Social Security Wealth, Inequality, and Lifecycle Saving

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Abstract

Wealth inequality in the US is high and rising, but Social Security is generally not included in those wealth measures. Social Security Wealth (SSW) is the present value of future benefits that an individual will receive less the present value of future taxes they will pay. When an individual enters the labor force, they generally face a lifetime of taxes to pay before they will receive any benefits, and thus their initial SSW is generally very low or negative. As an individual works, their SSW grows and generally peaks somewhere around typical Social Security benefit claim ages. The accrual of SSW over the working life is most important for lower-income workers, because the progressive Social Security benefit formula means that taxes paid while working are associated with proportionally higher benefits in retirement. Adding SSW to existing household wealth measures, which we do here using the Survey of Consumer Finances (SCF) for 1995 through 2016, provides a more comprehensive view of wealth inequality and wealth profiles over the lifecycle, across wealth groups, and over time.

1. Introduction

Wealth inequality in the US is very high and has been increasing, measured using either the income-capitalization approach (Saez and Zucman 2016, Smith, Zidar, and Zwick 2019) or wealth surveys (Bricker, Henriques, Krimmel, and Sabelhaus 2016). However, these estimates of wealth inequality do not include the present value of Social Security benefits less the present value of Social Security taxes—or Social Security Wealth (SSW). This omission is important because Social Security dominates other forms of retirement income for most families (Sabelhaus and Volz 2019) and Social Security has been growing relative to the size of the overall economy. A comprehensive measure of household wealth that includes SSW provides new insights into overall wealth inequality and our understanding of lifecycle saving behavior.

Aggregate Social Security benefits in the U.S. are now roughly the same order of magnitude as the sum of total pension benefits received and retirement account withdrawals. Social Security benefits are also growing relative to the size of the economy, from roughly four percent of personal income in the early 1970s to almost six percent today. Focusing on just the benefit side of SSW, the present value of Social Security benefits for everyone who has paid anything into the system was $73.3 trillion in 2019.[1] Thus, the present value of Social Security benefits is estimated to be roughly double all other household-sector pension and retirement account assets combined, and approximately three-fourths the size of all conventionally measured household net worth. Social Security is also an important retirement wealth equalizer, as employer-sponsored pension and retirement accounts accrue disproportionately to high wealth families (Sabelhaus and Volz, 2019).

Unlike pensions and other forms of retirement wealth, aggregate net SSW is zero, because there are no associated private claims to future production reflected in the market value of financial assets. The relatively small OASDI trust fund in principle represents real claims of Social Security beneficiaries on the rest of government, but even those claims are in the form of government bonds that are also the liabilities of taxpayers. Individual SSW (the present value of future benefits less the present value of future taxes for a given person) does vary over the lifecycle, meaning some (usually older) participants have positive SSW, while others (the young)

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[1] Table VI.F2 in the annual Trustees Report, Office of the Chief Actuary, Social Security Administration, available at https://www.ssa.gov/OACT/TR/2019/VI_F_infinite.html#1000308.

have negative SSW. Indeed, the rise and fall of SSW over the lifecycle is an important form of saving/dissaving that is measurable, just like any other type of lifecycle wealth.

SSW also varies within age groups by lifetime income because of the progressive Social Security benefit formula, and thus lower lifetime income workers automatically have higher SSW accrual while they are working. In a lifecycle sense, workers with low lifetime earnings are "saving" much more than higher lifetime income groups at any given working age, because each dollar of tax paid is associated with a larger increase in the net present value of benefits they will ultimately receive. If all workers have the same overall wealth (relative to income) trajectories, lower-lifetime earners with relatively high SSW should be observed with relatively lower conventionally measured wealth.

The expected interplay between conventionally measured wealth and SSW is by no means a new idea, but the empirical evidence is limited because by the lack of a comprehensive data set with both types of wealth for the same individuals. In this paper we begin with the triennial Survey of Consumer Finances (SCF), which has high-quality income and balance sheet data for a representative sample (including a high-wealth oversample) of the population. We construct measures of SSW for individuals using the retrospective work history and prospective work expectations modules in the SCF, solving for future payroll taxes, own worker benefits, and spouse and survivor benefits. We then use a pseudo-panel methodology—tracking birth cohorts across the eight survey waves between 1995 and 2016—to study lifecycle SSW patterns and how SSW interacts with other balance sheet components to determine overall wealth inequality.

There are five main takeaways from this exercise. First, aggregate SSW is quantitatively important when compared to other components of household wealth. As we detail in the next section, there are multiple ways to quantify SSW, but using real discount rates from the Office of the Chief Actuary (OACT) at the Social Security Administration, we estimate that the discounted present value (DPV) of future benefits less future taxes for all SCF respondents and their spouse/partners in 2016 was about $28 trillion, the difference between a DPV of benefits around $43 trillion and DPV of taxes around $15 trillion.[2] By comparison, the conventional measure of

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[2] Our estimated benefits DPV of $43 is about 70 percent of the OACT value for 2016. As discussed later in the paper, we are missing future benefits (and taxes) for persons aged 15 and older who are not SCF respondents or spouse/partners, we don't simulate future transitions onto disability, and we don't count spouse/survivor benefits because of future or past marriages.

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household net worth in the SCF—the so-called "Bulletin" wealth concept—was around $87 trillion, and the DPV of Defined Benefit (DB) pension benefits (including unfunded obligations) was around $18 trillion.

The second main takeaway is based on connecting the estimated SSW values across survey waves for individual birth cohorts. In this case, a value on the pseudo-panel chart is (say) the average SSW for the members of a given birth cohort (we study five cohorts, 1930-39, 1940-49, …. 1970-79) as of a given survey wave (1995, 1998, …, 2016). Thus, we have eight observations spanning two decades for each of the five pseudo-panel observations. We overlay the five birth cohorts on the same chart to draw out the lifecycle patterns of SSW, and show how SSW starts out negative at young ages, increases steadily through retirement, and then gradually decreases as the remaining expected years of life (and thus benefit receipt) decline at older ages. The age ranges in which the cohorts overlap show us how average SSW is evolving across cohorts, due to demographics (through spouse/survivor benefits) and lifetime earnings.

The lifecycle pseudo-panels also allow us to consider how an alternative measure of SSW—the "termination" value that captures the DPV of future benefits an individual has already earned as of a given age—evolves differently than our baseline "expected" value based on projected future work and taxes. We can also show how individual SSW is affected by projected aggregate funding shortfalls using a "payable" scenario in which (based on OACT projections) all benefits are reduced by 20 percent beginning in the year 2035. Under the payable scenario, for example, the average benefit DPVs across cohorts are all shifted down based on how much of their benefit receipt window occurs before or after 2035.

The third main finding is that SSW—unsurprisingly—is relatively much more important for otherwise low-wealth families at any given age. There is a myriad of ways to measure wealth inequality, and although the alternative approaches to sorting or constructing summary measures do affect estimated levels of inequality at any point in time, there are common trends. Our specific approach involves sorting person weighted SCF households into wealth groups within their age groups using Bulletin net worth. Thus, our "top ten" percent group includes the top ten percent of respondents and spouse/partners (not households) within each age group as ranked by the SCF net worth measure. We use this sorting and weighting approach in order to purge wealth comparisons over time of household composition and age effects and to make it so the inequality measures within and across age groups are additive.

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Sorting by conventionally measured net worth within age groups and person-weighting implies that our measures always answer questions of the form, "how does expanding the wealth concept affect the average wealth holdings at a given age of a conventionally measured wealth group?" We show that SSW (and to some extent DB wealth) is relatively much more important for low wealth (as measured by the Bulletin concept) individuals. For example, the bottom 50 percent of persons aged 35 to 44 in 2016 had average Bulletin net worth of only $13,500. However, the same group had average expected SSW of nearly $40,000, the difference between a PDV of benefits around $125,000 and a PDV of taxes around $85,000. Again, this is unsurprising given that low wealth individuals have much lower lifetime incomes, and the Social Security tax and benefit formulas are inherently progressive, even though differential mortality offsets some of that redistribution.

The fourth major takeaway is that although incorporating SSW into household wealth has a substantial impact on wealth inequality *levels*, it does not change overall *trends* in top wealth shares. While the top ten percent share of SCF Bulletin wealth (within age-sorted and person-weighted) increased from 58 percent to 66 percent between 1995 and 2016, the expanded wealth share that includes both DB wealth and SSW increased from 40 percent to 47 percent. In an important sense, adding SSW deepens, rather than ameliorates, concerns about rising wealth inequality, because roughly the same change in wealth share is applied to a much lower base. Under the SCF Bulletin wealth measure, the wealth share of the top ten percent increased 12 percent. Under our expanded wealth measure, the top ten share increased 17 percent.

The observations about overall wealth inequality are a stepping-stone to the fifth and last major takeaway from this work, which is that adding SSW to conventional wealth measures reinforces emerging concerns about within and across age group wealth differentials. The emerging focus on wealth inequality and age stems from the observations that average wealth among the young and middle aged seems to be increasing much less than for the old, and that is especially true for the young-poor relative to the old-rich. We show that this is indeed the case, comparing the three components of average wealth (Bulletin net worth, DB, and SSW) across within-age wealth groups over time. However, SSW at younger ages is not growing over time, perhaps due to a decrease in projected survivor and spousal benefits associated with lower marriage rates. The trends in across and within age group wealth disparities are made even more dire when one considers that 20 percent of scheduled benefits are not payable beginning in 2035.

2. Social Security Wealth

Social Security wealth (SSW) for a given individual is the discounted present value of their future benefits less the discounted present value of their future taxes. Estimates of SSW can be constructed at any point in the lifecycle using various assumptions about continued work and benefit claim ages. The discussion here focuses on two main scenarios, which we refer to as the "expected" and "termination" approaches to measuring SSW as of a given age. The expected concept is based on respondent-reported future work expectations, and thus includes future taxes and benefits. The termination concept—borrowed from the Defined Benefit (DB) pension lexicon—assumes the participant does not work and accrue additional benefits beyond what they have already earned. The two SSW measures in principle provide different perspectives on the evolution of SSW over the lifecycle under any given policy, and on how policy changes affect the lifecycle profiles of SSW at the point in time the policy changes are enacted.

Social Security Wealth Defined

In the most generic sense, SSW for an individual at age a is the discounted present value of survival-adjusted benefits less taxes,

$$SSW_a = \sum_{s=a+1}^{T-a} (benefits_s - taxes_s)\ \Pi_{s/a}\ \beta^{s-a}$$

Where T is the maximum lifespan, $\Pi_{s/a}$ is the probability of surviving to age s as of age a, and β is a period discount factor.

Moving from the generic representation to specific empirical measures requires introducing lifecycle timing for benefits and taxes, which in turn depend on the underlying lifecycle patterns of earnings and Social Security system parameters. Denote the last age that the individual works using m, and the first age that benefits are received using n. The specific benefit formula for an individual depends on their birth cohort, c. Benefits at age s are then given by,

$$benefits_s = b(\tilde{y}_m, n, c) \quad \forall\ s \geq n, 0\ \text{otherwise}$$

where $\tilde{y}_m$ is the vector of earnings through age m, and b(.) is a benefit calculator that maps lifetime earnings through age m and benefit start age n into a benefit level at age s for a member of birthyear cohort c.

Taxes paid at age s depend on earnings at age s and the calendar-year specific tax rate τ and taxable maximum y^{max}. Calendar year is the sum of cohort birthyear (c) and current age (s), so the tax parameters can also be written in terms of c + s. That is, for all ages s through the last working age m,

$$\text{taxes}_s = \tau_{c+s} * \max(y_s, y_{c+s}^{max}) \quad \forall\ s \leq m,\ 0\ \text{otherwise}$$

In the specific estimates described below, we will generally assume that benefits commence when working ends (n = m+1) or at the earliest possible age for benefits (generally 62) if the individual stops working prior to the earliest benefit age, but there is nothing in the notational framework above that requires those conditions.

When we adopt the simplifying assumption that benefit start age n=max(m+1,62), SSW is simplified to a two-dimensional object in current age (a) and stop work age (m). For a given member of cohort c,

$$SSW_a^m = \left[\sum_{s=\max(\max(a+1,m+1),62)}^{T} b(\tilde{y}_m, n, c)\ \Pi_{s/a}\ \beta^{s-a} \right] - \left[\sum_{s=a+1}^{m} \tau_{c+s} * \max(y_s, y_{c+s}^{max})\ \Pi_{s/a}\ \beta^{s-a} \right]$$

Various combinations of a and m answer different questions about the role of SSW in lifecycle wealth accumulation and inequality. Measures of *expected* SSW are most useful for thinking about variation in money's worth or progressivity across and within cohorts, or overall system finances. Measures of *termination* (or conditional termination) SSW are more useful for capturing the incentive effects of over the lifecycle.

Money's Worth and System Finances

One useful reference point for stop work age (m) is the *expected* value. When m is set to the expected (or already-realized for current beneficiaries) stop work age values (denoted by *), the average across all members of a given birth cohort of the constructed SSW_a^* map out the

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mean lifecycle pattern of SSW by age for that cohort. Those typical lifecycle SSW patterns will vary across birth cohorts, depending on the Social Security tax and benefit parameters faced by that cohort, their lifetime earnings, and their stop work ages. The overall mean value of SSW_a^* for any given cohort is generally negative at young ages because the present value of taxes to be paid exceeds the present value of benefits to be received, given appropriate discount rates. The mean SSW_a^* becomes positive and peaks at some age around retirement, then declines as retirees draw down their accumulated SSW.

The lifecycle patterns of mean expected SSW_a^* are immediately useful for understanding how changes in Social Security policy transfer resources across and within generations, and for understanding overall system finances. Every cohort begins life (at age a=0) with a mean value for their expected SSW_0^*, and that average tells us about the extent of inter-cohort redistribution. At the same time, there are important differences in SSW_0^* within cohorts, because benefit replacement rates decline with lifetime income, which makes the system more progressive. Given the progressive Social Security system parameters, the lower lifetime income members of a given cohort begin life with less negative or even positive SSW_0^*, and that is offset by the fact that the average SSW_0^* of the higher lifetime income group in the same cohort is more negative than the overall cohort average. There is some empirical uncertainty about how much SSW_0^* varies within cohorts, because the higher replacement rates enjoyed by lower lifetime income participants are offset at least in part by higher mortality rates.[3]

Across and within cohort net redistribution can be measured at any point in the lifecycle, including at age 0, by computing values for mean SSW_0^* within and across cohorts. Most empirical estimates of Social Security progressivity/redistribution use a variant of the SSW concept in the notation above. For example, the Congressional Budget Office redistribution measures are based on the value of taxes paid and benefits received for individuals at retirement, but it is similar to SSW_0^* in the sense that it captures taxes paid and benefits received over the entire lifecycle.[4] Rather than discount all tax and benefit flows back to age zero, taxes paid and

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[3] There are also some indications that mortality differentials are rising, which makes the system less progressive. See for example, the National Academies study, *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses*, available at https://www.nap.edu/catalog/19015/the-growing-gap-in-life-expectancy-by-income-implications-for.

[4] The latest CBO projections are available at https://www.cbo.gov/publication/55590. For a more detailed discussion of progressivity in Social Security in published CBO reports, see https://www.cbo.gov/sites/default/files/109th-congress-2005-2006/reports/12-15-progressivity-ss.pdf.

benefits received before age 65 are grown forward by the real discount rate, while taxes paid and benefits received after that are discounted back to age 65. These measure answers the direct question, "as of age 65, how much has an individual paid into the system, and how much will they get back out?" CBO reports the ratio of (discounted) lifetime benefits received to lifetime taxes paid—the so called "money's worth" ratio—and the two components relative to (discounted) lifetime income. The CBO estimates show that Social Security is indeed progressive, even after controlling for observable mortality differentials. Lifetime benefits received are about twice lifetime taxes paid for the lowest lifetime income quintile, and the ratio of lifetime benefits to taxes falls to about sixty percent for the highest lifetime income quintile.

One oft-cited example of these sorts of money's worth or net redistribution measures based on expected SSW is the introduction of the Social Security system itself. The earliest recipients (oldest workers) paid relatively little in tax yet were entitled to the same benefits as the younger workers who would face a lifetime of taxes before they received any benefits. In that sense, those earliest recipients received a substantial wealth transfer from future generations when the system began. In the year the program was put in place, their cohort mean SSW_a^* went from zero to a large positive number, which was in principle offset by large negatives for younger (and unborn) cohorts.[5]

Another overlooked yet more recent example was the substantial expansion of Social Security in the early 1970s, because the birth cohorts who were nearing or already in retirement when the expansion occurred received much higher benefits after the policy change, yet at the same time they had paid less in taxes (relative to the new tax schedules that accompanied the higher benefits) during most of their working years. This substantial intergenerational wealth transfer is likely a direct contributor to the observed patterns of labor force participation of older men in the quarter century following the policy change. Middle aged and older workers (especially men) received a substantial positive wealth shock, and they reacted (as expected) by retiring earlier, likely triggering or exacerbating the decline in labor force participation among older men that lasted through the mid-1990s.

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[5] The offset is "in principle" because the SSW of future generations is an endogenous object that depends on the trajectory for future earnings, population growth, and real discount rates, which may in turn be affected by the policy change (Leimer, 2016).

Capturing wealth transfers by looking at expected SSW across and within birth cohorts is also relevant for ongoing policy discussions, because any solvency-related policy changes will (holding lifecycle earnings patterns and discount rates fixed) necessarily lower expected SSW for some lifetime income group in some birth cohort. Indeed, there is a direct connection between system solvency and the expected SSW measures described above. When the ranges for s and c are limited to the Social Security 75-year valuation period, the population-weighted average expected SSW across in-scope cohort groups is just the overall system actuarial deficit (plus the current trust fund balance). The overall actuarial deficit is currently estimated to be negative. That is consistent with the idea that although workers approaching or already in retirement have large positive expected SSW, younger and even unborn workers (anyone who will begin working within the 75-year window) have more than offsetting negative expected SSW.

How should we think about expected SSW in a world of projected insolvency? Although there is a great deal of uncertainty about *how* Social Security insolvency will be resolved, there is a legal baseline that can (and should) be used as an analytical starting point. The Social Security system has no borrowing authority—the system can only spend what is in the trust fund—and thus failure to act before the trust fund is exhausted will eventually lead to benefit cuts. In that sense, the expected SSW measures under the no-action (or "payable") scenario should be computed using benefit streams that have those benefit reductions built-in. Although CBO and other observers also report the so-called "scheduled" scenario in their money's worth calculations, policy analysis of solvent alternatives is appropriately based on comparisons against the payable scenario. In that sense, expected SSW profiles *already* include reductions in benefits after the trust fund exhausts, to be disproportionately borne by young and even unborn cohorts.

Expected and Termination Social Security Wealth

Expected SSW captures how much an individual at a given age expects to receive from and pay into the Social Security system going forward, and when aggregated, is useful for characterizing lifetime Social Security redistribution across and within cohorts. There is an alternative concept of SSW suggested by the notation above—the termination value—that is more relevant for thinking about the incentive effects of Social Security over the lifecycle (Coile and Gruber, 2007; Goda, Shoven, and Slavov, 2011). The termination value is the starting point for measuring the net return to working an additional year, because it is the PDV of benefits

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earned as of a given age because of work and taxes paid at earlier ages. Measuring the net return (in terms of Social Security) just involves computing the change in PDV of benefits from working an additional year and subtracting the taxes paid in that extra year of work, then dividing the net by current age termination SSW or income.[6]

For our purposes, the key question is which of the two SSW concepts is most appropriate for *completing* existing measures of household wealth inequality? That is, should we be adding expected SSW or termination SSW to the other components of household wealth in order to construct a more comprehensive wealth measure for studying inequality? The answer is not obvious, and the underlying reasons why it is not obvious raise more general questions about measuring lifecycle saving, wealth accumulation, and wealth inequality.

One way to think about which concept of SSW is most appropriate for overall wealth inequality is to start with the case where it does not matter, which is the SSW of an individual after they have stopped working. In retirement, expected and termination SSW are identical— both are just the discounted present value of the future benefits the individual will receive until they die. As in a DB pension plan, the individual has earned the right to those benefits, and the individual has no further offsetting obligations in terms of plan contributions or taxes. Wealth is just the discounted present value of those future benefits. In a DB plan, the financial assets held by the plan exactly match those future benefit claims. Assuming future taxpayers will not renege on those promise benefits, SSW is well-defined and measurable, and equivalent under the two concepts.

Prior to retirement the values for expected and termination SSW can be very different, and it could matter which is added to the other balance sheet components to create a comprehensive wealth measure. Again, the appropriate choice is tied to the specific question being asked. For example, one could ask, "as of a given age prior to retirement, how does projected retirement readiness vary within and across generations?" This sort of question is appropriately answered using expected values for SSW (and DB pension benefits) as of retirement age (Jacobs, et al, 2019). However, the internally consistent answer to this question also involves expected values for *all* components of household wealth as of retirement age. If the age for evaluating future retirement readiness is (for example) set to 40, the expected retirement

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[6] Indeed, the data set we have developed for this paper is well-suited to empirically investigate the work (and saving) incentives associated Social Security.

readiness analysis involves computing SSW and DB pension wealth based on expected future work through retirement age, because age 40 termination values are uninformative about the wealth that individual will hold going into retirement. The other components of household wealth should also be adjusted using the same expectations about future work, along with some assumptions about saving out of the income from that future work.

An alternative to the retirement-readiness question involves asking the more general question about lifecycle saving and wealth accumulation, "as of a given age, how much wealth has the individual accumulated?" Setting aside SSW for a moment, wealth in this sense is just marketable assets less liabilities, which is exactly the concept built into the household sector balance sheets in the Financial Accounts of the United States, and exactly the concept used in the literature on household wealth inequality. One component of that household wealth measure is the present value of future DB benefits, and there are marketable financial assets underlying the DB benefit claims.[7] The marketable assets held by DB plans are consistent with termination values—DB plans are not legally required to hold assets against expected or continuation benefits—and thus the appropriate corresponding discounted present value of DB at the micro level uses the termination concept (Sabelhaus and Volz, 2019).

Given the treatment of DB plans, it seems that adding termination values for SSW is also the right answer to the question about how to complete the measures of household wealth for purposes of studying wealth inequality. However, the fact that termination SSW is always zero or positive—an individual won't pay any more taxes if they never work again—highlights the conundrum with using termination values. DB plans have underlying assets to offset the liabilities of the plans to their participants.[8] Yet the wealth claims of individuals with positive SSW have no legal basis without the wealth claims *against* those with negative SSW, and negative SSW is necessarily associated with continued work. Thus, although termination value seems more consistent with studying wealth inequality at a given age, the expected values are more relevant when studying wealth inequality across age groups and time. Thus, most of our focus is on expected SSW in the empirical work, though we do show terminations values (mostly for reference and clarification of expected values) at various points.

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[7] Technically, in the Financial Accounts, the value of DB pension claims is the sum of marketable assets held by the plans and unfunded liabilities. The unfunded liabilities are assets of the household sector offset by claims against the sectors (corporate, non-corporate, government) that sponsor the plans.

[8] As discussed below, termination versus expected benefits are also complicated by spouse and survivor benefits.

3. Data and Methods

Our goal is to produce empirical estimates of Social Security Wealth (SSW) that can be combined with existing household-level wealth measures and thus create more comprehensive wealth measures for studying lifecycle saving, wealth accumulation, wealth inequality. Achieving the goal involves starting with high-quality household level balance sheet data, then adding the various estimates of SSW as described in the previous section. Our empirical framework makes it possible to create both expected and termination SSW under alternative (scheduled and payable) benefit scenarios and various discounting assumptions. In this section we describe the micro data, explain how we construct the SSW measures, benchmark those estimates against published Office of the Chief Actuary (OACT) values, and show how aggregate SSW compares to other components of household wealth.

The micro base file used here is the Survey of Consumer Finances (SCF) for 1995 through 2016. The SCF is a triennial cross-section focused on household balance sheets, and also has extensive information about incomes, demographics, and labor force experiences.[9] The SCF sampling strategy is unique among public use household surveys, as about one-fourth of the sample is drawn from administrative data records in order to capture the top of the wealth distribution and thus overall aggregate wealth.[10] This oversample of high-wealth households, in addition to the detail on household portfolios, makes the SCF uniquely qualified for estimating how adding SSW affects lifecycle saving, wealth accumulation, and wealth inequality. The SCF is a series of cross-section snapshots, and thus estimating the PDVs of Social Security taxes and benefits requires estimating lifecycle earnings for individuals and their spouse/partners. Estimating PDVs (SSW and DB pensions) requires individual mortality rates, which we differentiate by age, sex, marital status, education, income, race/ethnicity, and birthyear.

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[9] See Bricker et al (2017) for a discussion of the SCF and the most recent results, for survey year 2016.
[10] See Feiveson and Sabelhaus (2019), Bricker et al (2016), and Batty et al (2019) for a discussion of how well the SCF captures macro aggregates over time, and how the SCF results on wealth distribution compare to other studies based on a straight read of the administrative data. Another key but often neglected advantage to using the SCF is the extensive interconnectedness between income and balance sheet components in the survey instrument that greatly improve data quality. For example, respondents may initially report no owned businesses, but then later in the survey reveal that they think of themselves as self-employed, which triggers reconsideration of the owned business questions. Similarly, the existence of various types of DB pensions and DC/IRA accounts is checked in various ways throughout the survey, as respondents are asked at various points about coverage, balances, and benefits/withdrawals in different ways. The extensive SCF case review process undertaken by Federal Reserve Board staff is largely focused on sorting through what is sometimes conflicting information about these complicated balance sheet items in the raw data.

Lifecycle Work and Earnings

The first crucial data development step is to use SCF detailed work history and work expectations modules to create lifecycle earnings measures from the cross-section observations, because lifecycle earnings are the key to PDVs of taxes and benefits. The SCF data on labor force participation, employment, unemployment earnings, current job characteristics, past jobs, and expected future work are collected in detailed modules for both the respondent and spouse/partner (if present).[11] The sequence of questions in the SCF labor modules focus first on current employment status, then (if employed) current main job characteristics, including pensions. That is followed by modules on employment and job histories and expected future work.

The idea of working versus not working is a simple idea for most survey respondents, but there are a variety of circumstances that can complicate the issue for some. Many respondents have multiple statuses: they are both working (full or part time) and a student, homemaker, volunteer, or some other status that is generally considered out of the labor force. The SCF instrument lists the possible situations, and then collapses (for the purpose of determining survey question sequence) people into three bins: not working, working full time, and working part time. The information one would like about the individual varies with the bin, and the SCF survey instrument is tailored to the three groups accordingly.

If the individual reports working full or part time, they are asked a number of questions about their current main job.[12] Many of these questions are standard in household surveys, including whether the respondent is self-employed or working for someone else, how much they earn through a regular salary and/or variable pay, their usual hours and weeks worked, their industry and occupation, and the size of the firm they work for. The key incremental information (relative to most cross-sectional data sets) that makes it possible to start building the longitudinal variables is that respondents are also asked when they started the current job, and when they expect to stop working on the current job.

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[11] In SCF micro data files the respondent is always recoded to be the male in a different sex couple, and the individual closest to 40 years old in a same-sex couple. This underscores the use of data for both respondent and spouse/partner in the empirical work here, because there are many cases where the spouse/partner will be the primary earner.

[12] The survey also collects limited information about second jobs, but that is not used for purposes of classifying work status.

After the current job data is collected, the survey turns to work histories. There are three distinct sequences of questions for individuals who report not working, working full time, and working part time. The goal of the survey instrument is to retrieve some common work history elements for the three groups, including the total number of years worked full time and part time, and details about the longest full-time job ever worked. The longest job questions are a subset of the information collected about the current main job, including salary in the last year they worked the job, industry, occupation, and self-employed versus working for someone else. The question sequences vary by current work status because of the frame of reference for different types of respondents. For example, the leading question "have you ever worked full-time?" will only make sense to respondents who are currently not working or working part-time.

Even with carefully tailored question sequences there is still some respondent confusion about and disagreement among the various work history responses that must be addressed in the data construction. For example, one common tendency is for respondents to confuse current main job "type" with their current employer. If they have been working the same type of job their whole adult life, they will sometimes answer that they started the current job at a young age, even though the earlier job(s) they are thinking about involved a different employer. The self-employed are particularly prone to answering they have been in the job since childhood, though in their case many of them work in family businesses all their lives. Building the longitudinal work histories requires a balancing of sometimes conflicting information from the current job, the longest full-time job, and the overall number of years worked full and part time.[13]

Forward looking measures are based on what respondents report they expect to do in the future, and thus the questions on future work are crucial. Again, the specific questions vary with current work status, but the general idea is to divide the future into periods of expected full time, part time, and not working. The majority of the working population—those who are working full-time in the survey year—are the easiest, because the survey instrument simply focuses on when they expect to stop full-time work, whether they expect to switch to part time after that, and if so, when they expect to stop working completely. The currently not working and working part time are first asked if they expect to start working full time before the rest of the question sequence kicks in. Again, there are sometimes conflicting answers vis a vis the current main job,

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[13] The code that reconciles the various employment history variables is available from the authors upon request.

situations where the respondent initially says they "never expect to stop" doing the particular type of job they are in, but then later say they actually do expect to stop at a particular age.

Reconciling those conflicting answers is key for generating expected stop work wages. Using the reconciled data, expected retirement of well-attached workers lines up well against observations from other data sets and the actual (recalled) retirement behavior of older respondents in the SCF itself (Sabelhaus, 2019). The specific concept of last work age we use in the expected SSW calculations is somewhat dependent on the respondent's current work status, because retirement and Social Security benefit claiming are imperfectly correlated. If the respondent is currently working full time or expects to become full time in the future, their expected last work age is when they say they will stop working full time, because many respondents state they expect to transition to part time work at the end of their career. If they are currently part time, then expected last work age is the age at which they expect to completely stop working. All answers are capped at age 70, where Social Security benefits no longer accrue.

Figure 1. Respondent-Reported Expected Last Work Age

Notes: Authors' calculations using 1995 through 2016 SCF. Conditional on not yet receiving Social Security benefits.
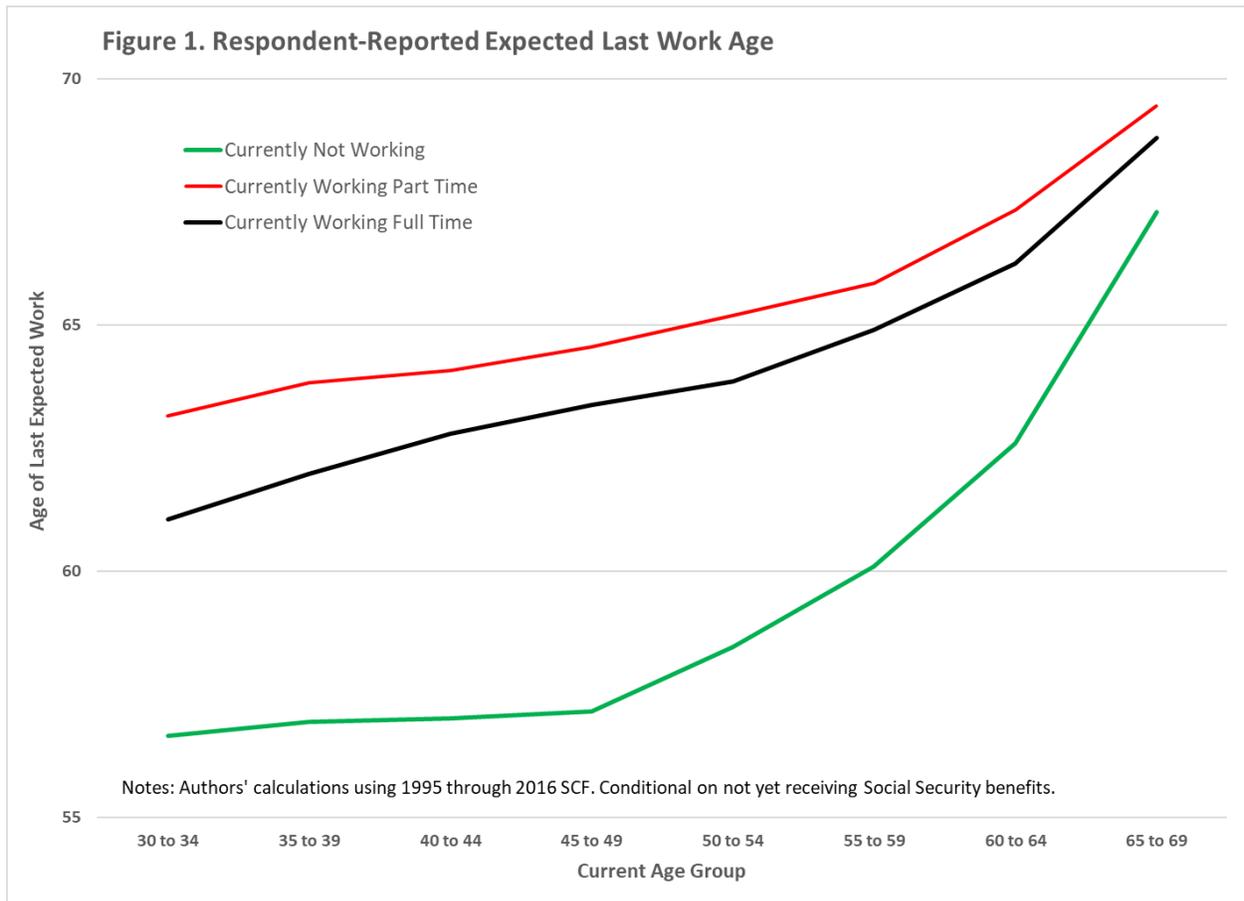
The reconciled expected stop-work ages vary predictably across current age and current work status (Figure 1). Younger workers tend to give lower ages for expected stop work than older workers for any current work status. The average expected stop work age increases with age, because expectations become more specific, and because some transition from working to not working or claiming benefits (those already claiming are not in Figure 1). Also, expected last work age at any given age (below 65-69) for full time workers increased, on average, about two years between the 1995 and 2016 survey waves, which is in line with actual and projected Social Security benefit claiming patterns.[14] Thus, our expected SSW calculations capture the phenomenon that younger cohorts at a given age and (real) income will have higher benefit PDVs than older cohorts (given the same discount rate) because they expect to work longer. Whether or not the higher benefit PDV translates into higher expected SSW depends on expected taxes and expected mortality.

Calculating Social Security benefits requires earnings at each point in the lifecycle. Earnings are assigned at each age for which an individual is predicted to be working either full time or part time. Beginning with prospective earnings (after the survey year), we assume 1.2 percent annual real wage growth, consistent with the average increase in average wage index (AWI) from Social Security over the time period we are making predictions. For individuals working at the time of interview, their current wage is used to project future wages through expected retirement. The wage is adjusted based on their current and projected future work status using a simple scalar, expected full time to part time transitions involve a 50 percent earbninsg reduction, for example.

Retrospective earnings are based on the "longest past job" questions in the SCF. Workers are asked about how much they were earning (and at what age) when they left their most important career job. We use that information along with current earnings to pin down a lifecycle earnings trajectory. If an individual does not have a long past job, then his survey earnings are also used to predict earnings earlier in the lifecycle. For individual with a long past job, the final earnings from the long job are used to fill in ages preceding the beginning of the long job. For ages between the end of a long job and the beginning of the current job, a linear mapping is used to connect the long job final salary and the predicted start salary on a current job. If no earnings are reported in the survey, which is especially problematic for those who

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[14] See, for example, Dudel and Myrskylä (2017).

report never having worked full time, we assign median earnings for ages 20-24 in survey year as a baseline if an individual is younger than 30, or the minimum wage for those at other ages (who expect to work in the future). As in the prospective earnings calculations, lifecycle earnings trajectories are adjusted for changes in work status.[15]

Demographics and Differential Mortality

The core demographics in the SCF (age, sex, education, marital status, and race/ethnicity) are key to estimating present values for retirement income streams through a differential mortality adjustment.[16] Constructing the present value of Social Security and DB pension incomes requires survival probabilities, which are computed through age 99. The starting point for the survival adjustments used here to transform data from the cross section to the longitudinal structure is Social Security Administration cohort mortality by age and sex. The second step is a differential mortality adjustments based on the results of a study that combined administrative earnings, demographics, and mortality data.[17] The differential mortality model was developed by the Congressional Budget Office (CBO) for use in their long-term Social Security model (CBOLT).[18] The key mortality-differentiating demographic variables are quintiles of permanent income, education, marital status, and race. The appendix to Feiveson and Sabelhaus (2019) explains how the CBOLT model parameters are calibrated to the SCF data in a way that preserves *relative* mortality across the lifetime earnings and four demographic groups across age, sex, and cohort population groups.

Actual Versus Predicted Benefits

Estimated lifecycle earnings and expected stop work ages are the key inputs into the SSW calculator. We compute own worker benefits based of the expected retirement stop work age,

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[15] Benchmarking our estimated PDVs of taxes and benefits against OACT aggregates (see Appendix) suggests that our assumptions about earnings may be too conservative on net, though it is not clear how much we are missing because of limiting our calculations to respondents and spouses. The SCF essentially captures aggregate taxable earnings insurvey year, but the PDVs are low, suggesting our assigned earnings are too low at other points in the lifecycle. This is an important area for further research.

[16] The demographic variables are available for both the SCF respondent and the spouse/partner, which is important, because the SCF micro files always assign the male in a couple (person closest to age 40 in a same sex couple) to be the respondent, and the other individual to be the spouse/partner, without regard to which is the primary earner.

[17] The SSA mortality data is available at www.ssa.gov/OACT/HistEst/Death/2017/DeathProbabilities2017.html.

[18] The CBO differential mortality model is described in Working Paper 2007-11, August 2007, available at https://www.cbo.gov/publication/19096.

then initiate the benefit stream at max (62, stop work age+1). We also use the spouse/partner worker benefit to calculate potential spouse/survivor benefits for married couples, and the PDVs are computed using own and spouse/partner differential mortality.

Figure 2. Fraction Already Receiving Benefits by Current Work Status

Notes: Authors' calculations using 1995 through 2016 SCF.

- Currently Not Working
- Currently Working Part Time
- Currently Working Full Time

y-axis: Percent — *x-axis: Current Age Group* (< 30, 30 to 34, 35 to 39, 40 to 44, 45 to 49, 50 to 54, 55 to 59, 60 to 64, 65 to 69)
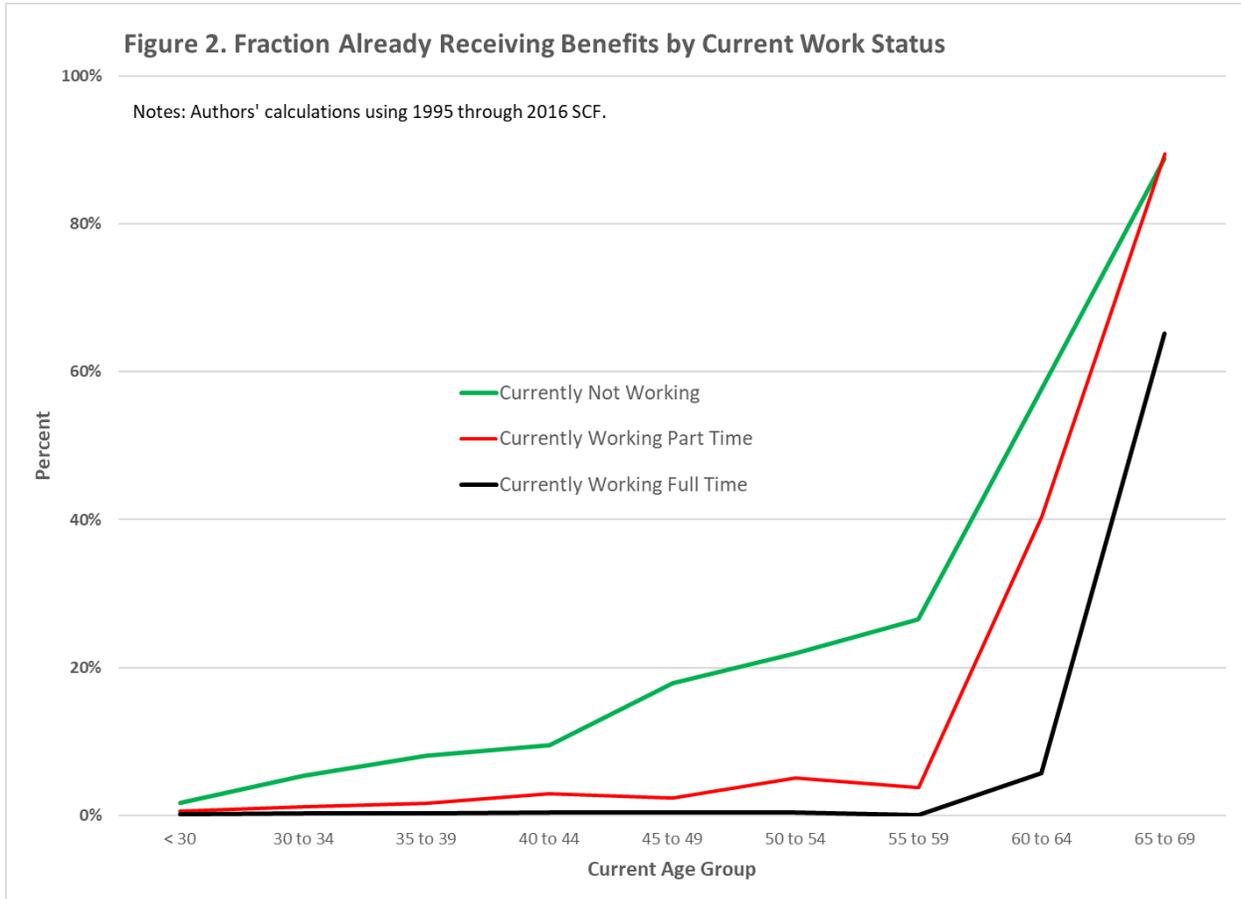
The approach to calculating SSW raises the question about choosing our computed benefits versus actual respondent reported values when the actuals are available. Across survey waves, the fraction of respondents for whom we have actual benefit values (and benefit start ages) increases predictable with age (Figure 2). In all of the calculations below, we use the actual benefit values when they are available, which include retirement, spousal, survivor, and disability. Reported benefit aggregates in the SCF for respondents and spouse/partners were about 85 percent of actual benefits paid in 2016.[19] We consider that ratio quite good, given that

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[19] Another important exercise for future work that will likely help refine our lifecycle earnings estimates is to compare the actual and predicted earnings for respondents who are already claiming.

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we are missing benefits paid to individuals outside the SCF sample frame (living in institutions) or residing in an SCF household where they are not the respondent or spouse/partner. Still, it is possible that some respondents are making systematic errors, such as reporting benefits after Medicare premiums are deducted.

DB Pension Wealth

The published SCF wealth concept—the so-called "Bulletin" wealth measure—includes neither SSW or DB pension wealth. As with Social Security, the wealth equivalent of a stream of future DB pension incomes is a survival-adjusted present value. Those wealth equivalents are constructed using survey information about currently received pension benefits, expected future pensions, and pensions associated with current jobs, using the same differential mortality model and discounting assumptions applied to SSW above. The sum of all pension wealth is benchmarked to the aggregate from the Financial Accounts of the United States (FA), and the distribution of pension wealth is benchmarked against direct measures from the HRS. Details of the DB wealth estimates used here follow, and see also Sabelhaus and Volz (2019).

The SCF collects comprehensive detailed information about retirement plans associated with current and past jobs of the respondent and their spouse or partner. The measure of wealth consistent with the comprehensive household balance sheet is the present value of those future DB benefits, which is equivalent to the value of the financial assets held now that will be liquidated over time to pay the promised stream of DB benefits when those liabilities come due. The SCF collects details about DB pension benefits in three different survey modules. The three categories cover DB benefits already being received, DB benefits associated with a past job where the known benefit amount will be received at a specific future date, and DB benefits associated with a current job, where the ultimate benefit will depend on how much longer the worker is covered by the plan and their final salary.

The survey questions about currently received benefits and expected benefits from past-job pensions are standard. The respondent is simply asked how much is currently being received, or how much will be received when the benefit begins. For our purposes, these streams of benefit payments are the input to an actuarial present-value calculation that also involves an assumed interest rate and respondents' expected longevity (which is again, differentiated). This present value calculation is the level of financial assets that the retirement plan sponsor must hold to pay

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promised benefits and, thus, corresponds directly to the household wealth measure we are trying to capture. In total, these present value calculations for SCF respondents indicate that about 40 percent of the aggregate DB pension assets in the FA is attributable to the promised benefits of currently receiving and past-job pensioners, and thus the remainder is accounted for workers still in the jobs for which they are accumulating the rights to future DB benefits.

Calculating DB pension wealth for workers covered by a plan on their current job is more complicated than for the first two cases, because the benefit that will eventually be received is unknown as of the survey date, and in any event, that benefit is likely different from the FA benchmark concept. The SCF asks a series of questions about current job DB pensions, including how long the worker has been in the plan, when they expect to receive benefits, and how much they expect to receive after benefit payments begin. As with SSW, these questions make it possible to construct a few different measures of what the stream of future benefits represents in present value. For example, it is possible to compute the present value of the future benefit stream assuming the worker remains in the job until his or her expected retirement age, for a given projected final salary, and under the assumption that the worker knows and reports values consistent with the actual benefit formula in the survey. DB benefit formulas are generally based on a complicated combination of years of service and average "high" salary, and those formulas are generally beyond the grasp of survey participants. Of course, if constructed properly, this "continuation" value of the DB pension is an important and useful concept when thinking about lifecycle financial planning.

The continuation value represents what the DB pension *could* be worth to the worker at some point, based on a series of assumptions about future employment and earnings under the current plan rules. However, the measure of DB wealth that corresponds to total household wealth in the FA is the narrower financial liability of retirement plan sponsors, the DB wealth that the worker has accumulated to date. Plan sponsors are not required to set aside the continuation value of a pension for every worker in their plans. Rather, DB plans are required to hold only the present value of benefits already earned by the worker, the "termination" value that corresponds to DB wealth in the FA. The termination value represents the worker's legal claim to DB wealth, because that level of assets is equivalent to the present value of benefits they will receive if their plan coverage ended today. The termination value of a DB pension is always less

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than or equal to the continuation value, and the two converge as the worker approaches retirement age, at which point they are equal.

Thus, the approach to solving for DB pension termination values for current workers in the SCF relies on three complementary sources of information. The first piece of information is the aggregate value of DB pension assets from the FA. After subtracting the roughly 40 percent of total assets accounted for by currently received and known future benefits (as described above), the remainder represents the legal claims (termination values) of current job DB participants. The second set of inputs, from the SCF, is the age, accumulated years of plan coverage, earnings, and sector (private or public) of the job held by the worker. Finally, the calculation involves data from Fang, Brown, and Weir (2016) from HRS to parameterize and validate our estimated person-level termination values. After building in the observable wedge between public and private sector DBs (public plans are more generous than private, relative to earnings), the actuarial present value calculations used to construct termination values are based on the same differential mortality model applied to SSW.

Aggregate Household Wealth

In 2016, SCF published household net worth based on the Bulletin concept was roughly $87 trillion, up from $21 trillion in 1995. As a prelude to lifecycle and distributional analysis of the expanded wealth measures that include DB and SSW it is useful to put the three aggregates side by side over time. How large are DB wealth and SSW relative to Bulletin net worth? Are those ratios changing over time? How is the ratio of each evolving relative to aggregate income? In doing so we establish important facts about the various constructs that are key for the distributional analysis later. For example, although aggregate SSW is large relative to other wealth components in every year of our sample, it is not growing as fast as Bulletin net worth. The size and growth of SSW depends on whether one looks at expected or termination SSW, the choice of discount rates, and whether one considers schedule or payable benefits.

Table 1. Nominal Wealth Aggregates by Year (Billions)								
	1995	**1998**	**2001**	**2004**	**2007**	**2010**	**2013**	**2016**
SCF Bulletin Net Worth	$21,101	$29,087	$42,338	$50,354	$64,649	$58,207	$64,748	$86,865
Defined Benefit Wealth	$ 5,960	$ 7,063	$ 8,509	$10,102	$12,022	$13,581	$16,092	$17,855
	OACT Discount Rates							
Expected Social Security Wealth	$ 7,141	$ 6,947	$ 8,658	$10,588	$13,498	$15,122	$18,565	$28,015
= PDV Expected Benefits	$12,915	$13,631	$16,676	$19,447	$23,642	$25,895	$30,507	$43,393
- PDV Expected Taxes	$ 5,774	$ 6,684	$ 8,019	$ 8,859	$10,144	$10,773	$11,942	$15,378
Termination Social Security Wealth	$ 9,785	$10,687	$13,237	$15,817	$19,083	$21,232	$25,384	$35,363
	Fixed Real Discount Rate=3%							
Expected Social Security Wealth	$ 6,355	$ 7,382	$ 8,959	$10,952	$13,424	$15,300	$18,126	$20,553
= PDV Expected Benefits	$12,298	$14,296	$17,056	$19,942	$23,553	$26,207	$29,824	$33,081
- PDV Expected Taxes	$ 5,943	$ 6,914	$ 8,097	$ 8,989	$10,130	$10,907	$11,698	$12,528
Termination Social Security Wealth	$ 9,607	$11,175	$13,457	$16,142	$19,032	$21,501	$24,840	$27,672
	Payable							
Expected Social Security Wealth	$ 6,445	$ 6,140	$ 7,538	$ 9,083	$11,375	$12,531	$15,238	$22,701
= PDV Expected Benefits	$12,219	$12,824	$15,556	$17,941	$21,518	$23,304	$27,180	$38,079
- PDV Expected Taxes	$ 5,774	$ 6,684	$ 8,019	$ 8,859	$10,144	$10,773	$11,942	$15,378
Termination Social Security Wealth	$ 9,527	$10,370	$12,747	$15,093	$18,006	$19,822	$23,429	$32,084
	Fixed Real Discount Rate=3% and Payable							
Expected Social Security Wealth	$ 5,756	$ 6,531	$ 7,792	$ 9,389	$11,314	$12,681	$14,880	$16,700
= PDV Expected Benefits	$11,699	$13,444	$15,889	$18,378	$21,443	$23,589	$26,578	$29,228
- PDV Expected Taxes	$ 5,943	$ 6,914	$ 8,097	$ 8,989	$10,130	$10,907	$11,698	$12,528
Termination Social Security Wealth	$ 9,384	$10,840	$12,950	$15,394	$17,961	$20,075	$22,931	$25,271
Addendum: Permanent Income	$ 4,461	$ 5,258	$ 6,916	$ 8,020	$ 9,401	$ 9,843	$10,496	$12,673
Notes: Authors' calculations using 1995 through 2016 SCF.								

In 2016, aggregate Bulletin net worth in the SCF was about $87 trillion, and aggregate DB pension wealth was about $18 trillion (Table 1). The estimates of aggregate SSW in 2016 ranged from as low $17 trillion to as high as $35 trillion, depending on the specific wealth concept—expected or termination—along with the assumptions about what rates to use for discounting future taxes and benefits, and whether future benefits are as scheduled or limited to payable under current OACT projections. Termination SSW is always above expected SSW. Payable benefits are always lower and declining as a share of scheduled benefits over time, because we are getting nearer to insolvency. Finally, choosing OACT real discount rates versus a fixed 3 percent real rate is generally benign, except in 2016.

Most of our focus in what follows is on expected SSW, and it is worth noting here that aggregate termination SSW is notably higher than aggregate expected SSW in all years. While it is true that termination SSW does not offset future benefit with future taxes, it is also true that termination values do not capture the extra benefits associated with extra (expected) years of work. In practice, the divergence between expected and termination aggregate SSW in these specific calculations is likely being driven by spouse and survivor benefits, because (say) the termination value for 40 year old worker incorporates the switch from worker to auxiliary benefits if their spouse is expected to continue working.

The substantial difference between payable and scheduled expected SSW under either discount rate assumption is growing over time, but not because of changes in assumptions about Social Security Trust Fund exhaustion. The payable scenarios for every survey wave assume that 80 percent of benefits will be payable after 2034, consistent with the latest *Trustees Report*. The ratio of payable to scheduled expected SSW has fell from about 90 percent to 80 percent between 1995 and 2016. Barring policy change, the ratio will continue falling as we get closer to 2035.

The rate used to discount future taxes and benefits turns out to be important for SSW, especially in the recent era of low real interest rates. In general, a 3 percent real rate assumption lines up well with using year-by-year OACT assumed real discount rates until 2016. Between 2013 and 2016, OACT lowered their assumed long-term discount rate, but most of the effect on PDVs comes from changes in the OACT assumptions about how quickly we transition from low current real interest rates to the assumed long run rate. The Appendix discusses the role of discounting in more detail, focusing on how the discounting assumptions bear on our aggregate SSW relative to conceptually equivalent OACT estimates.

4. Lifecycle Patterns of Social Security Wealth

Our distributional analysis begins with means of inflation-adjusted SSW across birth cohorts over the lifecycle. Any given SCF can be used to produce a point estimate for SSW at a given age, and we connect the dots and draw out lifecycle patterns by using the eight waves together in a pseudo-panel display. The previous section highlighted the impact of various conceptual and empirical decisions on aggregate SSW, and in this section we show the sensitivity of estimated lifecycle profiles to two of those inputs—the choice of expected versus termination SSW, and the decision to focus on scheduled versus payable benefits.[20]

Figure 3. Mean Real Expected SSW by Birth Cohort and Age

Notes: Values are per person for respondents and spouse/partners. Projected benefits include own worker and potential spouse and survivor when spouse/partner is observed. Actual benefits used for those already claiming. Taxes are based on own projected earnings.

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[20] We do not focus on the effects of alternative real discount rates, choosing to use the fixed real rate of 3 percent in the subsequent calculations. In general, the effect of adopting OACT discounting is to proportionally boost the 2016 values for SSW in the various charts and figures, though the net effects vary by age because of tax and benefit timing.

A useful way to view pseudo-panel results is to display outcomes for selected cohorts in various survey waves, where the x-axis is dimensioned by age in the survey year (Figure 3). Each point represents the mean SSW for the indicated birth cohort, plotted at the midpoint of their ten-year age band. Thus, for example, the first marker (purple circle) for the 1930-39 cohort is observed when they are (on average) 65 years old, in the 1995 SCF. The subsequent purple markers then follow the 1930-39 cohort forward across survey waves. In 1998, the mid-point of their age range was 68, and increasing by three years until they reached an average age of 81in 2016. Similarly, the first time we observe the 1970-79 birth cohort is when their mid-point age was 20, in the 1995 SCF. By 2016 the mid-point of their age range was 41. In addition to following the same cohort across survey waves, the cohort-age chart makes it possible to compare two birth cohorts at ages for which they overlap, but in different survey years. For example, we observe the 1970-79 cohort between ages 20 and 41 in the eight survey waves, and we observe the 1960-69 cohort between ages 30 and 41. In the overlap range between cohorts— ages 30 to 40 in this case—we can investigate how the mean wealth of a given cohort compares to a cohort ahead or behind them.

With those chart-reading principles in mind, we can interpret the estimates in Figure 3. First and foremost, there is a clear lifecycle pattern of SSW accumulation and decumulation. Average expected SSW is negative at younger ages, increases steadily through benefit claiming age, then declines slowly as the number of years of remaining benefit receipt falls with life expectancy. Second, although each cohort has its own internal consistencies as they age through the survey waves, the differences across cohorts are also noteworthy. For example, the mean SSW estimates for the 1940-49 cohort lie above the 1930-39 values in the age range overlap (ages 60 to 70) but the differences between younger cohorts are less clear or non-existent. There are possible explanations involving data problems, including the fact that actual benefits may be more underreported at older ages, or the actual and estimated benefits may diverge for other reasons. However, there are also two economic forces that could be causing the convergence in cohort means, real earnings and auxiliary benefits. If lack of earnings growth means that a given cohort has the same average lifetime earnings profile as their predecessors, they will have the same expected SSW at any given age. If a given cohort has more earnings convergence between spouses but the same average earnings, the incremental effects of spouse and survivor benefits are diminished.

Figure 4. Mean Real Expected and Termination SSW by Birth Cohort and Age

Notes: Values are per person for respondents and spouse/partners. Projected benefits include own worker and potential spouse and survivor when spouse/partner is observed. Actual benefits used for those already claiming. Taxes are based on own projected earnings.
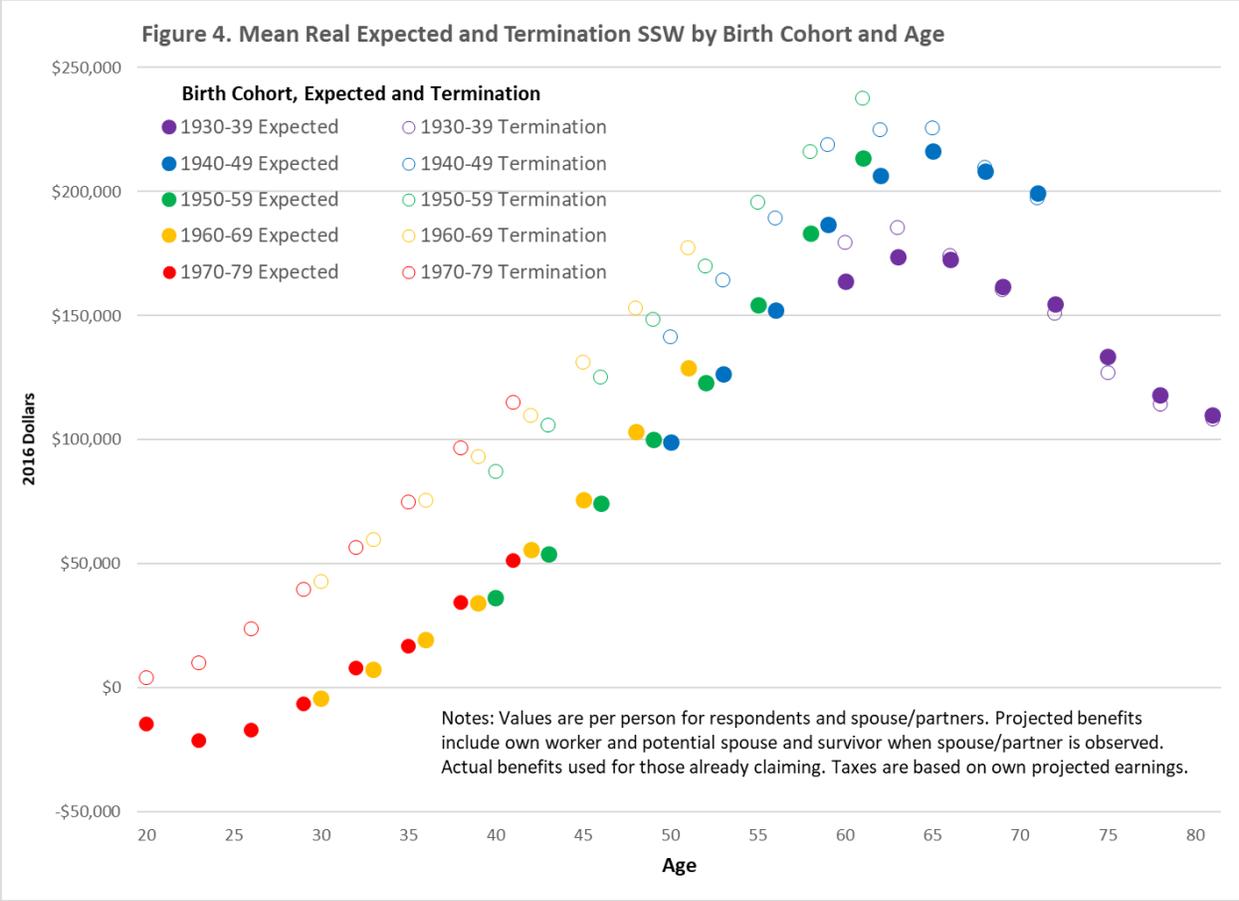
Although our focus in the rest of the paper is on expected SSW, we show the lifecycle means for termination SSW overlaid on the same chart with the expected SSW estimates (Figure 4). Termination SSW is generally above expected at younger ages, and the two measures (as expected) converge at older ages. There are at least effects at work here. First, at any given age, the PDV of own worker benefits is generally lower in the termination measure, because working more (under expected) will lead to a higher benefit, everything else constant. However, earning those additional benefits means paying more in taxes, which lowers expected SSW relative to termination. The patterns at younger ages suggests that a third effect may be dominating these other two, offsetting differences. In the calculations, a married individual receives the greater of their own benefits or half of their spouse's benefit while the spouse is living, and the full amount after the spouse dies. The termination values likely include a lot of this switching behavior, though this is clearly an area for future work, both conceptual and empirical.

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Figure 5. Mean Real Expected SSW by Birth Cohort and Age, Scheduled and Payable

Notes: Values are per person for respondents and spouse/partners. Projected benefits include own worker and potential spouse and survivor when spouse/partner is observed. Actual benefits used for those already claiming. Taxes are based on own projected earnings.
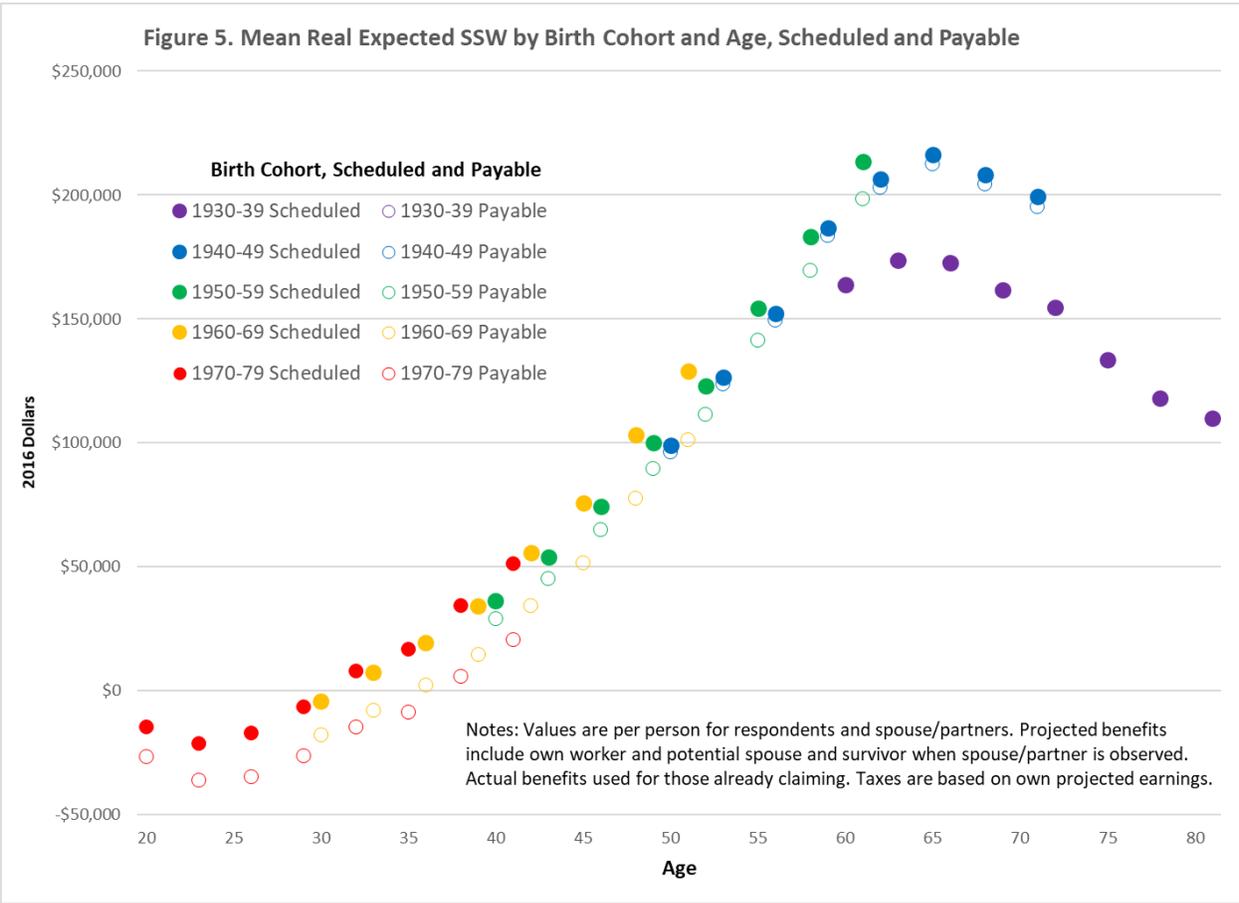
Our third cohort-age lifecycle SSW chart shows the effects of moving between the scheduled and payable scenarios. Under the payable scenario, we follow OACT is assuming that 80 percent of benefits are payable beginning in 2035. We apply the benefit reduction to all benefits paid from that point forward. The lifecycle chart shows that older cohorts (1930-39 and 1940-49) are somewhere between completely unaffected and only marginally affected, because most of their benefits will have been received before the Trust Fund is exhausted. Beginning with the 1950-59 cohort—who will be between 76 and 85 in 2035—the effect of benefit cuts become very noticeable. It is worth a reminder that the wedge between scheduled and payable here is not being driven by changes in expectations about system finances, we use the most recent OACT payable ratios in all years. As discussed in Section 2, a chart such as this would be very useful for understanding the across-cohort implications of proposed changes in taxes or benefits, because it would be possible to compare alternative solvent paths.

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5. Levels and Trends in Overall Wealth Inequality

Moving from across-age disaggregation any sort of distributional analysis requires that we make decisions about how to sort and weight observations. There are three key decisions, whether to sort the entire population or sort within age groups, whether to weight observations to keep a given number of households or a given number of persons in a distributional group, and whether to re-sort when the wealth measure is more expansive. Our sorting and weighting approach is intended to maintain consistency between overall and within-age inequality, and to purge the effects of evolving living arrangements. We sort within age groups and weight by persons (respondents and spouse/partners), both of which lower levels of a given top wealth share but do not affect trends. We also choose not to re-sort under more expansive wealth measures, which means we are asking how adding DB wealth and SSW to the wealth holdings of individuals sorted by their SCF Bulletin wealth affects conclusions about wealth inequality.[21]

These decisions about sorting and weighting have a substantial impact on estimated SCF Bulletin wealth shares in every survey year, but the trend is largely unaffected (Table 2, top panel). Under the traditional household weighted sorting irrespective of age, the share of SCF Bulletin wealth held by the top 10 percent increased from 68 to 77 percent between 1995 and 2016. When we sort households within their own (ten-year) age groups—effectively capturing the top 10 percent of each age group in each year—the top 10 wealth share increases from 64 percent to 73 percent. When, in addition, we change the weighting to capture a fixed percentage of respondents and spouse/partners (irrespective of living arrangements), the top 10 share rises from 58 percent in 1995 to 66 percent by 2016. The two adjustments have the expected effects at each point in time, as the young rich are less rich than the old rich, and the rich are more likely to be married. Although the decisions about how to sort and weight are contentious from a normative perspective, our decision to go with the equalizing assumptions is driven by our goal of comparing wealth across and within age groups over time using a consistent frame.

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[21] This approach is different than in our earlier work on adding DB wealth to the SCF Bulletin concept, where we re-sorted by total wealth after adding DB. The most obvious impact here is that we assign much more DB wealth to the bottom of the wealth distribution at younger ages. For example, a state and local worker in their 30s may have relatively little wealth under the Bulletin concept, but the present value of their DB benefits is substantial. In our earlier work we would have re-sorted that individual up the wealth distribution, but here we leave them where they were sorted using the more limited wealth concept.

Table 2. Overall Top 10 Percent Wealth Shares Under Alternative Sorting and Wealth Concepts								
	1995	1998	2001	2004	2007	2010	2013	2016
SCF Bulletin Net Worth (NW)								
Household Sorting	68%	69%	70%	69%	71%	74%	75%	77%
Household Sorting Within Age Groups	64%	66%	66%	65%	68%	69%	71%	73%
Person-Weighted Sorting within Age Groups	58%	60%	60%	59%	62%	62%	64%	66%
NW + Defined Benefit Wealth (DB)								
Household Sorting	58%	59%	62%	61%	64%	65%	64%	68%
Household Sorting Within Age Groups	53%	56%	58%	57%	61%	60%	60%	64%
Person-Weighted Sorting within Age Groups	48%	51%	52%	51%	54%	53%	53%	56%
NW + DB + Expected Social Security Wealth								
Household Sorting	51%	54%	56%	56%	58%	58%	56%	58%
Household Sorting Within Age Groups	45%	50%	52%	51%	54%	52%	51%	54%
Person-Weighted Sorting within Age Groups	40%	45%	46%	45%	48%	46%	45%	47%
NW + DB + Termination Social Security Wealth								
Household Sorting	48%	50%	53%	53%	55%	55%	54%	56%
Household Sorting Within Age Groups	43%	47%	49%	48%	52%	50%	49%	52%
Person-Weighted Sorting within Age Groups	38%	42%	43%	43%	46%	44%	43%	45%

Notes: Authors' calculations using 1995 to 2016 SCF. All sorting is done on the SCF Bulletin net worth (NW) concept. Expected and termination SSW calculated using a fixed 3% real discount rate.

Expanding the wealth concept beyond SCF Bulletin wealth to include DB and SSW has the expected wealth-equalizing effects on top 10 percent shares in every year, and that is independent of which sorting and weighting methodology is being used. Under our preferred sorting within age groups and weighting by population, the top 10 percent wealth share in 2016 falls from 66 percent to 56 percent when DB wealth is added, and further to 47 percent with expected SSW (45 percent with termination SSW). However, the expanded wealth shares show the same (or even more alarming) trends in top wealth shares, as the 8 percentage point increase in SCF Bulletin wealth is smaller relative to the base (58 percent in 1995) than the 7 percentage point increase in the most expansive expected SSW measure relative to its base (40 percent in 1995). Thus, the expanded measures show the world is more equal than we would have thought based on just SCF Bulletin wealth, but it is becoming less so.

The interplay between expanding the wealth concept and the way in which the population is sorted and weighted in the first place appears to be second order. This can be seen by looking within the three rows associated with different sorting and weighting for any given wealth concept. Although moving to more expansive wealth measures lowers the top 10 percent share in all cases, the differences in impacts across the sorting and weighting alternatives are comparable. For example, in 2016, moving from Bulletin wealth to Bulletin wealth plus DB lowers the top 10 percent share by about 10 percentage points, and adding SSW lowers the share by another 10 percentage points, but those differentials across the three sorting and weighting approaches. The important takeaway is that the increases in top shares are observed across the board in Table 2.

The decision not to re-sort after moving to a more expansive wealth measure may be having more of an effect, but again, our decision not to re-sort in this case is based on answering a particular set of questions about individuals with various levels of observed wealth, and how the unobserved components may be interacting with the observed across and within age groups over time. In addition, we are, if anything, biasing our results against finding increasing wealth concentration by not re-sorting, particularly in the case of DB wealth, and particularly for the young. For example, a middle-aged state and local worker with a generous pension but otherwise low accumulated retirement wealth would be re-sorted up the distribution, and that would likely increase top shares in recent years.

6. Wealth Inequality Across and Within Age Groups

We take two different approaches when considering how our expanded wealth measures affect wealth inequality across and within age groups. First, we compare real average wealth holding by age in 1995 and 2016, first for entire age groups, then for the bottom 50 percent, the next (or "middle") 40 percent, and top 10 percent by Bulletin wealth within each age group. We show how each component of wealth contributes to the overall age group average, and the extent to which the contribution of expected SSW to overall wealth varies between the scheduled benefits and payable scenarios. Our second disaggregation focuses on expected SSW from the lifecycle perspective, again, dividing each birth cohort in every survey year into the bottom 50, next 40, and top 10 by Bulletin wealth. We find, unsurprisingly, that average SSW rises with Bulletin wealth, because those individuals have higher lifetime incomes. However, SSW relative to lifetime income is much larger at the bottom of the wealth distribution.

Figure 6. Mean Real Net Worth, DB, and Expected SSW by Age, 1995 and 2016
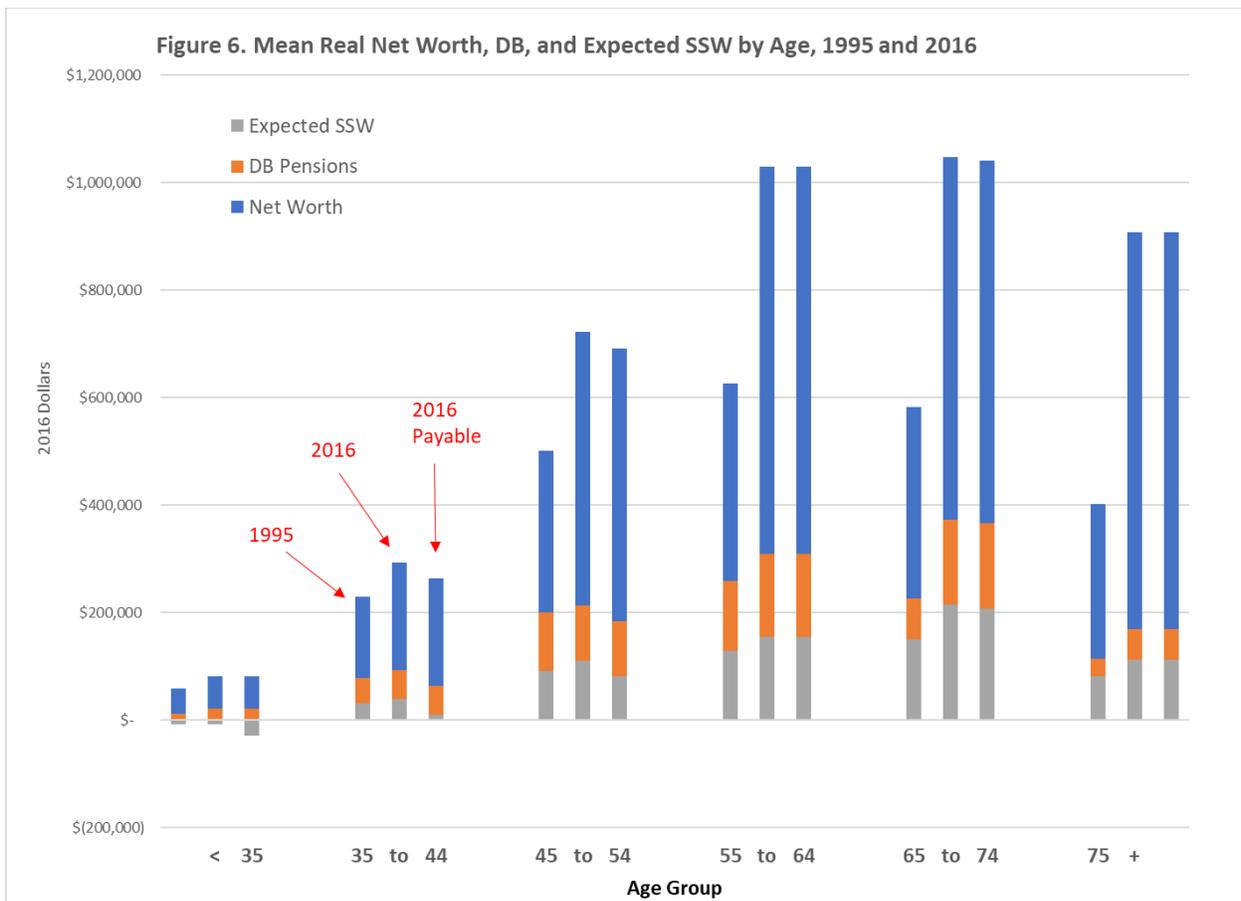
We begin the decomposition by looking across age groups in 1995 and 2016 (Figure 6). The columns stack average wealth by type—expected SSW, DB, and SCF Bulletin wealth—in 1995 and 2016. The third bar in each age group is the 2016 value with expected SSW reduced according to the payable scenario. In general, the main takeaways from the overall age group averages in Figure 6 are (1) average total wealth is dominated by the Bulletin wealth component, but the various components contribute different relative amounts at different ages, (2) overall average wealth increased across all age groups between 1995 and 2016, (3) average wealth increased much more at older ages, and (4) the impact of assuming payable benefits is only noticeable (against the backdrop of a comprehensive wealth measure) at younger ages.

Figure 7. Mean Real Net Worth, DB, and Expected SSW by Age, 1995 and 2016, Bottom 50 %
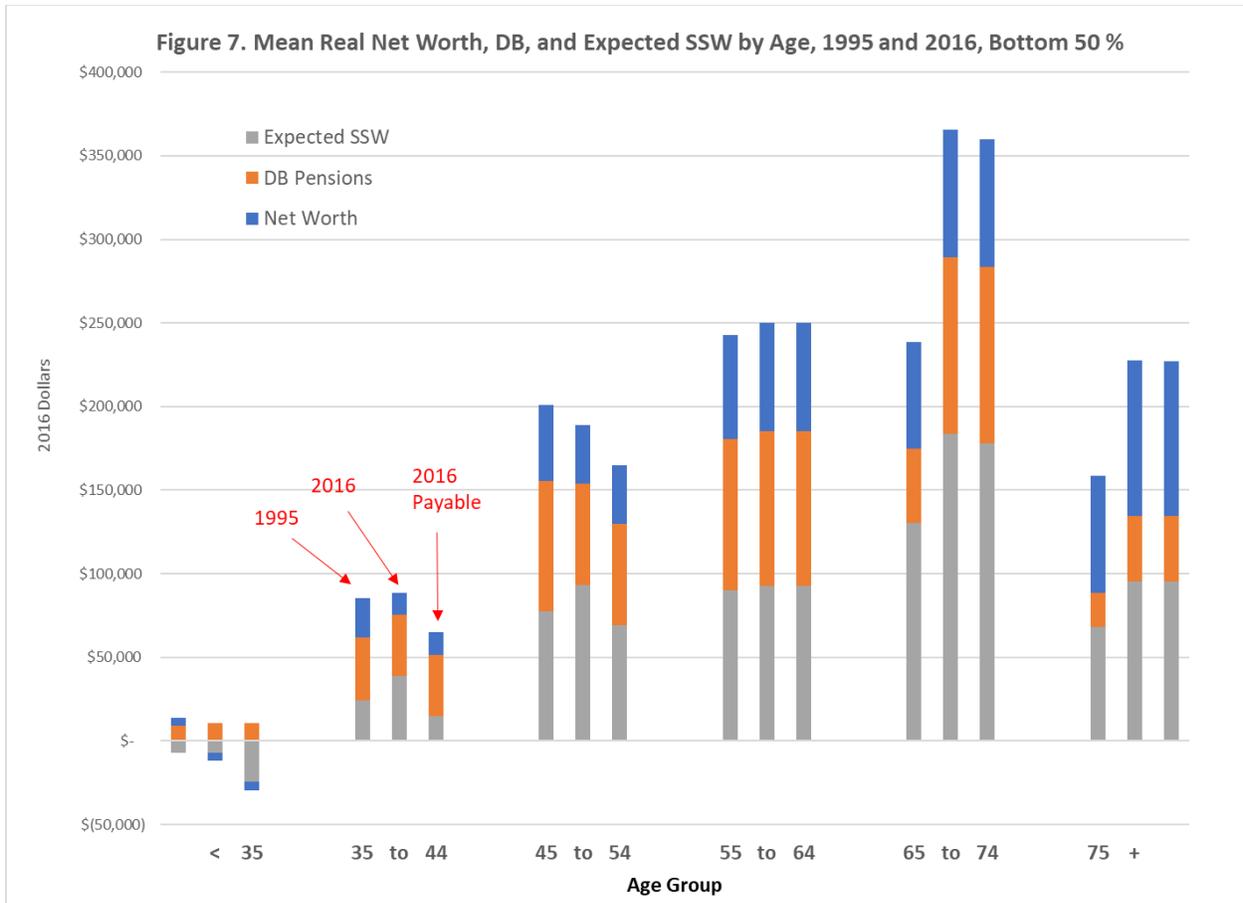
Our within- and across-age group wealth inequality analysis is motivated by a growing realization that the gap between older/wealthier and younger/low wealth groups may be growing much faster than the gap between high and low wealth overall or within a given age group. This

is borne out when looking within age groups by wealth (Figures 7, 8, and 9). Young people in the bottom 50 percent by wealth have seen declines in average total wealth over the past two decades, and even those ages 55 to 64 have seen little or no growth (Figure 7). The bottom 50 percent at older ages have seen wealth gains, though much of that is because of increased expected SSW. Indeed, average wealth for the bottom 50 percent at all ages is dominated by DB and expected SSW, and the payable SSW bars, show, for example, that switching from scheduled to payable in the 45 to 54 age group eliminates all gains in expected SSW over the 20 year period, reinforcing the decline in average wealth associated with the other two components.

Figure 8. Mean Real Net Worth, DB, and Expected SSW by Age, 1995 and 2016, Middle 40 %
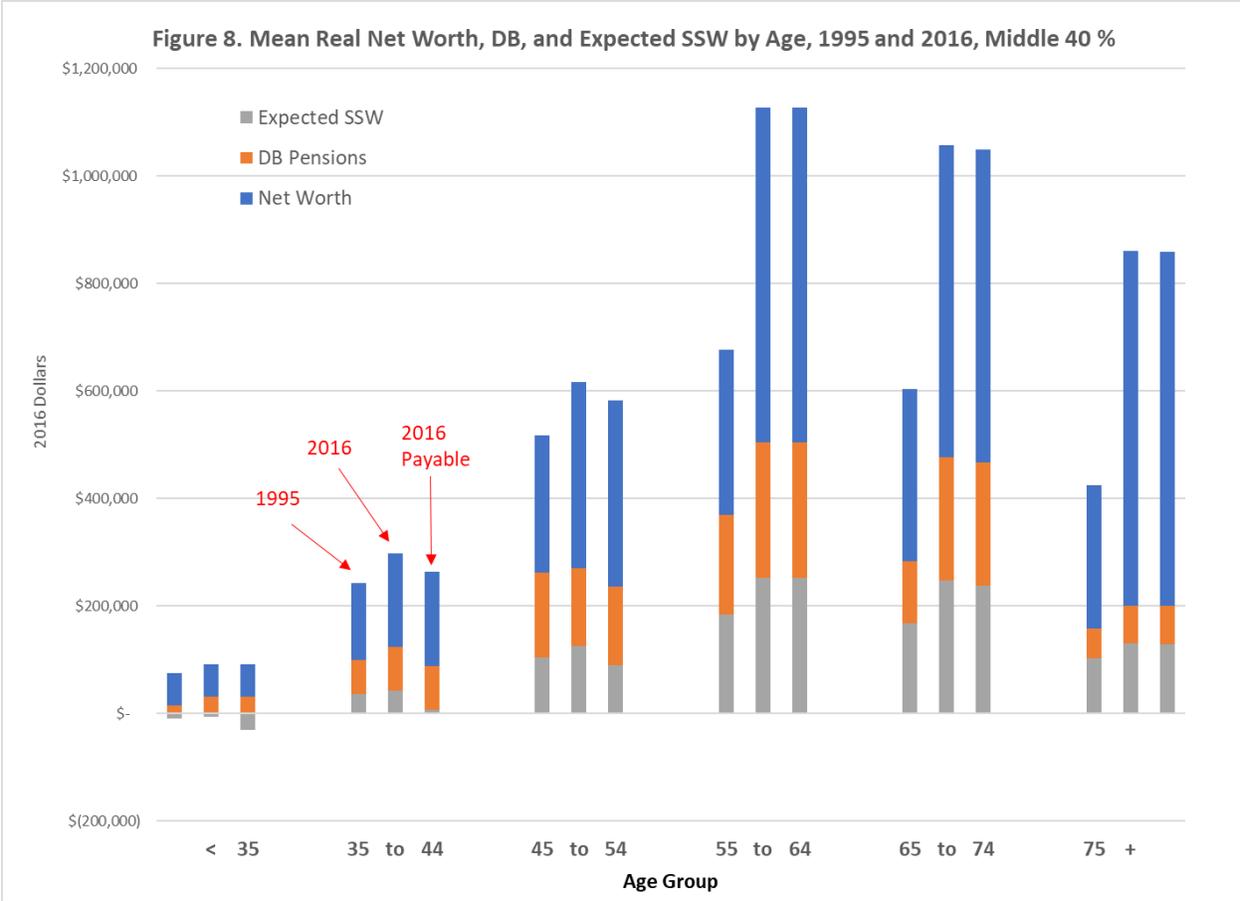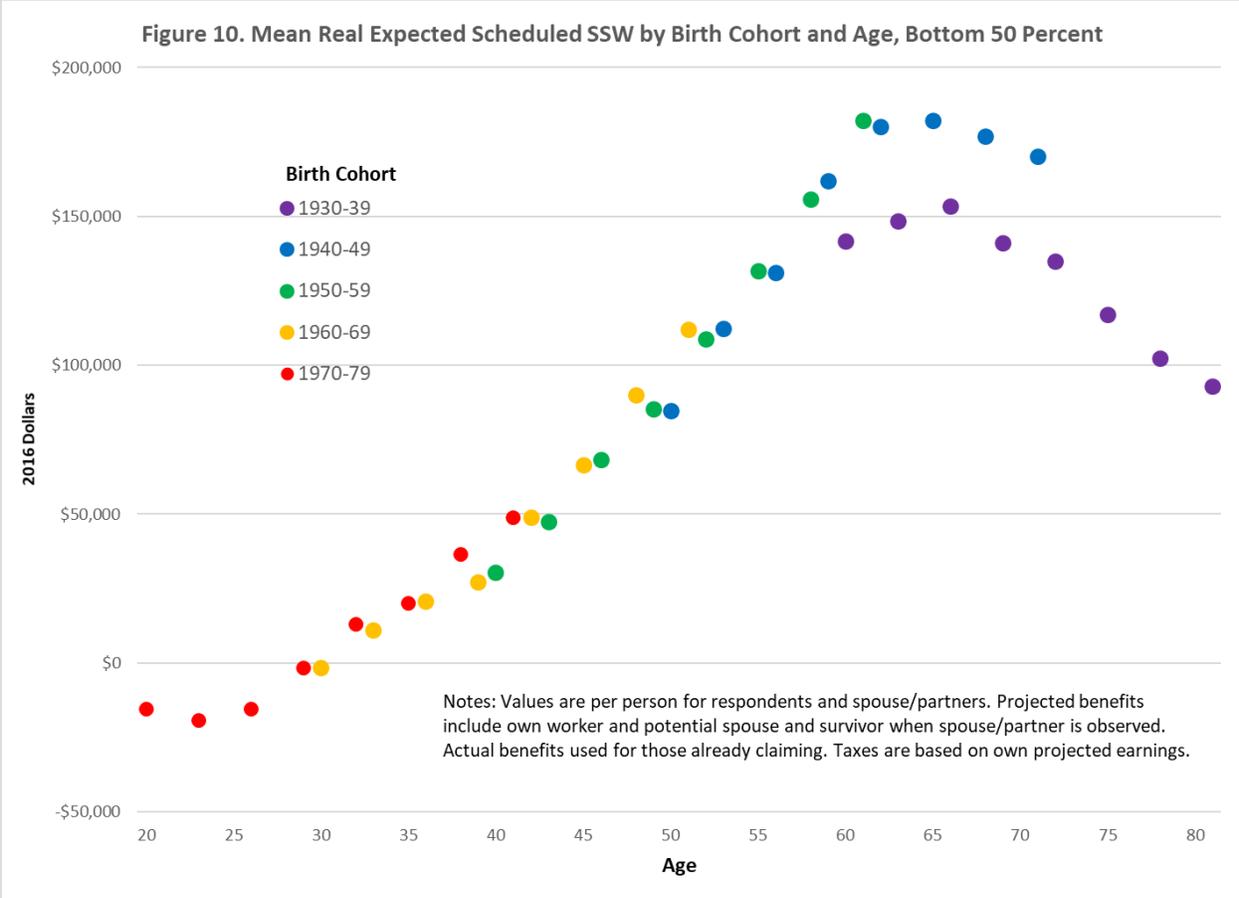
Average wealth in the middle 40 percent has risen much more older ages, though again only modestly so or even falling at the youngest ages (Figure 8). It is noteworthy that again, increases in expected SSW—mostly driven by higher lifetime earnings leading to higher benefits—are pushing up wealth in the groups ages 45 to 54 and older. Together, expected SSW

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and DB pensions account for a substantial share of wealth for those in the middle 40 percent wealth group who are approaching retirement, but their average wealth gains between 1995 and 2016 are largely in SCF Bulletin wealth components. This warrants further investigation, likely being driven by increased housing wealth.

Figure 9. Mean Real Net Worth, DB, and Expected SSW by Age, 1995 and 2016, Top 10 %
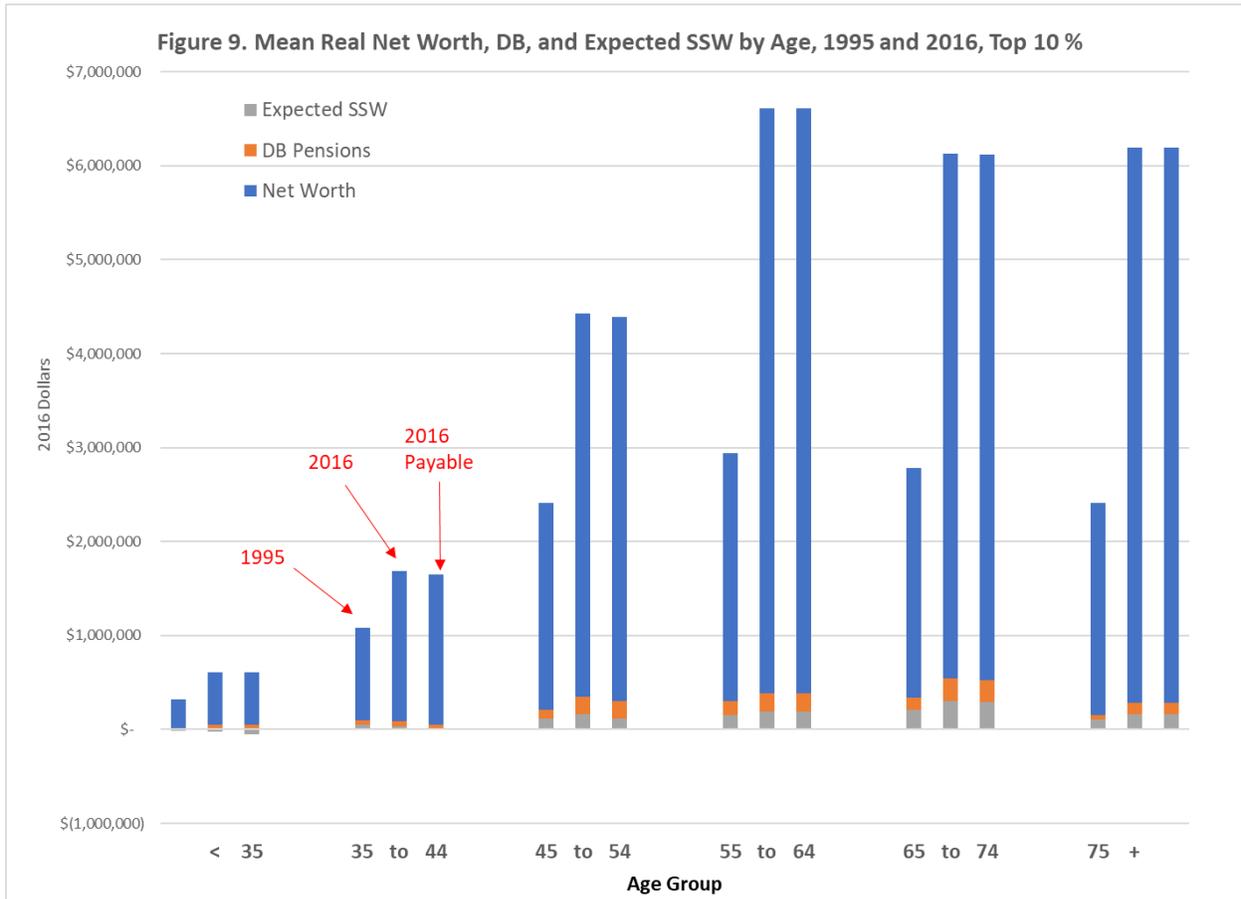
The increase in average wealth is proportionally greatest for the oldest age groups in the top 10 percent of their respective wealth distributions (Figure 9). Expected SSW and DB pensions are barely noticeable on the top 10 percent column charts, and there are substantial percentage increases in average wealth for the top 10 percent by wealth in all age groups, clearly being driven by the SCF Bulletin wealth component. The percentage gains are largest for the top 10 percent of wealth within the older groups, further reinforcing the old/wealthy versus young/low wealth inequality narrative.

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Figure 10. Mean Real Expected Scheduled SSW by Birth Cohort and Age, Bottom 50 Percent

Birth Cohort
- 1930-39
- 1940-49
- 1950-59
- 1960-69
- 1970-79

2016 Dollars

Notes: Values are per person for respondents and spouse/partners. Projected benefits include own worker and potential spouse and survivor when spouse/partner is observed. Actual benefits used for those already claiming. Taxes are based on own projected earnings.

Age

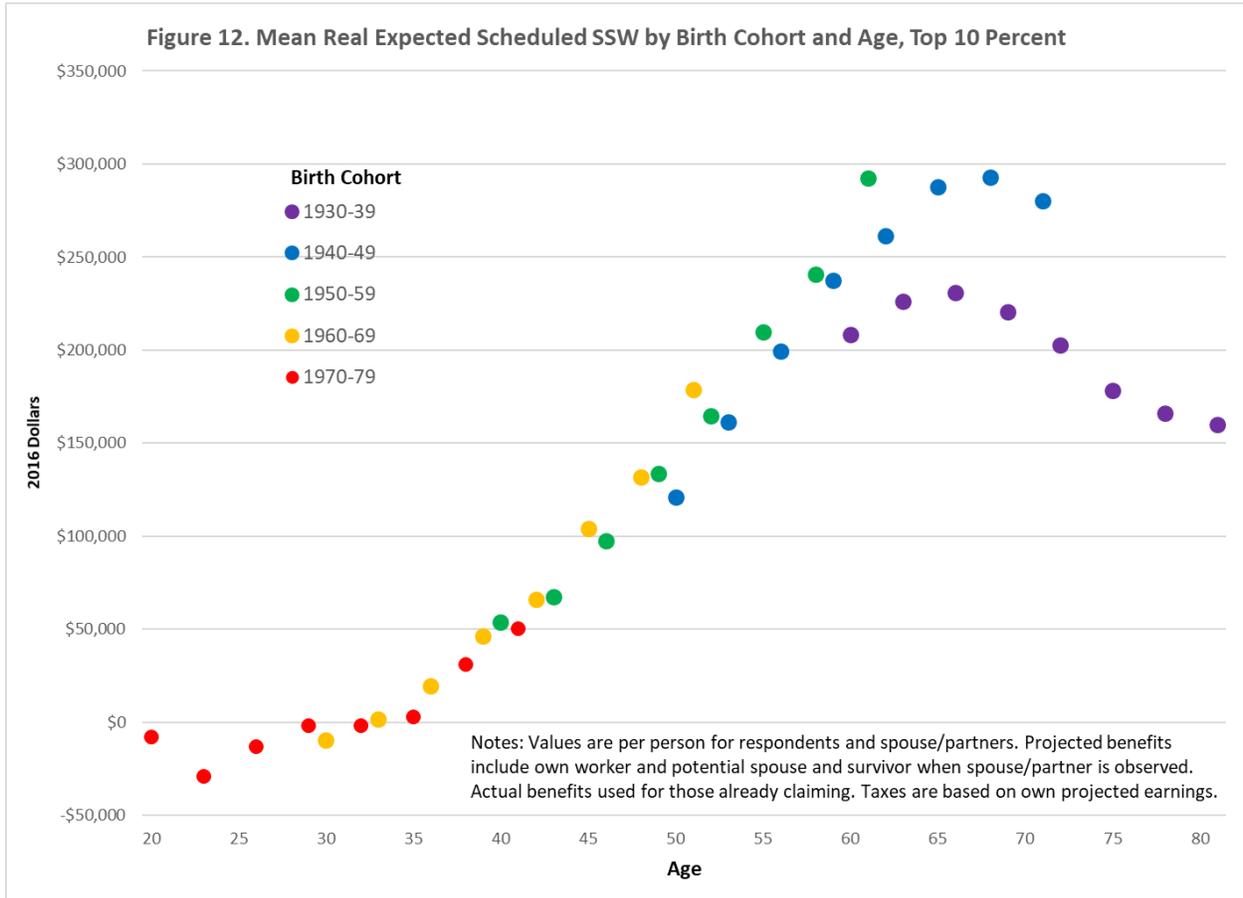We also present the lifecycle view of SSW by wealth group using the cohort-age pseudo panel charts. As above, we chart average SSW at the mid-point of the age range for each cohort in each survey year, but in this case, for each of the three wealth subgroups within the cohort (Figures 10, 11, 12). The identifying assumption required to connect the cohort dots across survey waves is that position within the wealth distribution for the members of a given birth cohort does not change between survey years. The most noticeable difference across the three charts is the height of y-axis. Average SSW peaks at just over $150,000 for the bottom 50 percent, at just over $200,000 for the middle 40 percent, and around $250,000 for the top 10 percent. However, these differences in mean expected SSW pale in comparison to differences in income. For example, pre-retirement incomes (ages 55 to 64) in the middle 40 group are more than twice as high as in the bottom 50, and in the top 10 percent by wealth incomes are more than 10 times greater than the bottom 50. In that sense, the rate of change in SSW over the lifecycle for lower income groups is much greater than for higher income groups.

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Figure 11. Mean Real Expected Scheduled SSW by Birth Cohort and Age, Middle 40 Percent

Notes: Values are per person for respondents and spouse/partners. Projected benefits include own worker and potential spouse and survivor when spouse/partner is observed. Actual benefits used for those already claiming. Taxes are based on own projected earnings.
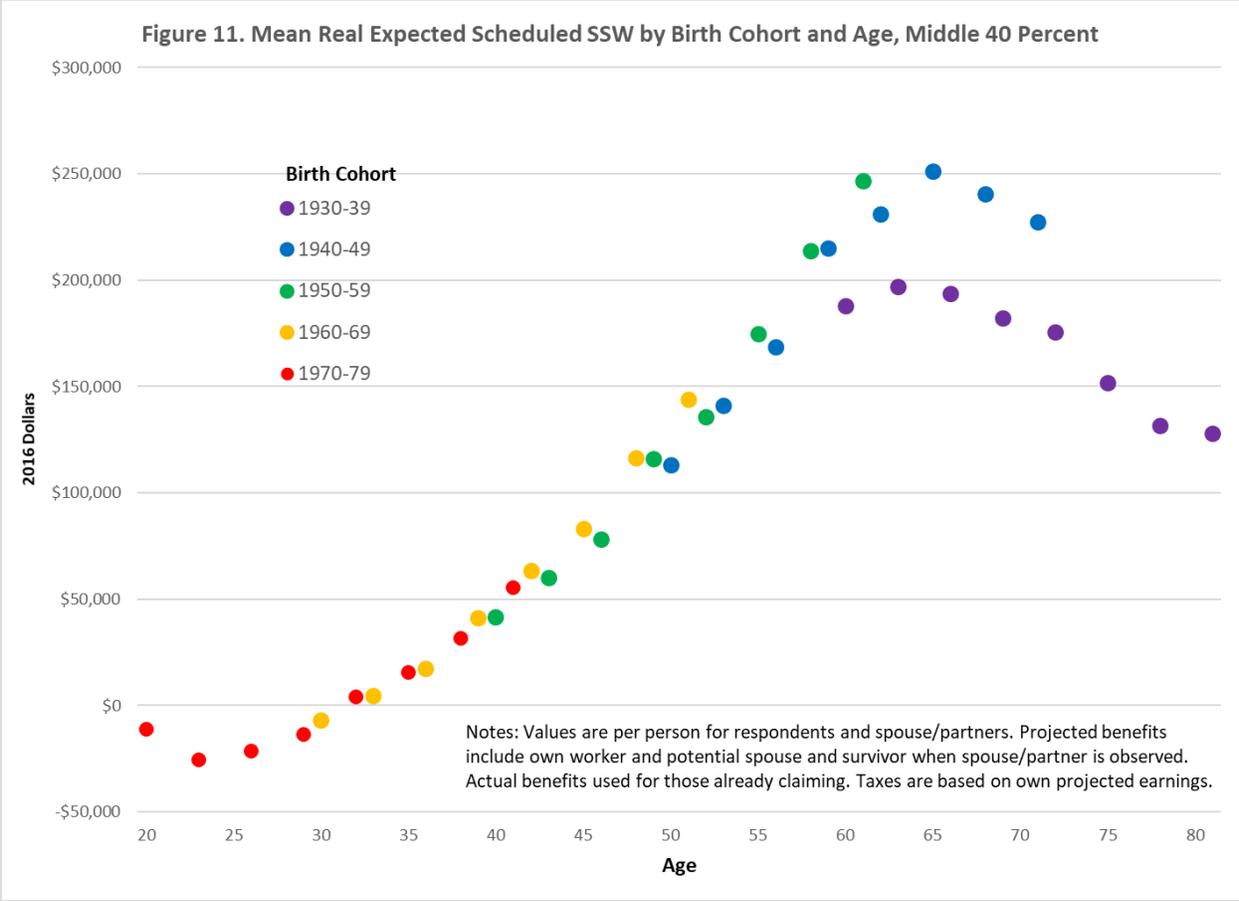
Although not shown in these lifecycle charts, the implications of moving from the scheduled to payable benefits scenario is likely proportionally larger on expected SSW for the young wealthy than it is for the young poor, but probably more important in terms of overall wealth accumulation for the young poor. The first suggestion is based on the observation that expected SSW is the difference between the PDV of benefits and taxes, and only benefits are affected when we move from scheduled to payable. Higher wealth young people have much higher PDVs of both taxes and benefits, but the net differences are only marginally different, and expected SSW is more negative for a longer age range. Thus, a benefit cut will weigh more heavily (again, in percentage terms) on the young wealthy.

On the other hand, the implication of the payable scenario for lifecycle wealth trajectories of the low wealth young are almost certainly more salient for overall well being and retirement. As shown in the year-age charts (Figures 7, 8, and 9) the key to accumulating retirement wealth claims for (otherwise) low-wealth individuals in earlier cohorts was Social Security and DB

pensions. As of 2016, those retirement income claims are no longer generating rising average wealth. Acknowledging that some of the scheduled Social Security benefits will never be received only worsens that trend. Among the top 10 percent by wealth, expected SSW is such a small component of the total, the payable baseline has much more modest implications.

Figure 12. Mean Real Expected Scheduled SSW by Birth Cohort and Age, Top 10 Percent

Birth Cohort
- 1930-39
- 1940-49
- 1950-59
- 1960-69
- 1970-79

Notes: Values are per person for respondents and spouse/partners. Projected benefits include own worker and potential spouse and survivor when spouse/partner is observed. Actual benefits used for those already claiming. Taxes are based on own projected earnings.

7. Conclusions and Next Steps

In this paper we begin with Survey of Consumer Finances (SCF) micro data and create a more comprehensive measure of household wealth that includes the present discounted value of Social Security benefits less taxes, a concept we refer to as Social Security Wealth (SSW). There are five main takeaways from this exercise. First, aggregate SSW is quantitatively important when compared to other components of household wealth. Second, including SSW helps us better understand typical lifecycle wealth profiles, as SSW rises steadily with age through retirement, then falls gradually with remaining lifespan. Third, SSW is very skewed towards otherwise low wealth families at any given age. Fourth, adding SSW to conventional wealth measures does not change perceptions about inequality trends, such as the increase in top wealth shares. Fifth, adding SSW conventional wealth measures reinforces emerging concerns about within and across age group wealth differentials. Although gaps between high wealth and low wealth families are increasing generally, the gap between old high wealth and young low wealth families is exploding, especially if one considers that only 80 percent of benefits are expected to be payable beginning in 2035.

The main takeaways are robust to data construction decisions regarding lifecycle earnings and benefits, discounting, and the SSW concept itself, but there are several aspects of our approach that are deserving of further research. On the data front, there is a clear need to test alternative approaches to constructing lifecycle earnings profiles, perhaps multiply-imputing using alternative data sources with longitudinal earnings histories where the donor records match SCF respondents in terms of characteristics and common labor force and earnings variables. The benefit calculations can and should be expanded to include other type of benefits, including disability and auxiliary benefits based on previous (and perhaps even prospective) marriages. The earnings history imputations and benefit calculator should also be checked against actual respondent-reported benefits in the SCF. In order to fully benchmark the SCF estimates against OACT values (see Appendix), we will need to add the PDVs for individuals 15 and older who are not represented in the population of SCF respondents who are either respondents or spouse/partners. Finally, given refined and benchmarked measures of SSW, it will be interesting to bring those measures to bear on explaining macroeconomic outcomes such as consumption and labor supply.

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Appendix. Benchmarking Aggregate SSW to OACT Estimates

The SCF-based SSW estimates reported in the text have a published counterpart for years going back to the 2001 survey (Appendix Table 1). The OACT benchmarks are a byproduct of disaggregating the "infinite horizon" unfunded liabilities of the Social Security system. The starting point is to compute the discounted present value of all future taxes and all future benefits, take the difference, then add the current Trust Fund balance to measure the overall aggregate shortfall in present value terms. The decomposition in tables (available only since 2001) allocates the PDVs across past, current, and future participants. The groups closest to the SCF population is current participants, which is the population 15 and older in the year for which the calculations are being made.

The SCF population we consider in this paper is a subset of the OACT current participants group, because we only compute SSW for SCF respondents and spouse/partners, which means we are excluding dependents and other persons (the NPEU in SCF parlance) 15 and older living in SCF households. Adult members of SCF households we miss include children still living with their parents, roommates, parents, or other older relatives living with respondents and spouse/partners. It may be feasible to study those individuals using the rudimentary SCF information that is collected, but for now, it is clear that we expect to calculate PDVs for taxes and benefits that are below OACT, even if we have the earnings profiles right for respondents and spouse/partners.

In general, the comparison of our estimated PDVs against published OACT values is reassuring, though the effect of alternative discounting and differences between the 62 and older and younger than 62 populations are notable and warrant further investigation. On the discounting front, there is little difference between simply using a 3 percent real discount rate and using the year-by-year OACT discount factors until 2016. Between 2013 and 2016 surveys, in addition to continued gradually lowering of assumed long-run real discount rates, OACT moved to an alternative time path for closing the gap between the current (and persistently low) real discount rates and their long run values, which has the effect of dramatically increasing SSW in 2016 relative to earlier years. The differences in PDVs between the retirement age and pre-retirement populations is also notable and warrants further investigation, in particular, the very low PDV of estimated taxes for the 62 and older population.

Appendix Table 1. Survey of Consumer Finances (SCF) and Office of the Chief Actuary (OACT) Present Discounted Values												
All Current Participants												
	2001		**2004**		**2007**		**2010**		**2013**		**2016**	
PDV Expected Social Security												
OACT Published	$	10,542	$	12,552	$	16,265	$	19,735	$	26,100	$	31,400
SCF, OACT Discount Rates	$	8,658	$	10,588	$	13,498	$	15,122	$	18,565	$	28,015
SCF, Fixed Real Rate=3%	$	8,959	$	10,952	$	13,424	$	15,300	$	18,126	$	20,553
= PDV Expected Benefits												
OACT Published	$	23,200	$	27,351	$	34,257	$	40,321	$	51,600	$	62,000
SCF, OACT Discount Rates	$	16,676	$	19,447	$	23,642	$	25,895	$	30,507	$	43,393
SCF, Fixed Real Rate=3%	$	17,056	$	19,942	$	23,553	$	26,207	$	29,824	$	33,081
- PDV Expected Taxes												
OACT Published	$	12,658	$	14,799	$	17,992	$	20,586	$	25,500	$	30,600
SCF, OACT Discount Rates	$	8,019	$	8,859	$	10,144	$	10,773	$	11,942	$	15,378
SCF, Fixed Real Rate=3%	$	8,097	$	8,989	$	10,130	$	10,907	$	11,698	$	12,528
Current Participants, Ages <62												
	2001		**2004**		**2007**		**2010**		**2013**		**2016**	
PDV Expected Social Security												
OACT Published	$	6,595	$	8,030	$	10,413	$	12,311	$	16,000	$	19,100
SCF, OACT Discount Rates	$	4,930	$	6,365	$	8,131	$	8,526	$	10,166	$	15,674
SCF, Fixed Real Rate=3%	$	5,199	$	6,672	$	8,063	$	8,623	$	9,896	$	10,379
= PDV Expected Benefits												
OACT Published	$	18,944	$	22,418	$	27,928	$	32,225	$	40,600	$	48,400
SCF, OACT Discount Rates	$	12,912	$	15,183	$	18,190	$	19,184	$	21,976	$	30,889
SCF, Fixed Real Rate=3%	$	13,259	$	15,620	$	18,108	$	19,414	$	21,465	$	22,755
- PDV Expected Taxes												
OACT Published	$	12,349	$	14,388	$	17,515	$	19,914	$	24,600	$	29,300
SCF, OACT Discount Rates	$	7,982	$	8,817	$	10,059	$	10,658	$	11,811	$	15,215
SCF, Fixed Real Rate=3%	$	8,060	$	8,948	$	10,045	$	10,791	$	11,569	$	12,376
Current Participants, Ages 62+												
	2001		**2004**		**2007**		**2010**		**2013**		**2016**	
PDV Expected Social Security												
OACT Published	$	3,947	$	4,522	$	5,852	$	7,424	$	10,100	$	12,300
SCF, OACT Discount Rates	$	3,728	$	4,223	$	5,367	$	6,595	$	8,399	$	12,341
SCF, Fixed Real Rate=3%	$	3,760	$	4,280	$	5,360	$	6,677	$	8,229	$	10,174
= PDV Expected Benefits												
OACT Published	$	4,256	$	4,933	$	6,329	$	8,096	$	11,000	$	13,600
SCF, OACT Discount Rates	$	3,764	$	4,264	$	5,452	$	6,711	$	8,530	$	12,504
SCF, Fixed Real Rate=3%	$	3,796	$	4,322	$	5,445	$	6,793	$	8,358	$	10,325
- PDV Expected Taxes												
OACT Published	$	309	$	411	$	477	$	672	$	900	$	1,300
SCF, OACT Discount Rates	$	36	$	41	$	85	$	115	$	131	$	163
SCF, Fixed Real Rate=3%	$	37	$	42	$	85	$	116	$	129	$	151