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ABSTRACT

The share of US workers covered by a traditional employer-sponsored defined-benefit pension plan has declined dramatically in the past half century. Though much of the decline has been offset by rising participation in account-type retirement plans, the trends in coverage by type of plan raises new policy questions. A great deal of research has focused on the implications of evolving retirement plan coverage for the distribution of total retirement wealth across and within generations, but there has been relatively little attention paid to shifts in access to protected income. This paper quantifies trends in protected income using several waves of the Health and Retirement Study. That study captures the decline in protected incomes between cohorts born in the early 1930s through cohorts born in the late 1950s and early 1960s. The analysis here also focuses on the role of annuitization behavior in driving protected income streams, because the same (especially higher-earning) workers who enjoyed protected income streams in previous generations without having to actively annuitize are now entering retirement with large retirement account balances but are forgoing the option to annuitize those balances.

THE CHANGING NATURE OF PROTECTED INCOME IN RETIREMENT

JOHN SABELHAUS

INTRODUCTION

The share of US workers covered by a traditional employer-sponsored pension plan has declined dramatically over the past few decades. According to Form 5500 filings (US Department of Labor 2021), in 1975 roughly 75 percent of workers included in private pension plans were in traditional defined-benefit (DB) plans, with 25 percent in defined-contribution (DC) plans. By 2019, even though the total number of pension plan participants had roughly tripled, the fraction participating in DB plans had fallen to less than 25 percent, and the absolute number of participating workers in DB plans had declined. Even some public sector jobs—once the bastion of the traditional DB pensions—are seeing shifts in coverage, especially for newly hired employees (National Association of State Retirement Plan Administrators n.d.).

The shift in pension coverage from DB to DC motivates the focus here on protected income in retirement over time and across population subgroups because DB plans are generally characterized by annuity payouts, whereas DC plans are rarely annuitized. Given the shift in pension coverage from DB to DC, we expect (and in fact find) that the occurrence of protected income is declining over time. We find that realized occurrence of protected income other than Social Security (meaning pension and annuity incomes) at retirement age fell from just over half of those born in the early 1930s to about one-third of those born in the early 1950s, the last cohort for whom we can observe postretirement income. We also find that expectation of retirement income (proxied by DB pension coverage) when individuals are at their peak preretirement earnings ages fell similarly for those born in the late 1930s and for those born in the early 1960s. The continued decline in DB coverage for those born after the early 1950s portends further declines in the occurrence of protected incomes when those younger cohorts reach retirement age.

In addition to looking across birth cohorts, we also study differences in the occurrence of protected income and DB coverage within birth cohorts by gender, race/ethnicity, marital status, education, income quartile, and wealth quartile. Differences in the occurrence of protected income and DB coverage are mostly as expected, since the more advantaged socioeconomic groups are more likely to have DB coverage and the resulting protected income flows. Indeed, some of the overall decline in the occurrence of protected income and DB coverage could be related to the evolution of subpopulation composition. We show that this is at most a small part of the story, however. Univariate analysis of across-cohort trends within each population subgroup shows common trends, and a multivariate analysis shows that overall cohort trend residuals are little affected when the other controls are added.

The final step in the analysis here involves determining the quantitative importance of trends in protected income during retirement. For this we use a longitudinal panel of individuals observed at both peak earnings and retirement ages. Although the cohort birth range covered by the longitudinal sample is limited to the late 1930s through the early 1950s, we still find evidence of a downward trend in the ratio of protected income to peak earnings, gauged by the fraction of individuals who cross various replacement-rate thresholds. When looking across socioeconomic characteristics, we also focus on the role of Social Security in overall protected incomes.

To complete the picture, we implement a simple thought experiment in which we consider how annuitizing retirement account balances would affect the conclusions about protected income replacement rates. Annuitizing retirement balances gets at the question of whether DC accumulation could in principle generate the same patterns of income replacement that occurred when DB pensions were more common. The results show that lower-income and lower-wealth groups already have high replacement rates—mostly from Social Security—and that increased annuitization of retirement balances for those in the top half of the income and wealth distribution would go a long way toward equalizing replacement rates across the distribution.

2. PROTECTED INCOME AND RETIREMENT ADEQUACY

Policy concerns about the distribution of retirement resources motivates an ongoing and evolving research agenda focused on retirement adequacy. Empirical research on retirement adequacy generally involves starting with some combination of household-level retirement income or wealth measures, and considering whether those resources are sufficient for the individuals to maintain a preretirement standard of living. There are several considerations that go into evaluating retirement preparedness; even though much progress has been made in terms of improving those measures, the role of protected income is not well understood.

The starting point for thinking about trends in retirement preparedness is employer pension coverage. Consistent measures of pension coverage over long periods are surprisingly hard to come by, but increased use of administrative data (e.g., W2 tax filings) shows that overall coverage rates have been stable or rising over the past two decades, and that coverage is strongly correlated with earnings (Brady and Bass 2019; Brady and Bogdan 2016; Pierce and Gober 2013). At face value, these patterns conflict with widely used measures of pension coverage from the Current Population Survey, but those differences are largely due to that survey's question wording and survey design (Sabelhaus 2022). The more-consistent Survey of Consumer Finances coverage measures available date back to the late 1980s, and confirm that overall coverage has remained stable but is shifting from DB to DC (Sabelhaus and Volz 2019).[1]

The shift from DB to DC pension coverage bears directly on the question of whether accumulated retirement wealth and/or protected retirement income flows are sufficient to maintain preretirement consumption. DB pension plans are historically associated with annuity payouts, whereas few DC balances are annuitized at retirement. The difference between retirement account balances and annuities is important, regardless of whether retirement adequacy is measured using projected income flows or some measure of accumulated retirement wealth to gauge retirement preparedness.

1. The Survey of Consumer Finances is a triennial survey available 1989 through 2018. See Bhutta et al. (2020) for a description of the survey and a summary of the most recent results.

One straightforward approach to measuring adequacy involves projecting incomes through retirement using dynamic microsimulation (Butrica, Iams, and Smith 2007). The method requires setting consumption targets and asking whether the combination of wealth at retirement age and protected income flows (pensions, annuities, and Social Security) are sufficient to pay for spending through the retirement period. In dynamic microsimulation models, individuals are subject to a sequence of life events or transitions that captures heterogeneity in outcomes across the population, including realized mortality. However, in addition to the challenge of choosing appropriate consumption targets (Hurd, Rohwedder, and Willis 2012), the dynamic microsimulation approach does not capture uncertainty about productivity growth and stock or other financial asset prices that are important for protected income relative to other resources, because adding those types of uncertainty is generally not computationally feasible.

The more common approach to measuring retirement adequacy involves creating fixed-point-in-the-life-cycle wealth measures, then looking at either (1) whether the comprehensive wealth measure is sufficient to support a targeted consumption level through the retirement period or (2) how those wealth levels are changing over time and vary with socioeconomic characteristics. There are many decisions required to construct such measures, and it is perhaps not surprising that the answer is sensitive to the assumptions.

Beginning with the targeted consumption approach, one prominent academic index of retirement adequacy uses the Survey of Consumer Finances to estimate what fraction of the population is expected to have enough wealth at age 65 to maintain their preretirement consumption (Munnell, Chen, and Siliciano 2021). The authors find that about half of current US households will fall more than 10 percent short of reaching their target, up from about a third of households in the 1980s. The model underlying the index is very complex, with income replacement targets that vary by factors such as housing tenure and effective income tax rates. Studies comparing actual wealth to the optimal wealth from a calibrated life-cycle model tend to be much less pessimistic about retirement adequacy (Engen, Gale, and Uccello 1999; Love, Smith, and McNair 2008; Scholz, Seshadri, and Khitatrakun 2006). Again, however, these wealth adequacy measures do not fully account for the macroeconomic risks that are key for understanding the role of protected income.

The measures of household wealth in retirement adequacy studies are generally limited to observable household balance sheet items, but one recent set of papers develops comprehensive measures of household wealth that adds the present value of DB pensions and Social Security incomes (Sabelhaus and Volz 2019, 2022, forthcoming). However, these and other wealth-based measures of retirement adequacy do not adjust for the risk characteristics of the income stream that can be generated from the different types of wealth. The present values are computed using the discount rates that a pension or Social Security actuary would use when evaluating system finances. From the perspective of households, those income streams are different because they are protected, and thus more valuable than (for example) financial asset wealth.

Given the complications involved with combining all the different type of retirement wealth, one simpler approach involves directly comparing wealth by type (along with demographic and other characteristics) across and within birth cohorts. If we observe bad outcomes based on preretirement wealth holdings (and other characteristics) in an older cohort, we can project whether future cohorts will experience bad outcomes in future cohorts based on their preretirement wealth and other characteristics. The idea is to capture differences in a model-free way, by using the experiences of older cohorts to project what will happen when current workers reach retirement (Brown, Dynan, and Figinski 2020; Fichtner 2019). The approach does not require assumptions about inputs such as consumption targets or future labor force activity, and relies on the idea that individual outcomes depend on wealth and other characteristics, not birth cohort per se.

The cohort-comparison approach to studying retirement adequacy is also imperfect, because the macroeconomic and policy environment may be different for those future retirees. However, cohort-comparison offers an alternative approach to using wealth and other characteristics for understanding how retirement experiences can be expected to change for future cohorts and does

not require assumptions about the relationship between retirement and preretirement standard of living. As such, we adopt the cohort-comparison approach here as a first step toward better understanding the role of protected income in retirement. We look at trends in the occurrence of protected income at retirement age, and trends in the occurrence of DB pension coverage at peak earnings age; we establish the fact that the composition of retirement resources is changing in a systematic way; we look within birth cohorts to see for whom protected income is changing, and find a common trend across subpopulations defined by socioeconomic characteristics; finally, we implement a longitudinal comparison that shows differences in the ratio of protected income to preretirement earnings across and within birth cohorts.

An additional step in the analysis here touches on another literature that spans the gap between income- and wealth-based measures of retirement adequacy. In a thought experiment in section 5 we ask how annuitizing retirement account balances and adding those annuities to existing protected income flows would affect overall protected income replacement rates. This thought experiment relies on market prices for annuities because we simply multiply existing account balances at ages 63 to 65 by 6 percent, which approximates the flow of protected income that can be purchased. However, it is well known that most retirees fail to purchase annuities when they have sufficient resources to do so, and the explanation for that might bear directly on how we should think about the trends and within-cohort differences in protected income.

Behavioral economics offers one set of explanations for lack of annuitization: that the lack of demand arises because annuities are complex and difficult to understand (Brown et al. 2021). Selection into annuity markets and the resulting impact on annuity prices is another possible explanation (Poterba and Solomon 2021). In between are explanations involving (possible) misconceptions about inputs such as survival (O'Dea and Sturrock 2021). Resolving the different explanations is key to moving from the cohort-comparison analysis here to a more complete assessment of the role of protected income in retirement. If failure to annuitize is behavioral, then the emphasis should be on policies focused on overcoming those hurdles.

3. DATA

The analysis in this paper is based on several waves of the Health and Retirement Study (HRS). The HRS is a biennial longitudinal household survey of individuals age 50 and older, conducted by the Institute for Social Research at the University of Michigan. The HRS collects extensive demographic and health information, along with the crucial labor force, income, and wealth measures needed to answer the questions posed in this study. The HRS began collecting data in 1992, with an initial sample of 50- to 59-year-old respondents. The HRS systematically refreshes the sample as new six-year birth cohorts reach the age of 50. As of this writing, HRS data (in final form) are publicly available through the 2018 survey wave.

As with any survey conducted over many years, the HRS has evolved in terms of question scope and wording. The good news is that HRS users have access to the invaluable HRS data extract produced and maintained by researchers at the RAND Corporation (Bugliari et al. 2021). The RAND HRS Longitudinal File is a cleaned, reconciled, linked, and easy-to-use extract of HRS wave files. The RAND file is organized by respondent, with time-varying measures such as labor force participation, income, and wealth stored on the individual records. Relatively few respondents have complete longitudinal records, because that would require that they are always in scope (meaning older than 50, still alive, and still participating in the survey) since the original HRS sample was drawn in 1992. The youngest members of the original HRS sample had reached age 78 by 2018, and the oldest original members were age 87. The most recent cohort refresh (late baby boomers) were born between 1960 and 1965, and thus were 53 to 58 years old in 2018.

The HRS collects both individual- and household-level data. The HRS frame includes spouses of sampled individuals, but only age-eligible spouses are themselves potential respondents. The spousal variables on HRS RAND respondent records are used here to equally allocate household variables (such as assets, income, and pension coverage) and thus create per capita measures. A household with two HRS respondents has two records in the data extracts used here, where each spouse has

their own demographic characteristics, but each is assigned half the income and wealth.[2] Also, if one member of the household has protected (pension or annuity) income or DB pension coverage, the measured occurrence is assigned to both respondent and spouse. The data set here is person-level, but household-level information plays a key role.

The age limitations and incremental birth cohort structure of the HRS motivate the empirical strategies used here. There are two (effectively cross-sectional) analyses that consider how the outcomes of interest vary across and within birth cohorts. The cross-sectional comparisons are focused on retirement ages (63 to 65) and peak earnings ages (53 to 55). Not all respondents are at their peak earnings at ages 53 to 55, and not all respondents are retired at ages 63 to 65. At the same time, few respondents have left their career jobs before age 55, and few are still working career jobs after age 65. These sample decisions play a role in terms of outcomes such as the levels of DB pension coverage and the occurrence of protected income in retirement, but the trends are essentially the same regardless of how the samples are restricted. In addition to the cross-sectional analyses, we also implement a longitudinal analysis that involves collecting data for unique individuals as observed at both peak earnings and retirement ages. We require individuals to be in a "working" household (one in which at least one person is working) at ages 53 to 55, and a "both retired" household (one in which both members are retired) at ages 63 to 65.

The cross-sectional and longitudinal analyses introduce different limitations on the cohort birth year ranges that are in scope for our purposes. In the cross-sectional retirement age analysis focused on the occurrence of protected income at ages 63 to 65, the HRS timing and age structure effectively limits the sample to those born between 1931 and 1953, observed in the HRS between 1992 and 2018. One can find HRS respondents outside this birth year range at ages 63 to 65 because out-of-scope spouses can be surveyed when they become in-scope. However, we know the sample is statistically representative only for birth years 1931 through 1953. Thus, we effectively have a 23-year time series for studying trends in protected income at retirement.[3]

The same age and year restrictions also apply to the second cross-sectional analysis, which is focused on the expectation of protected income (proxied by DB pension coverage) at peak earnings age, defined here to include those ages 53 to 55 at the time of they were surveyed.[4]

The birth year window for the peak earnings age sample is slightly wider and shifted, covering the 25 cohort birth years between 1939 and 1963. Again, to reinforce how the age and survey year overlaps jointly determine the statistically representative birth cohort window, the 55-year-old respondents in HRS wave 14 (survey year 2018) were born in 1963, and the 53-year-old respondents in HRS wave 1 (survey year 1992) were born in 1939.

The birth year restrictions associated with the HRS age and time overlap generate large samples for the two cross-sectional analyses here. There are 42,233 longitudinal respondent records in the HRS RAND Longitudinal File. From those, we extract 21,409 cross-sectional observations of individuals at ages 63, 64, or 65 born between 1931 and 1953. Not all cross-sectional observations are unique individuals. Some individuals are observed at both ages 63 and 65, because they participated in two consecutive survey waves. Similarly, there are 18,026 cross-sectional observations of individuals at ages 53, 54, and 55 born between 1939 and 1963. The starting point for the cross-sectional DB coverage analysis is a slightly reduced subset of all peak earnings age observations. The base sample is the 17,817 cross-sectional observations of individuals ages 53 to 55 living in a household where either they or their spouse is working.

As noted, the strategy of observing individuals at fixed ages leads to a situation where some additional sample exclusions may be warranted. In addition to studying the entire population ages 63 to 65, we also consider two

2. The same approach to wealth-splitting is used in Sabelhaus and Volz (2022, forthcoming).
3. The 65- to 67-year-old age group shows the same basic results, but the birth year range is even more limited.
4. In what follows we use the HRS pension coverage measures to gauge the expectation of protected income, acknowledging that previous research has shown that survey respondent knowledge about pension plan coverage, especially type of coverage, is somewhat incomplete (Gustman and Steinmeier 2004). However, respondent knowledge about pension coverage does improve with age, and thus reported coverage at ages 53 to 55 is, on average, much better (Chan and Stevens 2008).

population subgroups.[5] Of the 21,409 person-year observations ages 63 to 65 born between 1931 and 1953, 9,330 individuals report that both they and their spouse (if present) are fully retired. A larger sample subset (12,707 person-year observations) is in households where neither they nor their spouse reports earnings above the Social Security earnings threshold. We also create two subsets of the peak earnings (ages 53 to 55) sample. Of the 17,817 person-year observations where at least one person (respondent or spouse) is working, there are 15,811 observations where at least one person is working for someone else (not self-employed) and 14,062 observations where at least one person is working full time for someone else.

The longitudinal analysis includes individuals observed between ages 53 to 55 and again between ages 63 to 65. The pairing makes it possible to assess how levels of protected income in retirement compare to peak earnings. The birth year restrictions on the peak earnings sample and the retirement age sample are both in force, and thus the birth year window for which the longitudinal population is representative is only 1939 through 1953. There are 7,550 unique individuals in the peak earnings age sample born in those years, and 8,720 unique individuals in the retirement age sample.[6] Of those, 6,017 unique individuals are in both samples, meaning they completed at least one interview when they were between 53 and 55, and at least one interview between ages 63 and 65. The main sample used in the longitudinal analysis is further restricted because of the same "working" and "both retired" sample restrictions used in the cross-sectional analyses. The sample count of linked unique individuals ages 63 to 65 who are living in a household where both they and their spouse have earnings below the Social Security earnings threshold is 3,496.

4. TRENDS IN THE OCCURRENCE OF PROTECTED INCOME

The first goal of this study is documenting trends in the occurrence of protected income (exclusive of Social Security) across and within birth cohorts. The approach is to first focus on realized receipt of protected income at ages 63 to 65, and then to consider the expectation of protected income (based on DB pension coverage) at ages 53 to 55. Using the HRS RAND file, the analysis at ages 63 to 65 allows us to look at birth cohorts 1931 through 1953, while the analysis at ages 53 to 55 allows us to look at birth cohorts 1939 through 1963. In addition to trends by birth year, we also show how the occurrence of protected income varies by gender, race/ethnicity, marital status, education, income quartile, and wealth quartile. The occurrence of protected income (realized and expected) has a strong downward trajectory across and within birth cohorts, and multivariate analysis shows clearly that the overall decline in receipt and expectation of protected income by birth year is not being driven by changing population composition.

4A. PROTECTED INCOME AT RETIREMENT AGE

Analyzing trends in protected income at retirement requires being specific about what protected income means, and what it means to be in the retirement population. The HRS RAND longitudinal file collects income across several broad categories, one of which is income from pensions and annuities. The focus of this subsection (4A) is on the occurrence of protected income, so we simply measure whether income from pensions and annuities is greater than zero.

Retirement is a more nebulous concept. Some individuals never really work for pay and could in principle consider themselves retired at a very young age. Some individuals never really retire and remain in the labor force even after they start receiving Social Security or pension income. However, most individuals with substantial labor force attachment leave their career jobs before their mid-60s, and then start receiving Social Security and pension income (if eligible). Thus, the age range 63 to 65 is our starting point for studying receipt of protected income. To make birth cohorts more comparable, we also show trends for two subsets of the age 63 to 65 population. The first group is those with total earnings below the Social Security earnings test threshold at which Social Security benefits are reduced for those below full retirement age. The second group is those ages 63 to 65 who self-report as retired in the HRS.

5. The sample counts here are unweighted, but the analysis in section 4 of this paper uses HRS household weights from the RAND files.
6. In the longitudinal analysis, the two cross-sectional records for individuals observed twice (e.g., at ages 53 and 55 or at ages 63 and 65) are collapsed into one observation, averaging the two sets of cross-sectional outcomes.

FIGURE 1. *Occurrence of Protected Income at Ages 63 to 65 by Birth Year, 1931–53*

Regardless of whether we look at all individuals ages 63 to 65, just those ages 63 to 65 who self-report that they are retired, or just those who have earnings below the Social Security earnings test threshold (or low wage) there is a clear downward trend in the occurrence of protected income receipt by birth year (figure 1). Not surprisingly, the fraction of all individuals ages 63 to 65 with protected income is below the fraction with protected income in the more restricted populations, because no filters have been applied to distinguish those still working in career jobs.[7] The occurrence of protected income is highest among the self-reported retired population in all birth years. Though there is clear sampling variability in the single birth year chart, the declines in occurrence of protected income in retirement are clear, and are on the order of 10 to 15 percentage points within each population subgroup between the 1931 and 1953 birth cohorts.

The HRS ages 63 to 65 data set used to produce figure 1 averages nearly 1,000 observations per birth year. Although that is more than enough observations to capture the overall downward trend, sampling variability is clearly present in figure 1; that variability would become incrementally worse if we looked at trends within subgroups of the retirement age population. Thus, in what follows, we sort individuals into three cohort birth year groups: 1931–38, 1939–46, and 1947–53. This grouping makes it possible to see clear trends over time by gender, race/ethnicity, marital status, education, income quartile, and wealth quartile (figures 2a–2f). There is a common thread to the demographic and economic decompositions. Although we observe clear differences in the *levels* of the occurrence of protected income in retirement, there is a clear downward *trend* across cohort birth year groups within demographic and economic subgroups.

The first demographic split is by gender (figure 2a). The population considered in figure 2a is all individuals ages 63 to 65 but restricting the sample to those who self-report themselves to be retired or to those with low earnings does not affect the conclusions. Women have higher occurrence of protected income at ages 63 to

7. Just under half of 63- to 65-year-old individuals self-report as retired, and just over half have earnings below the Social Security earnings test cutoff (and their spouse, if present, meets the same criterion). Appendix table A1 shows that there is a slight upward trend in self-reported retired population share at ages 63 to 65, and a slight downward trend in the low-wage population share.

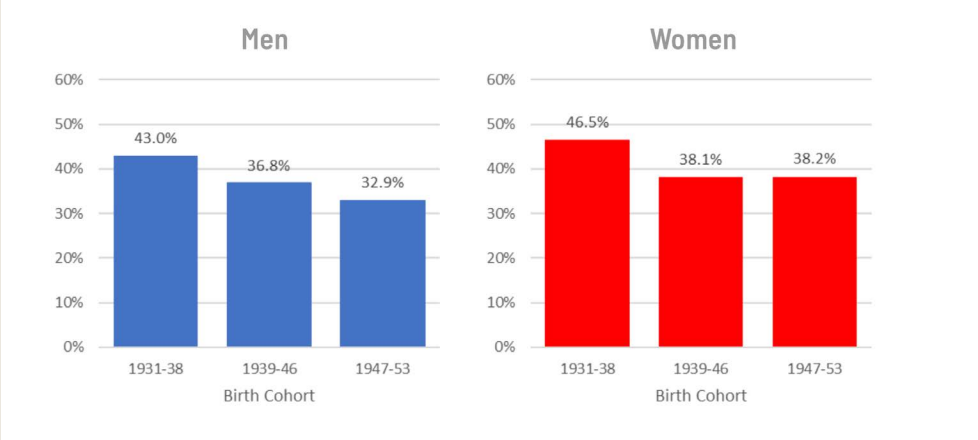

FIGURE 2A. *Occurrence of Protected Income at Ages 63 to 65 by Gender, 1931–53*

65, but the differences are only a couple of percentage points. Most importantly, both men and women show a clear and substantial decline in the occurrence of protected income at ages 63 to 65. Women account for a slightly larger share of the ages 63 to 65, but there is no trend in that share, and thus the overall decline is not (immediately) explained by an increasing male share in the younger birth cohorts.

Differences in the occurrence of protected income at ages 63 to 65 are much more pronounced by race and ethnicity, but the same message about declines occurring within groups comes through clearly (figure 2b). The occurrence of protected income at retirement age is much higher among the White non-Hispanic population than it is among either the Black or the Hispanic populations in all birth cohorts, but all three subpopulations show declines across the three cohort-birth year groups. Unlike the gender split, there is a decrease in the share of the retirement-age population accounted for by White non-Hispanics (appendix table A1) and thus some of the overall decline in the occurrence of protected income may be attributable to demographic shifts.

The HRS also makes it possible to split the retirement age population by marital status (defined here as single versus married or living with a partner) and by education (we look at high school diploma or less versus some college or more). Single individuals have notably lower occurrence of protected income, which is true generally, but that fact is reinforced by the decision to assign protected income based on either respondent or spouse (figure 2c).

The occurrence of protected income is higher for the more educated group, and there is some indication that the gap between the more-educated and the less-educated could be widening over time (figure 2d). Declining occurrence is still evident for all subpopulations.

In addition to demographics, we also subset the population of individuals ages 63 to 65 by total income quartile measured at the same age (figure 2e). The first income quartile has much lower occurrence of protected income than the other groups, with the second and third quartiles standing out as the highest. Many of the individuals in the highest income quartile are there precisely because they still have substantial earned income, which could be correlated with the lower occurrence of protected income. In any event, the recurring theme of declining occurrence across subpopulations remains very clear, with double-digit declines for all but the highest income group.

Finally, we consider the occurrence of protected income by wealth quartile (figure 2f). The patterns observed for income quartile (both levels and trends) come through for the wealth quartiles as well, with the highest occurrence of protected income and largest trend decrease in the second and third quartiles. Looking ahead to section

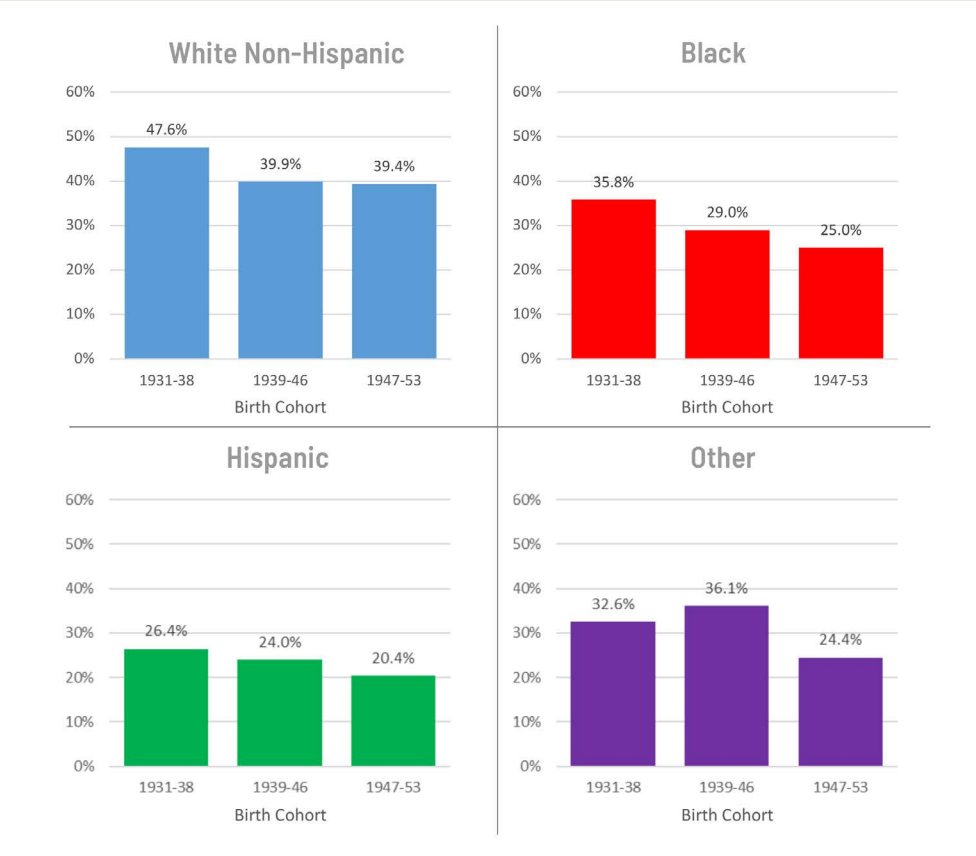

FIGURE 2B. *Occurrence of Protected Income at Ages 63 to 65 by Race/Ethnicity, 1931–53*

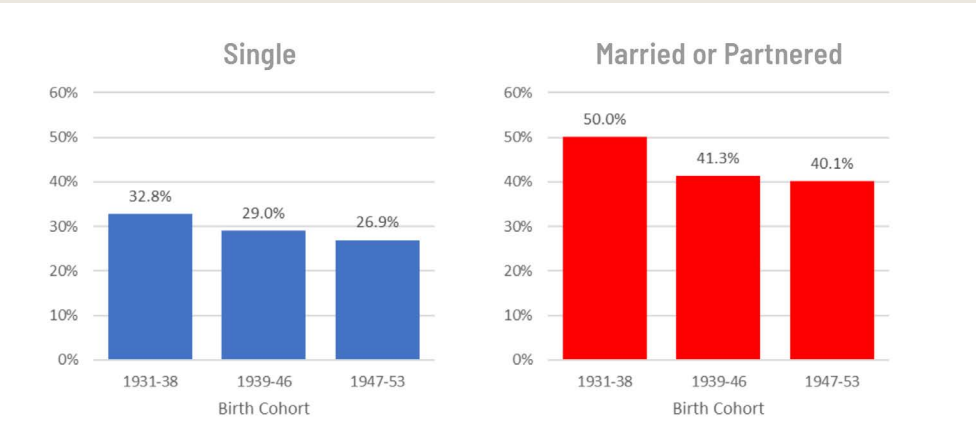

FIGURE 2C. *Occurrence of Protected Income at Ages 63 to 65 by Marital Status, 1931–53*

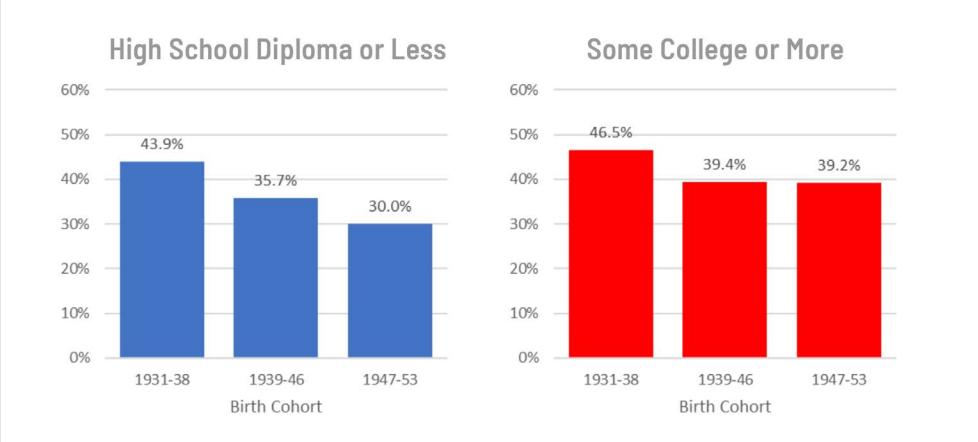

FIGURE 2D. *Occurrence of Protected Income at Ages 63 to 65 by Education, 1931–53*

FIGURE 2E. *Occurrence of Protected Income at Ages 63 to 65 by Income Quartile, 1931–53*

FIGURE 2F. *Occurrence of Protected Income at Ages 63 to 65 by Wealth Quartile, 1931–53*

5 of this paper, this is particularly troubling because, in general, only individuals in the highest wealth quartile have the much higher retirement account balances available to be annuitized and to be used to replace what would have been a DB annuity for a comparable individual in an earlier cohort.

The levels and trends in the occurrence of protected income for the entire population at ages 63 to 65 shows the expected differences by gender, race/ethnicity, marital status, education, income quartile, and wealth quartile. There is also a general and robust decline in the occurrence of protected income within each of those demographic or economic subpopulations. However, the univariate decompositions above raise two additional questions: First, how much of the overall decline in protected income is because population composition has changed? Second, are the conclusions about *within cohort changes* versus *across cohort changes* in the occurrence of protected income sensitive to whether we look at the entire population ages 63 to 65, versus just those who self-report being retired, versus just those whose earnings are below the Social Security earnings test threshold?

A simple approach to answering both questions is to run a series of linear probability models where the dependent variable is a dummy that reflects receipt of protected income, and the independent variable list and population restriction are systematically varied (table 1). There are three sets of two regressions each: the first set is for the entire population ages 63 to 65, the second is for those who self-report being retired, and the third is for those with earnings below the threshold. The first

COEFFICIENT ON	WHOLE POPULATION		RETIRED POPULATION		LOW-EARNER POPULATION	
Birth Cohort 1939 to 1946	-0.074***	-0.070***	-0.088***	-0.050***	-0.087***	-0.058***
Birth Cohort 1947 to 1953	-0.091***	-0.085***	-0.098***	-0.050***	-0.115***	-0.073***
Women		0.059***		0.044***		0.038***
Black		-0.031**		-0.027		-0.023
Hispanic		-0.076***		-0.021		-0.076***
Other Race or Ethnicity		-0.072**		-0.052		-0.082**
Some College or More		-0.001		0.006		0.002
Married or Partnered		0.093***		0.151***		0.137***
Income Quartile 2		0.244***		0.355***		0.378***
Income Quartile 3		0.239***		0.454***		0.485***
Income Quartile 4		0.177***		0.424***		0.385***
Wealth Quartile 2		0.088***		0.099***		0.094***
Wealth Quartile 3		0.133***		0.125***		0.095***
Wealth Quartile 4		0.048***		0.016		-0.049**
Constant	0.449***	0.129***	0.578***	0.107***	0.513***	0.124***
R-Squared	0.006	0.094	0.007	0.232	0.009	0.241
Degrees of Freedom	21,406	21,394	9,327	9,315	12,704	12,692

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 1. *Linear Probability Models, Occurrence of Protected Income at Ages 63 to 65*

regression in each set has only a constant and dummies for the two younger birth cohorts (so the 1931–38 birth cohort is the omitted group), while the second regression has those same cohort indicators along with all the control variables represented in figures 2a through 2f. The three pairs of regressions reinforce the conclusions in those figures, meaning (1) there are intuitive and (mostly) statistically significant differences in the occurrence of protected income across demographic and economic characteristics, and (2) the dummies show that the decline in the occurrence of protected income at ages 63 to 65 is only partially explained by demographics.

Inferences about any specific independent variable are suspect in these sorts of regressions because the demographic and economic characteristics are themselves highly correlated. With that proviso, the evidence does suggest that the economic variables generally dominate the demographic variables in terms of correlation with the occurrence of protected income—for example, residual differences by race/ethnicity are relatively small after controlling for income and wealth. However, the decrease in the coefficients on the two birth cohort dummies as we add the other controls within each of the three subpopulations suggests that, taken together, the

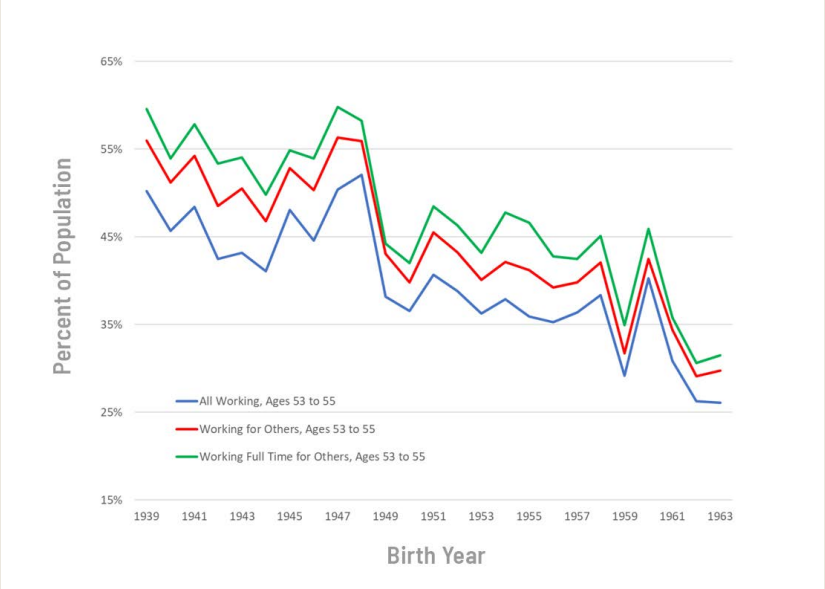

FIGURE 3. *Occurrence of Defined-Benefit Coverage at Ages 53 to 55 by Birth Year, 1939–63*

other controls do account for some of the decline in the overall occurrence of protected income at ages 63 to 65.

4B. EXPECTED PROTECTED INCOME AT PEAK EARNINGS AGES

The observed trends in the realized occurrence of protected income in retirement confirms the premise and basis for this study: fewer workers are entering retirement with a guaranteed stream of income for life. The time series on realized protected income ends with cohort birth year 1953, the group that reached age 65 in 2018, which is the last available HRS survey year. In this subsection (4B) we extend the time frame by considering expectations of protected income at ages 53 to 55, or what we refer to as peak earnings ages. The expectation of protected income is proxied by DB pension coverage. In addition to looking ahead to the prospects of protected income in retirement for those born through 1963, the analysis also shows that the decline in realized occurrence of protected income is precipitated by a decline in DB pension coverage.

The trends in DB pension coverage across birth cohorts 1939 through 1963 look a lot like the trends in realized protected income shown in figure 3. The trends in DB coverage are shown for three population subgroups. The base population is all HRS respondents ages 53 to 55 in a household where the respondent (or spouse if present) is working; the first subpopulation is those who are working for someone else (i.e., are not self-employed), and the narrowest population is those working full time for someone else. The three lines are close because most individuals live in a household where either they or their spouse works full time for someone else. The three lines in figure 3 all capture the dramatic decline in DB pension coverage that motivates this study. The fraction of workers covered by a DB pension at ages 53 to 55 fell by nearly 50 percent between the 1939 and 1963 birth cohorts.

Before disaggregating the trends in DB coverage by demographic and economic characteristics, it is interesting to explore how the patterns in figure 3 relate to the occurrence of protected income in figure 1. In terms of levels, roughly 35 percent to 45 percent of the early 1950s birth cohorts had DB coverage at ages 53 to 55 (figure 3), and the same fraction of those birth cohorts had realized protected income at ages 63 to 65 ten years later (figure 1). Both figures also show that the DB coverage rate and occurrence of protected income for the early

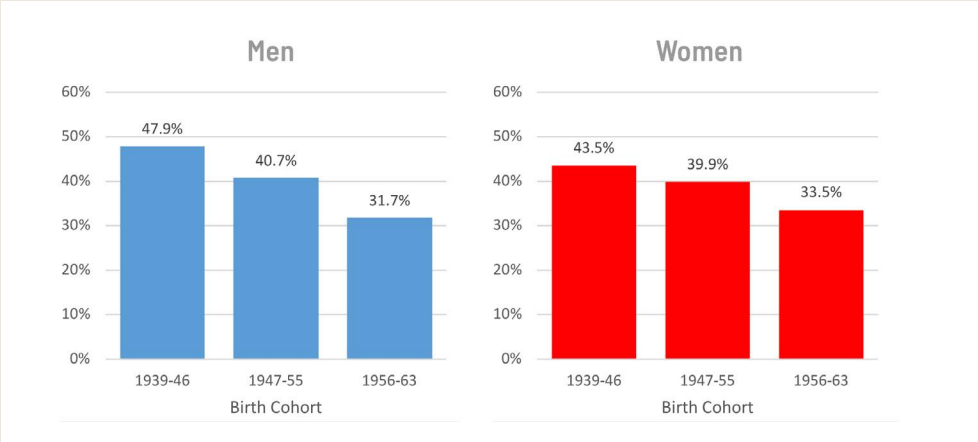

FIGURE 4A. *Defined-Benefit Plan Coverage at Ages 53 to 55 by Gender, 1939–63*

1950s cohorts were roughly 10 percentage points below the cohorts born in the late 1930s. Thus, there is a close correspondence between DB coverage at ages 53 to 55 and the realization of protected income at ages 63 to 65. Given that the decline in DB coverage continues for cohorts born between 1952 and 1963, we can project that the occurrence of protected income at ages 63 to 65 will continue to fall when those cohorts reach retirement age.

The decomposition by demographics (age, race/ethnicity, marital status, education) and economic characteristics (income and wealth quartiles) parallel the analysis from subsection 4A. As seen in subsection 4A, rather than show DB coverage at ages 53 to 55 by year of birth, we group the in-scope populations into those born between 1939 and 1946, those born between 1947 and 1955, and those born between 1956 and 1963. As with the decomposition of the occurrence of protected income at ages 63 to 65 in subsection 4A, the patterns of DB pension coverage across and within birth cohorts tells a clear and compelling story. Although there are stark differences in DB pension coverage across population subgroups, the decline in DB pension coverage within subgroups across birth year groups is ubiquitous.

DB pension coverage at ages 53 to 55 is roughly the same for men and for women, and is driven to a large extent by the decision here to consider an individual to be covered if they or their spouse has DB coverage (figure 4a).[8]

Women at ages 53 to 55 born in the early cohorts have lower DB coverage than men at the same ages, but that is reversed for the youngest group, born in the late 1950s and early 1960s. The relative gain for women is substantial—from nearly 5 percentage points lower than men to about 2 percentage points higher—and likely captures the decline in unionization and DB plans in occupations dominated by men. Still, the overwhelming takeaway is a decline in DB pension coverage across birth cohorts at ages 53 to 55 for both men and women.

Differences in reported DB coverage at ages 53 to 55 by race/ethnicity are less stark than differences in the occurrence of protected income at ages 63 to 65 for the same groups (figure 4b). The White non-Hispanic population has the highest rate of DB pension coverage in recent cohorts, but the evidence is more mixed for earlier years. These figures are for the entire working population at ages 53 to 55; so, for example, if the White non-Hispanic group has higher rates of self-employment, that will push down their coverage rates relative to the other race/ethnicity subgroups, because the self-employed are much less likely to have DB coverage.

There is no doubt that sampling variability and potential respondent misreporting of pension type could be playing a role in some of the subpopulation differences as well. Measuring the occurrence of protected income at ages 63 to 65 is more straightforward than measuring

8. Appendix table A2 shows that about 75 percent of HRS respondents are married or living with a partner, and for that group coverage is equal by construction.

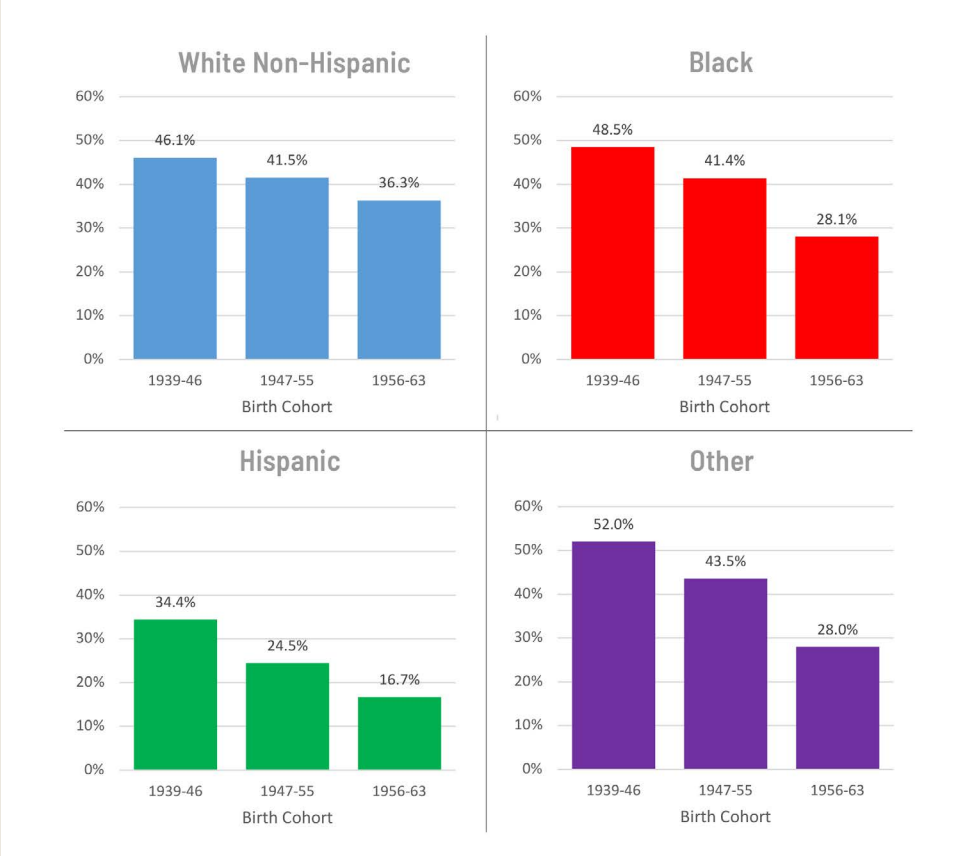

FIGURE 4B. *Defined-Benefit Plan Coverage at Ages 53 to 55 by Race/Ethnicity, 1939–63*

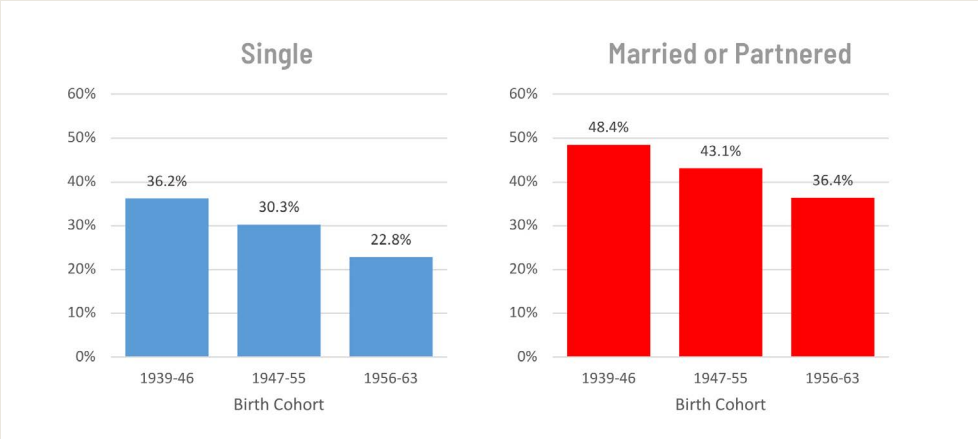

FIGURE 4C. *Defined-Benefit Plan Coverage at Ages 53 to 55 by Marital Status, 1939–63*

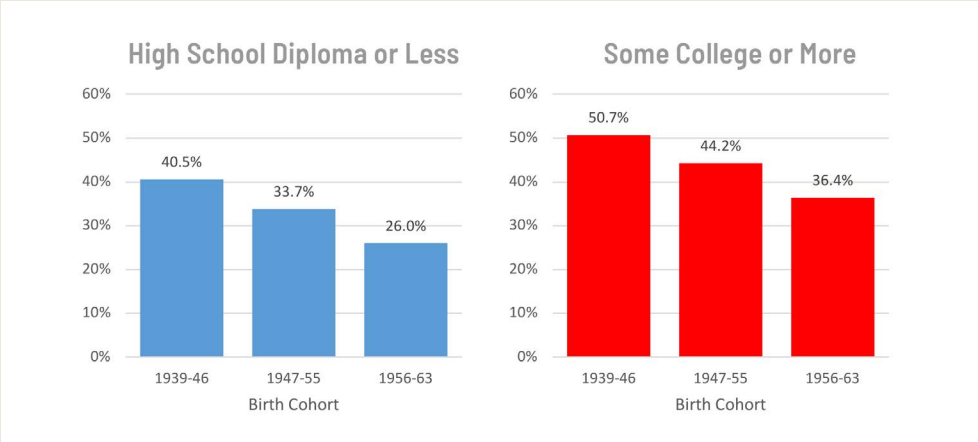

FIGURE 4D. *Defined-Benefit Plan Coverage at Ages 53 to 55 by Education, 1939–63*

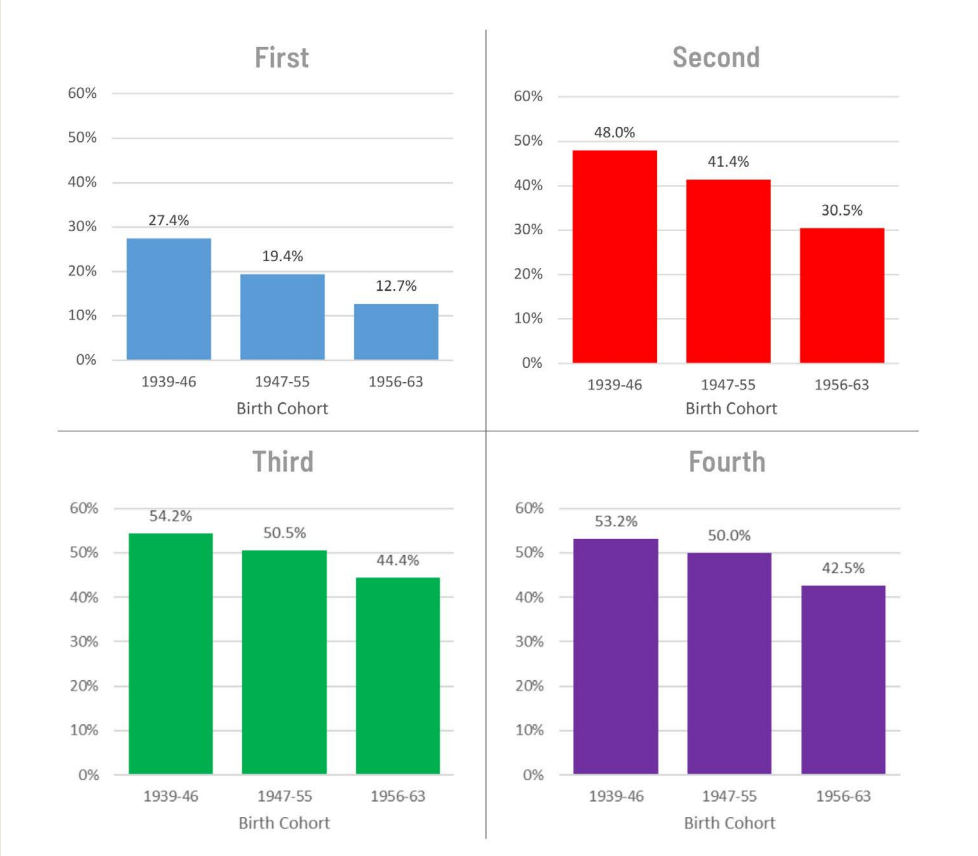

FIGURE 4E. *Defined-Benefit Plan Coverage at Ages 53 to 55 by Income Quartile, 1939–63*

FIGURE 4F. *Defined-Benefit Plan Coverage at Ages 53 to 55 by Wealth Quartile, 1939–63*

current job pension coverage by type, because respondents are sure about regular incomes. The HRS began in 1992, just as the shift from DB to DC pension coverage was gaining steam.

Differences in DB pension coverage at ages 53 to 55 by marital status (figure 4c) and education (figure 4d) largely mirror the differences in the occurrence of protected income across those groups at ages 63 to 65 shown in subsection 4A. Again, the gaps are consistent with expectations, and the key incremental information is that DB coverage has declined proportionally across the two sets of subpopulations.

Turning to the disaggregation by economic variables, the patterns of DB coverage at ages 53 to 55 by income quartile (figure 4e) and wealth quartile (figure 4f) look very similar to patterns of protected income receipt at ages 63 to 65 shown in subsection 4A. The classifiers here are income and wealth measured at ages 53 to 55, but the patterns across quartiles are largely the same. Again, there is a substantial decline in coverage across birth cohort groups within quartiles. The declines in the lower quartiles are most concerning, because those groups are much less likely to be offsetting the prospective decline in protected income by annuitizing wealth accumulated inside or outside of contributory retirement plans.

Finally, we implement a liner probability model for DB coverage at ages 53 to 55 that parallels the analysis in subsection 4A for receipt of protected income at ages 63 to 65 (table 2). The results are consistent with the findings for protected income, in the sense that the eco-

COEFFICIENT ON	WORKING POPULATION		WORKING FOR OTHERS		WORKING FULL TIME	
Birth Cohort 1939 to 1946	-0.054***	-0.058***	-0.066***	-0.072***	-0.068***	-0.076***
Birth Cohort 1947 to 1953	-0.130***	-0.128***	-0.154***	-0.155***	-0.161***	-0.166***
Women		0.009		0.008		0.018
Black		0.057***		0.049***		0.048***
Hispanic		-0.051***		-0.053***		-0.049**
Other Race/Ethnicity		-0.009		-0.014		-0.021
Some College or More		0.025**		0.023*		0.024*
Married or Partnered		0.120***		0.114***		0.117***
Income Quartile 2		0.169***		0.163***		0.152***
Income Quartile 3		0.262***		0.252***		0.238***
Income Quartile 4		0.259***		0.266***		0.256***
Wealth Quartile 2		0.079***		0.087***		0.087***
Wealth Quartile 3		0.071***		0.091***		0.094***
Wealth Quartile 4		0.039**		0.098***		0.113***
Constant	0.456***	0.127***	0.514***	0.172***	0.547***	0.195***
R-Squared	0.012	0.091	0.016	0.101	0.017	0.095
Degrees of Freedom	17,814	17,802	15,808	15,796	14,059	14,047

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 2. *Linear Probability Models, Occurrence of Define Benefit Coverage at Ages 53 to 55*

nomic variables dominate the demographic variables in terms of explaining levels of DB coverage, but the significant birth cohort dummies show there is a substantial trend unexplained by the other control variables. The one noticeable difference is that the coefficients on birth cohort dummies are largely the same in the second regression within each population subgroup, meaning population shifts are not driving the decline in DB pension coverage at ages 53 to 55.

5. WHAT FRACTION OF PRERETIREMENT EARNINGS IS PROTECTED?

The HRS-based cross-sectional analysis of the occurrence of protected income at ages 63 to 65 and DB coverage at ages 53 to 55 in section 4 paints a clear picture and reinforces the premise for this study. The nature of protected income in retirement is evolving, with cohorts born after 1945 realizing much lower occurrence of protected income at ages 63 to 65 than those born in

the early 1930s. Trends in DB pension coverage at ages 53 to 55 suggest that further declines in the occurrence of protected income are imminent for those born in the late 1950s and early 1960s, when they reach retirement age. The occurrence of protected income is a good starting point, but the more-relevant question is how these trends affect earnings *replacement* in retirement. In section 5 we investigate trends in the share of earnings replaced by protected income, and we consider how annuitizing accumulated retirement balances would affect replacement rates.

The strategy here is to construct a longitudinal sample of HRS respondents observed at both peak earnings and retirement ages, both of which are described in sections 2, 3, and 4. Our peak earnings group is individuals ages 53 to 55 and includes birth cohorts 1939 through 1963. Our retirement group is those ages 63 to 65 and includes birth cohorts 1931 through 1953. The longitudinal sample includes the overlapping cohorts in those two samples, born between 1939 and 1953, which gives us a relatively short window of 15 birth years over which to study trends. Thus, the time series analysis is somewhat limited, but we show there is further evidence of a changing protected income landscape even over that window. In addition, we can also look within this group to study differences in replacement rates across subpopulations and investigate the potential impact of annuitizing accumulated retirement balances.

Although retirement planners like to describe rules of thumb such as "replace 70 percent of your preretirement earnings," there is in fact no one-size-fits-all replacement-rate target. Indeed, it is not even clear what measure of earnings should be replaced. First, the relationship between before-tax and after-tax income often changes dramatically at retirement because effective tax rates decline. Second, retirees are generally not focused on additional saving out of current cash flow, so they can have the same spending with low cash inflows. Finally, other factors such as decreased need to financially support dependent children also suggest that a fixed percentage preretirement gross earnings benchmark may be inappropriate for many or most retirees.

There is no one-size-fits-all measure of replacement rates, so the very simple approach here involves measuring the ratio of protected income in retirement (at ages 63 to 65) relative to earnings ten years earlier (ages 53 to 55) for everyone in the sample. As before, all flows and wealth measures are per capita. And again, although the variable construction uses household level information, the statistics themselves are for individuals. Unlike the previous analysis where all economic measures are relative (e.g., the quartile position within one's birth cohort), the statistics here require inflation adjustment, which we implement using CPI-U.

There are two more analytical decisions in the replacement-rate analysis that merit further discussion. First, the computed statistics themselves are intentionally very simple. Rather than attempt to characterize the entire distribution of replacement rates, we focus on the fraction of a given group or cohort (birth year cohort, demographic group, or economic group) that crosses various replacement-rate thresholds. Specifically, we first compute the fraction of respondents for whom protected income at ages 63 to 65 is 50 percent or more of their earnings at ages 53 to 55, then we compute the fraction for whom the ratio exceeds 75 percent. These two high-level statistics likely bracket the outcomes of interest without requiring resolution of measurement errors in either the earnings or protected income measures. Measurement errors in both numerator and denominator of ratio statistics are particularly problematic for the tails of the distribution, and the 50 percent and 75 percent replacement-rate threshold measures are less sensitive.

The second issue is Social Security. Most individuals in our retirement age sample receive Social Security benefits, because of age or disability, as a worker, spouse, or survivor. Indeed, the incomes of most retirees are dominated by Social Security, which is arguably the most protected of all protected income streams. Furthermore, any distributional analysis of protected income replacement rates should account for the fact that Social Security is lifetime redistributive because all workers pay the same tax rate (up to the Social Security taxable maximum) but benefits relative to average lifetime earnings are declining in lifetime earnings. Indeed, most low- and middle-earners have very high replacement rates based on Social Security alone. Thus, for both the 50 percent and 75 percent statistics, we look at the fraction crossing the replacement-rate thresholds based on Social Security alone, and then the fraction from Social Security and other forms of protected income.

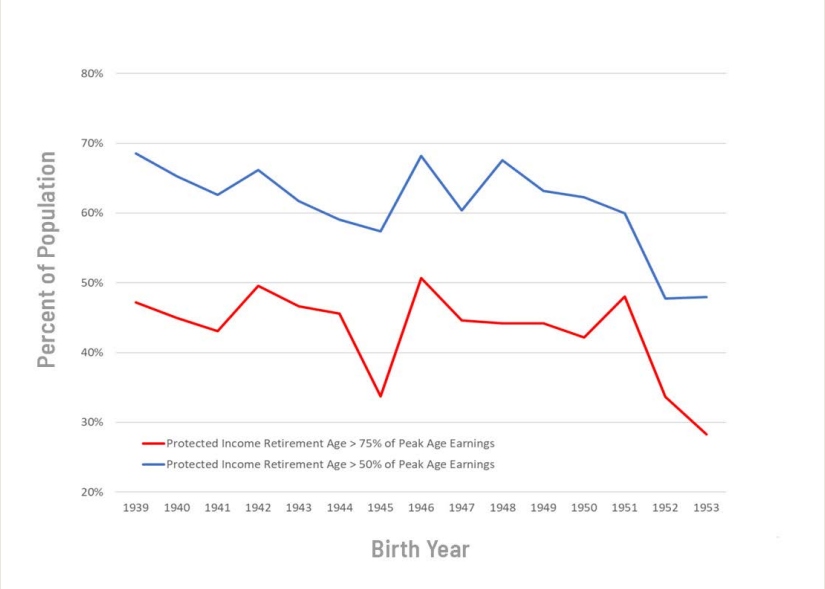

FIGURE 5. *Threshold Analysis of Protected Income to Peak Earnings, by Birth Year, 1939–53*

As before, we begin with trend analysis of retirement age protected income relative to peak age earnings across birth cohorts (figure 5). Although the time series is now much shorter because of the longitudinal sample limitations, there is some evidence that protected income is becoming smaller relative to earnings over time. In the first part of the sample, for those born in 1939 to 1940, the fraction with more than 50 percent of earnings replaced by protected income averaged about 65 percent, while the fraction in the 50 percent or higher replacement category fell to 60 percent or less for those born in the early 1950s. The trend for the 75 percent or higher replacement-rate group is perhaps more difficult to discern because of sampling variability, but the rate is still declining. The overall fraction with protected income greater than or equal to 75 percent of peak age earnings drops from about 50 percent at the beginning of the sample to below 40 percent by the end of the (admittedly very limited) birth cohort time series.

Although the longitudinal sample is limited from a time-series dimension, the same rich demographics available in the cross sections are useful for a deeper dive into the role of protected income in retirement. For the entire sample of HRS respondents born between 1939 and 1953, the fraction of respondents with protected income at ages 63 to 65 replacing 75 percent or more of their earnings at ages 53 to 55 is 43.0 percent (table 3). The fraction with protected income replacing 50 percent or more peak age earnings was much higher, at 60.8 percent. As discussed in section 3, these fractions are for the (longitudinal) subpopulation in which the respondent (or their spouse, if present) was working at peak earnings age (53 to 55), and in the low-wage group (earnings below the Social Security retirement earnings test threshold) at retirement ages 63 to 65. Of course, a narrower construction of the retired subpopulation would increase the fractions crossing the replacement thresholds.

The replacement-rate analysis in table 3 has two key dimensions for both the 50 percent and the 75 percent threshold statistics. First, we report the summary statistics (fraction crossing each threshold) by the same demographic and economic characteristics used in section 4, where the numerator in the replacement rate is all protected income, meaning Social Security plus pensions and annuities. We also report the same statistics for the 50 percent and the 75 percent thresholds across population subgroups using Social Security alone, which makes

	75% or Higher Peak Age Earnings Replacement from . . .		50% or Higher Peak Age Earnings Replacement from . . .	
Population Group	Social Security Plus Pensions and Annuities	Social Security Alone	Social Security Plus Pensions and Annuities	Social Security Alone
Total Population	43.0%	27.7%	60.8%	40.2%
Men	39.3%	24.1%	55.4%	34.6%
Women	45.7%	30.2%	64.7%	44.2%
White Non-Hispanic	43.0%	26.8%	61.2%	39.3%
Black	40.4%	26.2%	57.8%	39.5%
Hispanic	44.2%	36.6%	60.4%	49.7%
Other	45.9%	31.3%	58.9%	43.0%
Singles	45.0%	31.8%	62.1%	44.3%
Married or Partnered	41.8%	25.2%	59.8%	37.5%
High School Diploma or Less	47.2%	34.7%	66.2%	50.3%
Some College or More	39.3%	21.3%	55.9%	31.1%
First Earnings Quartile	85.7%	82.5%	88.3%	86.0%
Second Earnings Quartile	43.6%	25.3%	68.6%	55.6%
Third Earnings Quartile	27.7%	2.1%	54.5%	17.5%
Fourth Earnings Quartile	14.6%	0.0%	31.5%	0.6%
First Wealth Quartile	49.9%	41.9%	66.1%	56.4%
Second Wealth Quartile	43.9%	24.3%	66.5%	41.4%
Third Wealth Quartile	37.9%	19.1%	56.6%	31.5%
Fourth Wealth Quartile	40.2%	25.2%	54.0%	31.4%

TABLE 3. *Detailed Age 63 to 65 Protected Income Relative to Age 53 to 55 Earnings*

it possible to infer the incremental effect of income from DB pensions or other (usually purchased) annuities. Social Security alone pushes 27.7 percent of the longitudinal sample above the 75 percent replacement-rate threshold, and thus 43.0 – 27.7 = 15.3 percent are incrementally pushed above the 75 percent replacement-rate threshold by pensions and annuities. Similarly, 40.2 percent of respondents are above 50 percent replacement based on just Social Security, and the incremental effect of pensions and annuities is 20.6 percentage points.

The interaction between Social Security and other forms of protected income across the various characteristics is a key part of the story because of the progressive nature of Social Security. For example, a larger proportion of women cross the 50 percent and 75 percent replacement-rate thresholds using either Social Security alone or comprehensive protected income measures, but the incremental effects of pension and annuities are the same for men and women. This is likely because women's peak earnings are generally below men's peak earn-

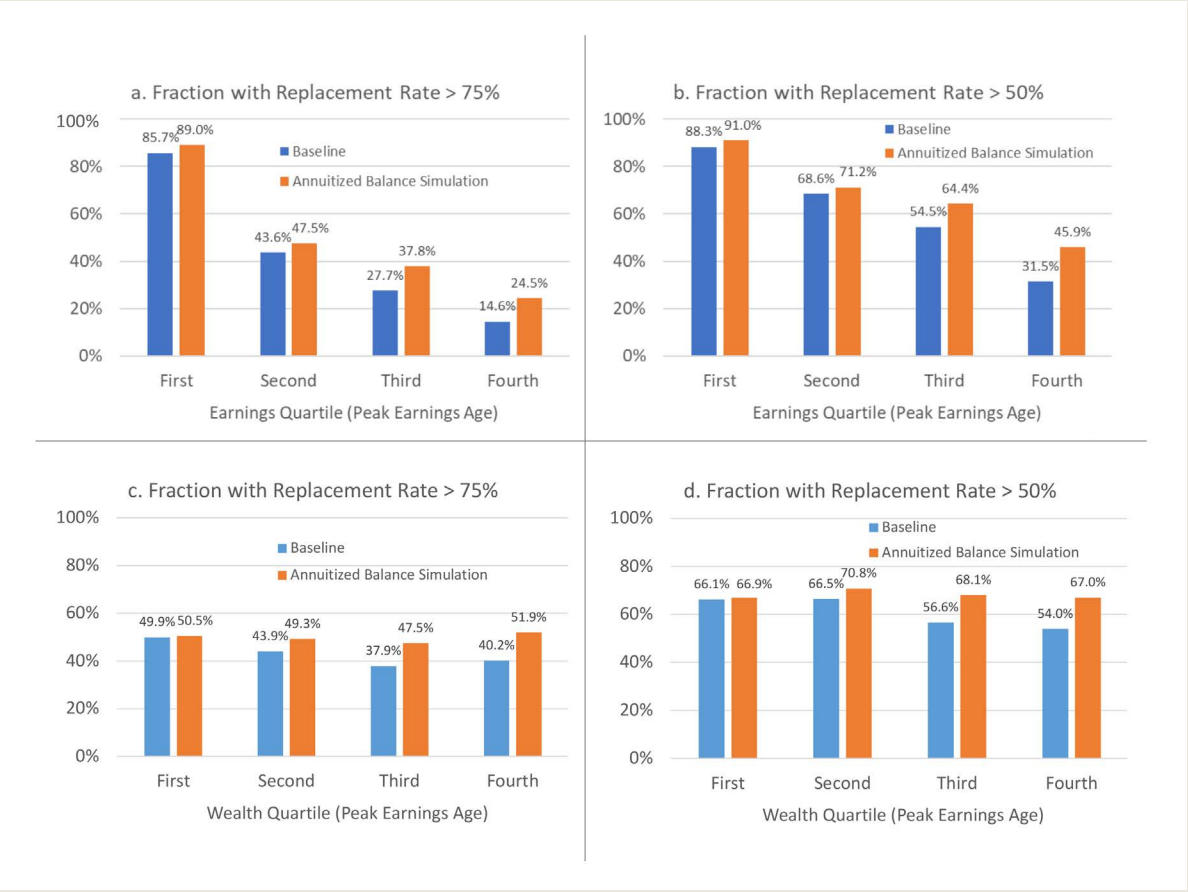

FIGURE 6. *Effect of Annuitizing Individual Retirement Account and Defined-Contribution Balances, by Earnings and Wealth Quartile*

ings, and thus Social Security benefits generally replace a higher fraction of women's earnings.

The replacement statistics across other demographic subpopulations tell an even more nuanced story. For example, by race/ethnicity, the White non-Hispanic and Black subpopulations have roughly the same fraction above the 50 percent and 75 percent replacement-rate thresholds based on Social Security alone (39 percent and 26 percent for the two thresholds, respectively), but roughly 3 percent more White non-Hispanics are incrementally lifted over the thresholds by pensions and annuity incomes, consistent with their higher occurrence of protected income in retirement (figure 2b). Other factors could be at play in terms of Social Security; perhaps differences in earnings (as for men versus women) are offset by differences in spousal and survivor benefits. Similarly, differences by marital status and education reflect a mixture of potentially offsetting forces, where lower peak age earnings make it easier for Social Security to replace 50 percent or 75 percent of those earnings, but the incremental effect of pensions and annuities is more modest.

Differences in the replacement-rate summary statistics by (peak earnings age) earnings quartile are the cleanest examples of how Social Security and other forms of protected income interact across the earnings distribution. In the first earnings quartile, the vast majority (88.3 percent) have levels of protected income in retirement that exceed 50 percent of their (by construction, low) earnings at peak earnings age. Indeed, the vast majority of the replacement rates above 50 percent also have replacement rates above 75 percent (85.7 / 88.3 = 97.1 percent). These are not unexpected, given what

we know about Social Security, and the Social Security Alone columns in table 3 confirm this. The incremental effect of pensions and annuities is only a few percentage points in the lowest earnings quartile. The exact opposite holds in the top half of the earnings distribution. Social Security alone is unable to raise retirees above the replacement-rate thresholds, but pensions and annuities have a much bigger impact.

The patterns of replacement rates by income and wealth quartile motivate a final (and very simple) thought experiment (figure 6). The experiment starts with a basic observation: although the incremental effect of pensions and annuities in lifting individuals above the 50 percent and 75 percent replacement-rate thresholds is much higher in the top half of the earnings and wealth distributions, the overall fractions (based on Social Security plus pensions and annuities) crossing the lines are lower for top wealth groups and much lower for top earnings groups. Figure 6 answers the question, "What if individuals annuitized their accumulated retirement account balances and added those flows to their protected income streams?"[9] As expected, the annuitization effects are quite large for the wealthy, nearly equalizing the replacement-rate statistics by wealth quartile and mitigating much of the drop in the fraction crossing the replacement-rate thresholds by earnings quartile.

CONCLUSIONS

Well-documented trends in employer-sponsored pension plans have led to much discussion and research on retirement adequacy. This paper focuses on a subtheme within the general literature on retirement preparedness: Beyond just worrying about the overall distribution of wealth as individuals approach retirement, the focus here is on *protected* income, meaning the ability of retirement plans (in conjunction with Social Security) to provide a steady stream of income for retirees for the remainder of their lives. We use a rich longitudinal data set—the HRS—to analyze the occurrence of protected income and DB pension coverage across and within birth cohorts. We also use the data to compute high-level replacement-rate statistics that compare levels of protected income in retirement to a measure of earnings earlier in the life cycle.

There are several takeaways. First, given what we know about trends in pension coverage, we expect and observe a decline in the occurrence of protected income at retirement (ages 63 to 65) across cohorts born between 1931 and 1953. Second, there is a corresponding decline in the expectation of protected income (proxied by DB pension coverage) at peak earnings age (ages 53 to 55) for those born between 1939 and 1963. Third, although there are systematic (and intuitive) differences in the occurrence of protected income and DB coverage across population subgroups within birth cohorts, the trend declines are not attributable to population shifts. Fourth, a linked-sample comparison of protected incomes in retirement to earnings at peak earnings age shows that typical replacement rates are between 50 percent and 75 percent, though again there is substantial variation across population subgroups, many of which are due to the interaction of Social Security and other forms of protected income.

The final contribution is more of a thought experiment than a statistic per se: Given that higher-earnings individuals have less of their income replaced by Social Security, it is expected that they should (and we know they do) participate more actively in employer pension plans. The shift from DB to DC that motivates this study is leaving successive cohorts of retirees with higher retirement account balances but less protected income. The thought experiment shows that annuitization of those incremental retirement account balances could go a long way toward balancing replacement-rate outcomes across the population. The bottom half of the earnings and wealth distribution see relatively high replacement rates because of Social Security, but top earners and wealth holders could achieve the same outcomes through increased annuitization.

9. The thought experiment simply multiplies individual retirement account (IRA) and DC account balances by 6 percent, which is roughly the annual payout from an annuity for individuals at ages 63 to 65. There is a myriad of ways one could construct the alternative replacement rate statistics; for example, one could include other financial assets, and not just IRAs and DC plans. Also, the HRS RAND longitudinal file is a work in progress in this regard because the full reconciliation and imputation of DC retirement account balances is on the agenda for the RAND team in 2022. That will push the alternative replacement rates up at the top of the earnings and wealth distributions, and perhaps by quite a lot.

AUTHOR

John Sabelhaus is nonresident Senior Fellow at the Brookings Institution, Washington DC, and adjunct associate research professor at the University of Michigan. Email: jsabelhaus@gmail.com. Web: www.johnsabelhaus.com.

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APPENDIX

	COHORT BIRTH YEAR		
	1931–38	1939–46	1947–53
Total Population Ages 63 to 65			
Fraction with Protected Income	44.9%	37.5%	35.7%
BY WORK STATUS			
Self-Reported Retired Population Ages 63 to 65			
Percent of Total Population Ages 63 to 65	41%	44%	46%
Fraction with Protected Income	57.8%	49.0%	48.0%
Population Ages 63 to 65, Earnings Below Threshold			
Percent of Total Population Ages 63 to 65	61%	56%	52%
Fraction with Protected Income	51.3%	42.7%	39.9%
BY GENDER			
Men			
Percent of Total Population Ages 63 to 65	46%	48%	46%
Fraction with Protected Income	43.0%	36.8%	32.9%
Women			
Percent of Total Population Ages 63 to 65	54%	52%	54%
Fraction with Protected Income	46.5%	38.1%	38.2%
BY RACE/ETHNICITY			
White Non-Hispanic			
Percent of Total Population Ages 63 to 65	82%	80%	78%
Fraction with Protected Income	47.6%	39.9%	39.4%
Black			
Percent of Total Population Ages 63 to 65	9%	9%	10%
Fraction with Protected Income	35.8%	29.0%	25.0%
Hispanic			
Percent of Total Population Ages 63 to 65	6%	8%	9%
Fraction with Protected Income	26.4%	24.0%	20.4%
Other			
Percent of Total Population Ages 63 to 65	2%	3%	3%
Fraction with Protected Income	32.6%	36.1%	24.4%
BY SINGLE VS. MARRIED OR PARTNERED			
Single			
Percent of Total Population Ages 63 to 65	30%	31%	33%
Fraction with Protected Income	32.8%	29.0%	26.9%
Married or Partnered			
Percent of Total Population Ages 63 to 65	70%	69%	67%
Fraction with Protected Income	50.0%	41.3%	40.1%

TABLE A1. *Characteristics and Protected Income, Ages 63 to 65, by Birth Cohort*

	COHORT BIRTH YEAR		
	1931–38	1939–46	1947–53
BY EDUCATION			
High School Diploma or Less			
Percent of Total Population Ages 63 to 65	62%	52%	38%
Fraction with Protected Income	43.9%	35.7%	30.0%
Some College or More			
Percent of Total Population Ages 63 to 65	38%	48%	62%
Fraction with Protected Income	46.5%	39.4%	39.2%
BY PER CAPITA INCOME QUARTILE			
First Quartile			
Percent of Total Population Ages 63 to 65	25%	25%	25%
Fraction with Protected Income	25.0%	17.3%	14.7%
Second Quartile			
Percent of Total Population Ages 63 to 65	25%	25%	25%
Fraction with Protected Income	55.4%	46.2%	43.7%
Third Quartile			
Percent of Total Population Ages 63 to 65	25%	25%	26%
Fraction with Protected Income	54.5%	48.3%	43.8%
Fourth Quartile			
Percent of Total Population Ages 63 to 65	25%	25%	25%
Fraction with Protected Income	44.6%	38.4%	40.8%
BY PER CAPITA WEALTH QUARTILE			
First Quartile			
Percent of Total Population Ages 63 to 65	25%	25%	25%
Fraction with Protected Income	28.2%	25.2%	20.9%
Second Quartile			
Percent of Total Population Ages 63 to 65	25%	25%	25%
Fraction with Protected Income	49.7%	41.2%	37.3%
Third Quartile			
Percent of Total Population Ages 63 to 65	25%	25%	25%
Fraction with Protected Income	56.7%	46.2%	45.8%
Fourth Quartile			
Percent of Total Population Ages 63 to 65	25%	25%	24%
Fraction with Protected Income	45.0%	37.4%	39.3%

TABLE A1. *Characteristics and Protected Income, Ages 63 to 65, by Birth Cohort (Cont.)*

	COHORT BIRTH YEAR		
	1939–46	1947–55	1956–63
Working Population Ages 53 to 55			
Fraction with DB Coverage	45.6%	40.3%	32.7%
BY WORK STATUS			
Working for Others Population Ages 53 to 55			
Percent of Working Population Ages 53 to 55	88%	89%	89%
Fraction with DB Coverage	51.4%	44.8%	36.0%
Working Full Time for Others Population Ages 53 to 55			
Percent of Working Population Ages 53 to 55	79%	80%	80%
Fraction with DB Coverage	54.7%	47.9%	38.6%
BY GENDER			
Men			
Percent of Working Population Ages 53 to 55	49%	45%	47%
Fraction with DB Coverage	47.9%	40.7%	31.7%
Women			
Percent of Working Population Ages 53 to 55	51%	55%	53%
Fraction with DB Coverage	43.5%	39.9%	33.5%
BY RACE/ETHNICITY			
White Non-Hispanic			
Percent of Working Population Ages 53 to 55	83%	80%	71%
Fraction with DB Coverage	46.1%	41.5%	36.3%
Black			
Percent of Working Population Ages 53 to 55	8%	8%	10%
Fraction with DB Coverage	48.5%	41.4%	28.1%
Hispanic			
Percent of Working Population Ages 53 to 55	7%	8%	11%
Fraction with DB Coverage	34.4%	24.5%	16.7%
Other			
Percent of Working Population Ages 53 to 55	3%	4%	8%
Fraction with DB Coverage	52.0%	43.5%	28.0%
BY SINGLE VS. MARRIED OR PARTNERED			
Singles			
Percent of Working Population Ages 53 to 55	23%	22%	27%
Fraction with DB Coverage	36.2%	30.3%	22.8%
Married and Partnered			
Percent of Working Population Ages 53 to 55	77%	78%	73%
Fraction with DB Coverage	48.4%	43.1%	36.4%

TABLE A2. *Characteristics and DB Coverage, Ages 53 to 55, by Birth Cohort*

	COHORT BIRTH YEAR		
	1939–46	1947–55	1956–63
BY EDUCATION			
High School Diploma or Less			
Percent of Working Population Ages 53 to 55	50%	38%	36%
Fraction with DB Coverage	40.5%	33.7%	26.0%
Some College or More			
Percent of Working Population Ages 53 to 55	50%	62%	64%
Fraction with DB Coverage	50.7%	44.2%	36.4%
BY PER CAPITA INCOME QUARTILE			
First Quartile			
Percent of Working Population Ages 53 to 55	25%	25%	25%
Fraction with DB Coverage	27.4%	19.4%	12.7%
Second Quartile			
Percent of Working Population Ages 53 to 55	24%	25%	25%
Fraction with DB Coverage	48.0%	41.4%	30.5%
Third Quartile			
Percent of Working Population Ages 53 to 55	25%	25%	25%
Fraction with DB Coverage	54.2%	50.5%	44.4%
Fourth Quartile			
Percent of Working Population Ages 53 to 55	25%	25%	25%
Fraction with DB Coverage	53.2%	50.0%	42.5%
BY PER CAPITA WEALTH QUARTILE			
First Quartile			
Percent of Working Population Ages 53 to 55	25%	25%	25%
Fraction with DB Coverage	32.0%	25.9%	19.4%
Second Quartile			
Percent of Working Population Ages 53 to 55	25%	25%	25%
Fraction with DB Coverage	52.8%	43.3%	31.3%
Third Quartile			
Percent of Working Population Ages 53 to 55	25%	25%	24%
Fraction with DB Coverage	51.8%	47.1%	37.6%
Fourth Quartile			
Percent of Working Population Ages 53 to 55	25%	25%	25%
Fraction with DB Coverage	46.1%	44.6%	42.5%

TABLE A2. *Characteristics and DB Coverage, Ages 53 to 55, by Birth Cohort (Cont.)*