based on the respondent-reported values for those benefits, cohort life tables from the Social Security Administration, differential mortality from CBO, and an assumed nominal discount factor that varies over time. The present value of benefits is calculated similarly for those that report coverage from a past job, relying on expected payment and age at

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[23] Financial Accounts data is available on the Federal Reserve Board's web site, in the quarterly Z1 release. The data can be accessed at http://www.federalreserve.gov/releases/z1/.

which benefits will begin. The total present value of all these benefits are then subtracted from the FA aggregate, creating a "residual".

The algorithm we use for distributing DB assets for group (2), those with coverage on current job, is not based on SCF respondent-reported expected DB benefits. For this group, we follow in spirit how the plan would be required to fund their pension plan, through accrued benefit obligation (ABO). Thus, we rely on current wage and years in the plan, and an assumed accrual of 2% of wages gained per year towards annual benefit to estimate ABO for each individual. Then, to ensure the household sector aggregate match the total assets from the FA, the "ABO" for each worker is scaled to ensure the total benefits from this second step matches the "residual" calculated after first estimation step.

Appendix Figure 1A. Median Wage for Men born 1933-1935, SCF predictions and CPS values
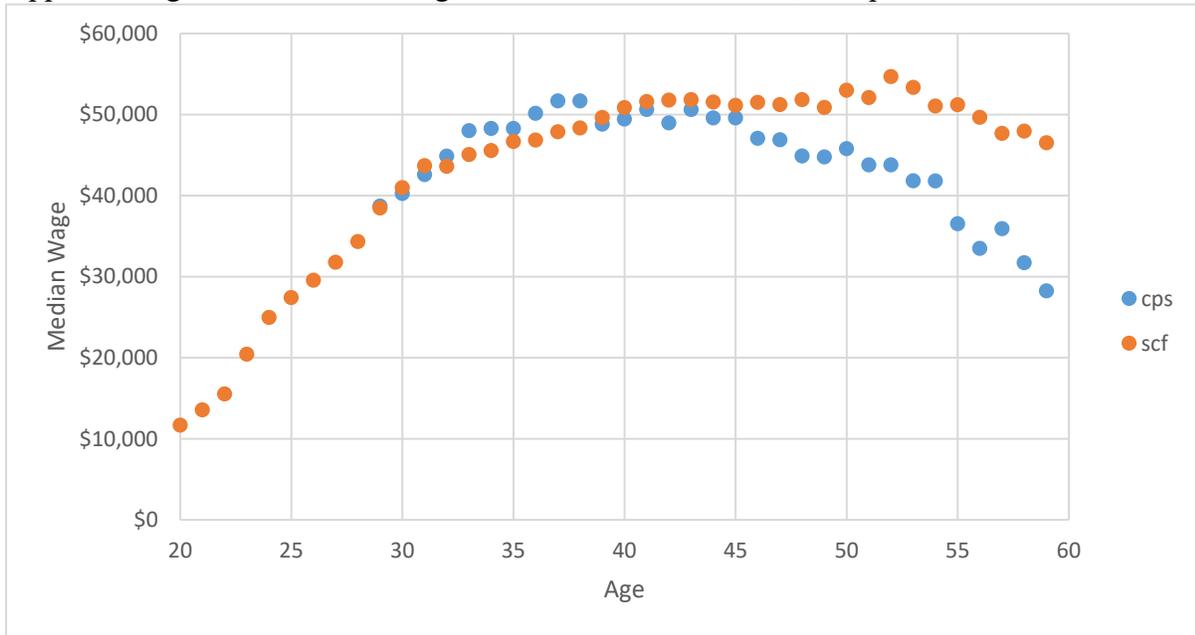
Note: the SCF estimates are from applying estimates from CPS earnings regressions to SCF respondents. The CPS values are raw medians from microdata.

Appendix Figure 1B. Median Wage for Men born 1957-1959, SCF predictions and CPS values
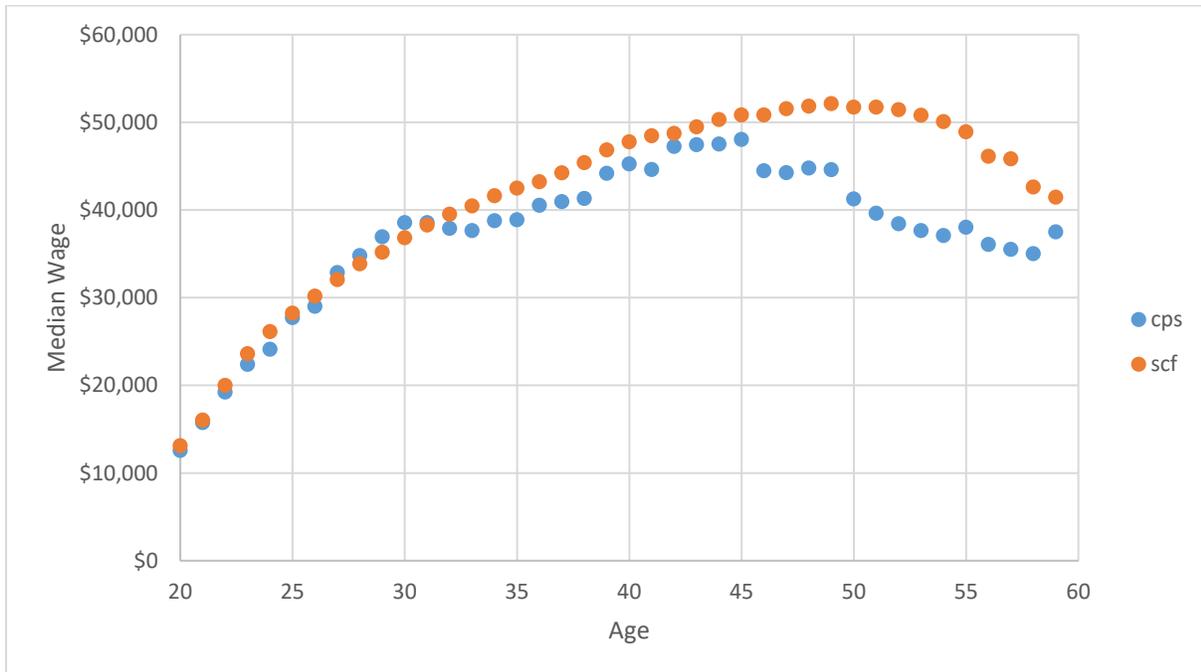
Note: the SCF estimates are from applying estimates from CPS earnings regressions to SCF respondents. The CPS values are raw medians from microdata.

Appendix Figure 2. Implied Annual Growth Rates from Net Worth Projections: Growth Rates at Each Age from 40 to 63 for Nine Income/Wealth Cohorts

A. Low wealth cohorts
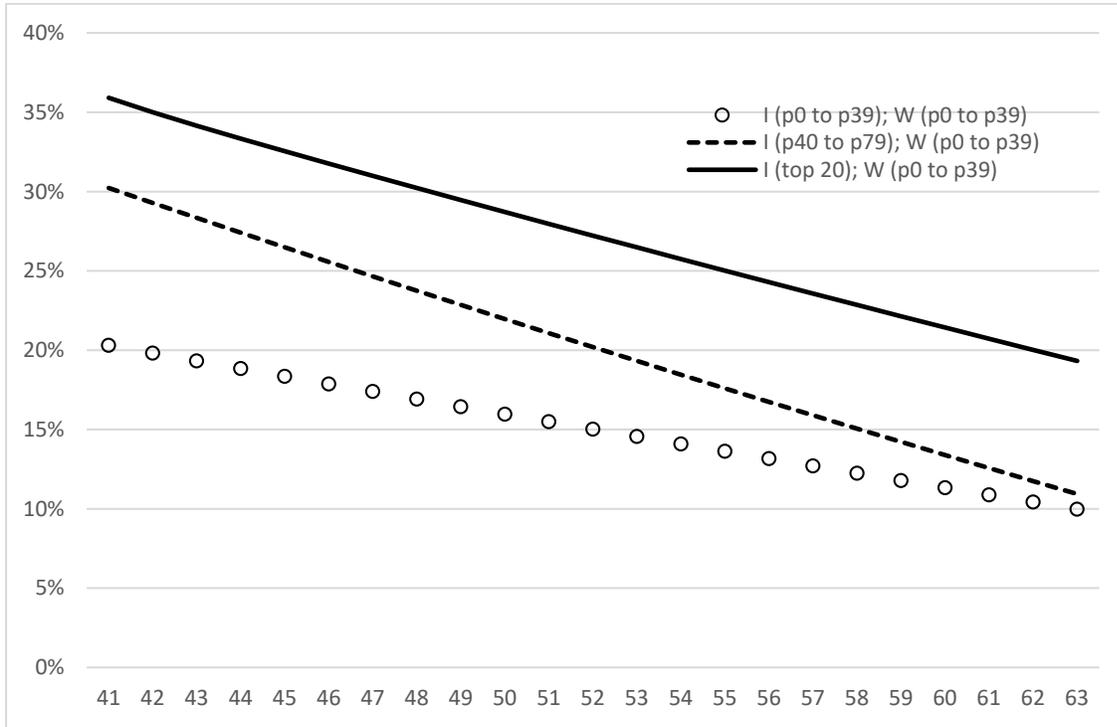
B. Middle and high wealth cohorts
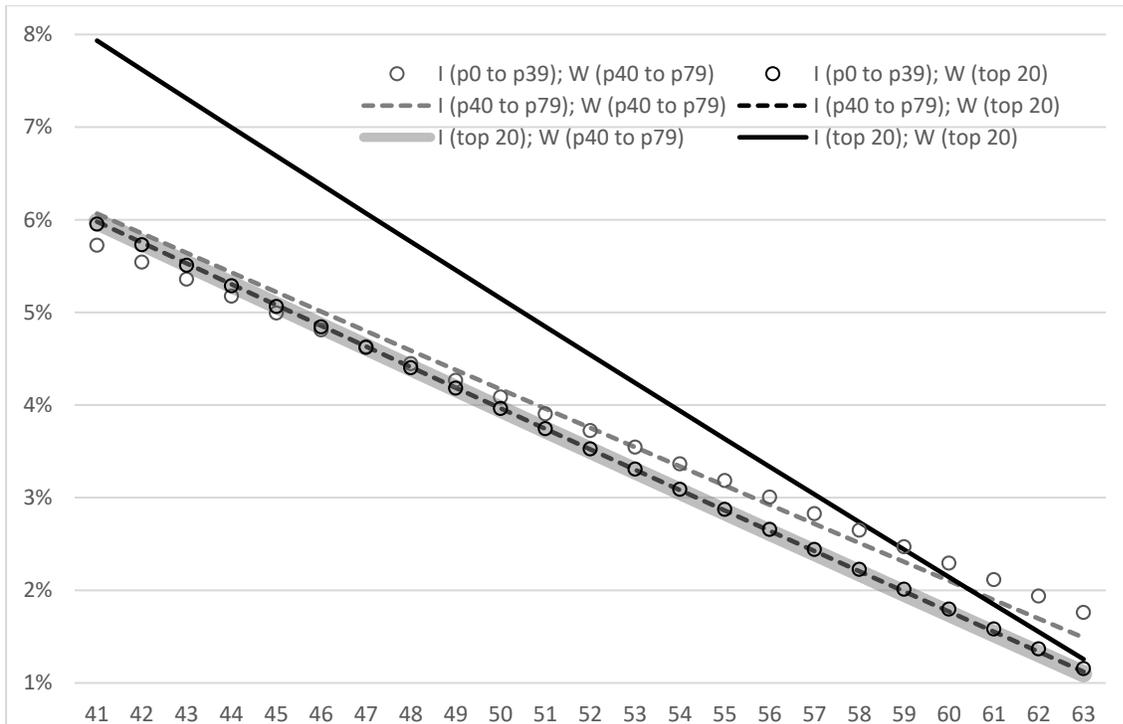
Appendix Figure 3. Mean Combined Wealth by Age of Household Head in 2016 – Comparing Current Combined Wealth with Projected, Discounted Combined Wealth (3-year smoothed average)
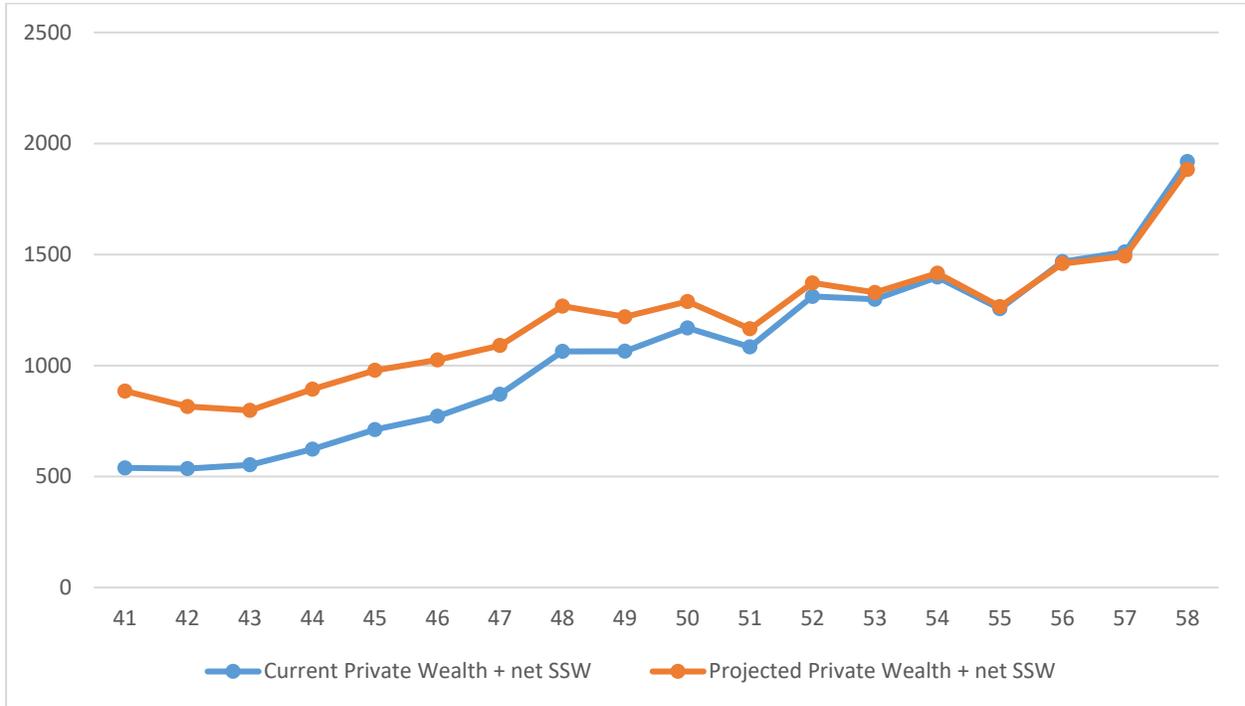
Note: Average wealth has 2016 SCF survey year level, including expected net Social Security wealth.

Appendix Table 1. Mean Retirement wealth by type, year and age group, real 2016 $ (thousands)

		1989	1992	1995	1998	2001	2004	2007	2010	2013	2016	% Change 1989 to 2016
Age 40-49	Projected Non-retirement wealth	670.8	523.8	538.5	612.5	705.7	752.7	773.5	602.0	605.3	595.6	-11%
	Projected DC Wealth	55.9	45.4	69.3	82.9	103.5	86.3	94.7	94.2	98.7	116.1	108%
	DB Wealth	89.7	128.0	131.5	124.6	132.4	130.3	155.5	121.3	125.6	147.7	65%
	DC (Projected) + DB Wealth	145.5	173.8	200.7	207.5	235.9	216.6	250.1	215.6	224.3	263.8	81%
	Non-retirement (Proj) + DC (Proj) + DB wealth	816.3	697.6	739.3	820.0	941.6	969.3	1023.7	817.6	829.6	859.4	5%
	Net SS wealth	127.3	140.0	147.9	141.5	143.5	150.3	142.2	144.0	141.2	149.5	17%
	Proj Combined Wealth	943.6	837.8	887.2	961.5	1085.1	1119.7	1165.9	961.6	970.8	1008.9	7%
Age 50-59	Projected Non-retirement wealth	501.3	500.1	554.8	628.2	801.8	810.7	857.0	669.5	603.7	853.7	70%
	Projected DC Wealth	46.2	71.8	82.8	91.5	129.9	132.0	148.2	142.8	135.7	158.7	244%
	DB Wealth	162.9	201.7	218.2	210.0	277.7	243.9	238.5	239.8	209.7	206.1	27%
	DC (Projected) + DB Wealth	209.1	274.0	301.0	301.5	407.5	375.9	386.7	382.6	345.4	364.8	74%
	Non-retirement (Proj) + DC (Proj) + DB wealth	710.4	774.2	855.9	929.7	1209.3	1186.6	1243.7	1052.2	949.1	1218.5	72%
	Net SS wealth	189.4	217.6	217.7	229.3	241.3	240.0	251.8	249.2	241.4	238.1	26%
	Proj Combined Wealth	899.8	992.3	1073.6	1158.9	1450.6	1426.7	1495.5	1301.3	1190.5	1456.6	62%
Age 40-59	Projected Non-retirement wealth	596.5	514.2	544.7	619.3	745.4	779.5	812.8	636.4	604.5	732.0	23%
	Projected DC Wealth	51.7	56.1	74.4	86.6	114.4	107.3	119.9	119.0	118.0	138.6	168%
	DB Wealth	121.8	158.0	164.4	161.4	192.4	182.7	194.5	181.7	169.3	178.5	47%
	DC (Projected) + DB Wealth	173.4	214.4	238.8	248.0	306.8	290.1	314.4	300.7	287.3	317.2	83%
	Non-retirement (Proj) + DC (Proj) + DB wealth	769.9	728.6	783.5	867.3	1052.2	1069.5	1127.2	937.1	891.7	1049.2	36%
	Net SS wealth	154.5	171.5	174.4	179.4	183.9	191.7	193.8	197.6	193.3	196.3	27%
	Proj Combined Wealth	924.4	900.4	957.9	1046.7	1236.1	1261.2	1321.0	1134.7	1085.0	1245.5	35%

Note: All components of combined wealth are projected forward to either age 62 or for DB wealth, the age they expect to stop working on their current job.

Appendix Table 2. Median Retirement Wealth by Type, Year and Age Group, real 2016 $ (thousands)

		1989	1992	1995	1998	2001	2004	2007	2010	2013	2016	% Change 1989 to 2016
Age 40-49	Projected Non-retirement wealth	395.7	267.1	290.5	315.5	345.9	322.8	337.8	192.2	153	194.1	-51%
	Projected DC Wealth	0	0.4	2	3.8	5.2	3.4	5.6	2.8	2.5	4.2	NA
	DB Wealth	0	0	0	0	0	0	0	0	0	0	NA
	DC (Projected) + DB Wealth	30.6	37.4	30.5	35	32.8	29	21.2	12.6	13	20.3	-34%
	Non-retirement (Proj) + DC (Proj) + DB	509.9	410.6	428.2	443.5	471.4	472.7	453.9	277.5	255.9	303.8	-40%
	Net SS wealth	118	133.3	144.5	130	131.7	141.3	130.9	136.6	129.4	141.8	20%
	Proj Combined Wealth	638.6	555.9	584.9	595	642.6	633.2	623.7	435.2	411.6	463.2	-27%
Age 50-59	Projected Non-retirement wealth	219.6	203	205.8	201	236.4	262.8	255.2	166.6	131.6	141.8	-35%
	Projected DC Wealth	0.6	2	3.4	4.2	9.7	7.4	16.3	6.5	6	6.4	967%
	DB Wealth	2	19.6	0	0	0	0	0	0	0	0	-100%
	DC (Projected) + DB Wealth	52.2	107.9	81.8	65	93.9	68.7	78.7	50.6	45.7	37.4	-28%
	Non-retirement (Proj) + DC (Proj) + DB	348.8	387.6	380.3	369.4	479.8	487.5	431.4	323.3	273.2	239	-31%
	Net SS wealth	178.9	209.7	205.3	221.1	231.8	214.3	233.2	221.8	218.8	206.6	15%
	Proj Combined Wealth	571	621.9	612.1	629.5	742.8	712.9	746.9	589.4	514.7	492.6	-14%
Age 40-59	Projected Non-retirement wealth	305.5	242.6	257.2	271.1	299.3	294.9	293.9	176.6	140.8	164.3	-46%
	Projected DC Wealth	0.2	0.9	2.4	3.9	6.6	5.6	9.6	4.6	4.3	5.1	2450%
	DB Wealth	0.4	0	0	0	0	0	0	0	0	0	-100%
	DC (Projected) + DB Wealth	38.3	58.2	46.5	43.9	52.2	45.9	42.3	25.6	26.6	29	-24%
	Non-retirement (Proj) + DC (Proj) + DB	445.5	402.9	414.4	420.5	477.5	477.9	446.1	297.8	261.5	267.7	-40%
	Net SS wealth	147	163.5	165.2	161.1	166.2	167.9	172	171.8	169.9	173.1	18%
	Proj Combined Wealth	603.5	581.4	592.5	612	684.1	671	667.3	500.8	460.1	482.7	-20%

Appendix Table 3. Distribution of Wealth to Income Ratio by Wealth Concept, Year, and Age-Group

6A.	Age Group 40-49									
	1989	1992	1995	1998	2001	2004	2007	2010	2013	2016
Panel A. DB + Projected DC Wealth to Income Ratio										
P25	-	-	-	-	-	-	-	-	-	-
P50	0.4	0.5	0.4	0.4	0.4	0.4	0.3	0.2	0.2	0.2
Mean	1.4	2.1	2.2	2.5	2.2	2.0	2.3	2.0	2.2	2.2
P75	2.0	2.9	3.2	2.9	2.9	2.1	2.1	1.7	1.9	1.8
P90	3.6	6.2	7.1	8.3	7.3	6.6	8.0	7.0	6.8	7.4
Mean/Median	3.5	4.2	5.5	6.3	5.5	5.0	7.7	10.0	11.0	11.0
P90/P50	9.0	12.4	17.8	20.8	18.3	16.5	26.7	35.0	34.0	37.0
Panel B. DB + Projected DC + SS Wealth to Income Ratio										
P25	1.5	1.9	2.1	1.7	1.7	1.7	1.7	1.7	1.7	1.6
P50	2.6	3.4	3.4	2.9	2.9	2.8	2.8	2.7	2.8	2.7
Mean	3.5	4.9	4.8	4.6	4.3	4.2	4.4	4.4	4.5	4.4
P75	4.2	5.8	6.1	5.6	5.5	5.0	4.9	5.1	5.0	4.8
P90	6.9	9.1	9.7	10.4	9.4	9.2	10.3	10.1	10.2	10.3
Mean/Median	1.3	1.4	1.4	1.6	1.5	1.5	1.6	1.6	1.6	1.6
P90/P50	2.7	2.7	2.9	3.6	3.2	3.3	3.7	3.7	3.6	3.8
Panel C. Projected Combined Wealth to Income Ratio										
P25	5.6	5.0	5.4	4.8	4.8	4.9	4.5	3.7	3.5	3.6
P50	8.5	8.0	8.7	8.2	8.4	8.1	8.2	6.5	5.9	6.1
Mean	10.2	11.1	10.9	10.9	11.0	10.5	10.5	9.2	9.3	8.7
P75	12.6	12.0	12.9	13.1	13.5	13.0	14.0	11.0	10.8	10.5
P90	18.7	18.3	19.6	20.2	20.1	18.4	21.9	18.4	18.6	18.2
Mean/Median	1.2	1.4	1.3	1.3	1.3	1.3	1.3	1.4	1.6	1.4
P90/P50	2.2	2.3	2.3	2.5	2.4	2.3	2.7	2.8	3.2	3.0

Appendix Table 4. Distribution of Wealth to Income Ratio by Wealth Concept, Year, and Age-Group

6B.	Age 50-59									
	1989	1992	1995	1998	2001	2004	2007	2010	2013	2016
Panel A. DB + Projected DC Wealth to Income Ratio										
P25	-	-	-	-	-	-	-	-	-	-
P50	0.7	1.6	1.3	0.9	1.1	0.8	0.8	0.7	0.6	0.5
Mean	2.4	3.3	3.6	3.3	3.8	3.3	3.4	3.3	3.4	3.0
P75	3.5	5.0	5.8	5.1	6.1	4.2	4.0	4.5	4.2	3.2
P90	6.9	8.4	10.4	10.8	11.9	11.7	11.2	11.6	11.8	10.4
Mean/Median	3.4	2.1	2.8	3.7	3.5	4.1	4.3	4.7	5.7	6.0
P90/P50	9.9	5.3	8.0	12.0	10.8	14.6	14.0	16.6	19.7	20.8
Panel B. DB + Projected DC + SS Wealth to Income Ratio										
P25	2.6	3.4	3.2	3.0	3.0	2.9	3.1	3.2	3.2	3.0
P50	4.4	5.8	5.5	5.3	5.2	4.7	5.0	5.3	5.3	4.8
Mean	5.9	8.1	7.3	7.1	7.4	7.0	7.0	7.3	7.5	7.0
P75	7.6	9.2	10.1	9.6	9.9	8.8	8.5	9.6	9.3	9.0
P90	12.0	14.8	14.7	15.2	16.1	15.6	16.1	16.0	17.1	16.2
Mean/Median	1.3	1.4	1.3	1.3	1.4	1.5	1.4	1.4	1.4	1.5
P90/P50	2.7	2.6	2.7	2.9	3.1	3.3	3.2	3.0	3.2	3.4
Panel C. Projected Combined Wealth to Income Ratio										
P25	5.6	6.4	6.3	6.0	5.8	6.0	5.9	5.5	5.0	5.0
P50	8.6	9.9	9.8	9.8	9.8	9.3	9.4	8.9	8.5	8.2
Mean	11.0	13.9	12.6	12.6	13.4	13.2	12.5	11.9	11.9	11.4
P75	13.4	15.2	15.2	15.8	16.5	15.7	15.5	15.1	14.3	14.9
P90	20.3	23.1	22.7	22.3	26.5	26.4	24.9	23.5	23.5	23.4
Mean/Median	1.3	1.4	1.3	1.3	1.4	1.4	1.3	1.3	1.4	1.4
P90/P50	2.4	2.3	2.3	2.3	2.7	2.8	2.6	2.6	2.8	2.9

Appendix Table 5. Mean/Median Ratios by Wealth Concept, Age Group and Year

	Mean/Median				90/50			
	1989	1998	2007	2016	1989	1998	2007	2016
Age 40-49								
Projected Non-retirement wealth	1.7	1.9	2.3	3.1	2.9	3.1	3.7	5.4
Projected non-retirement + Projected DC + DB wealth	1.6	1.8	2.3	2.8	2.7	3.5	4.8	6.5
Projected Combined Wealth	1.5	1.6	1.9	2.2	2.4	2.9	3.9	4.7
Age 50-59								
Projected Non-retirement wealth	2.3	3.1	3.4	6.0	4.5	4.5	5.0	7.3
Projected non-retirement + Projected DC + DB wealth	2.0	2.5	2.9	5.1	4.3	4.8	6.1	10.0
Projected Combined Wealth	1.6	1.8	2.0	3.0	3.2	3.4	4.0	5.7
Age 40-59								
Projected Non-retirement wealth	2.0	2.3	2.8	4.5	3.6	3.5	4.3	6.3
Projected non-retirement + Projected DC + DB wealth	1.7	2.1	2.5	3.9	3.2	3.9	5.4	8.3
Projected Combined Wealth	1.5	1.7	2.0	2.6	2.7	3.1	4.0	5.2

Appendix Table 6. Top Shares

	Top 10%								
	Age: 40 to 49			Age 50 to 59			Age 40 to 59		
	Projected Non-Retirement Wealth	Projected non-retirement + DC + DB wealth	Projected Combined Wealth (including Net SS)	Non-Retirement Wealth	Projected non-retirement + DC + DB wealth	Projected Combined Wealth (including Net SS)	Non-Retirement Wealth	Projected non-retirement + DC + DB wealth	Projected Combined Wealth (including Net SS)
1989	48.0%	45.9%	42.0%	57.4%	48.5%	41.1%	52.0%	47.2%	41.9%
1992	53.2%	46.6%	41.4%	59.2%	48.4%	41.2%	55.6%	47.7%	41.6%
1995	52.2%	46.2%	40.9%	63.7%	51.5%	44.2%	56.7%	48.6%	42.6%
1998	52.5%	47.9%	43.0%	65.3%	55.1%	47.3%	58.1%	51.3%	45.2%
2001	52.4%	47.3%	43.0%	67.5%	55.8%	49.2%	59.1%	51.6%	46.3%
2004	57.3%	52.0%	47.1%	65.3%	54.8%	48.4%	61.1%	53.9%	48.1%
2007	58.0%	52.6%	48.1%	68.0%	58.2%	50.6%	62.9%	55.7%	49.9%
2010	66.7%	59.9%	53.3%	68.6%	58.2%	50.3%	67.8%	59.3%	52.2%
2013	69.3%	61.0%	54.6%	73.3%	59.5%	50.8%	71.4%	60.5%	52.7%
2016	64.52%	57.2%	51.2%	79.5%	67.8%	59.5%	73.8%	63.8%	56.6%

	Top 5%								
	Age: 40 to 49			Age 50 to 59			Age 40 to 59		
	Non-Retirement Wealth	Projected non-retirement + DC + DB wealth	Projected Combined Wealth (including Net SS)	Non-Retirement Wealth	Projected non-retirement + DC + DB wealth	Projected Combined Wealth (including Net SS)	Non-Retirement Wealth	Projected non-retirement + DC + DB wealth	Projected Combined Wealth (including Net SS)
1989	39.1%	36.3%	32.3%	45.2%	35.7%	29.7%	41.4%	36.2%	31.3%
1992	42.9%	35.2%	30.6%	47.6%	36.4%	29.9%	44.8%	35.7%	30.4%
1995	41.8%	34.6%	30.1%	54.3%	40.4%	33.7%	46.7%	37.1%	31.8%
1998	42.8%	36.6%	32.4%	55.5%	43.2%	36.2%	48.3%	39.8%	34.4%
2001	41.9%	35.6%	31.9%	56.5%	42.8%	36.4%	48.6%	39.7%	35.1%
2004	47.2%	40.6%	36.2%	55.6%	42.6%	36.8%	51.4%	41.5%	36.6%
2007	47.1%	39.5%	35.9%	57.3%	45.3%	39.1%	52.3%	42.9%	37.8%
2010	56.5%	47.2%	41.5%	55.5%	42.7%	36.5%	56.4%	45.5%	39.3%
2013	59.3%	48.4%	42.5%	62.5%	46.3%	38.5%	61.0%	47.4%	40.5%
2016	53.0%	43.3%	37.6%	69.3%	54.4%	47.3%	63.3%	50.9%	44.6%