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Work and Retirement of Older Black and Hispanic Adults

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Abstract

Growing U.S. income inequality and the aging of Black and Hispanic populations point to greater risks of financial insecurity for older populations in coming years. Research on retirement determinants for Blacks and Hispanics is limited. Using data from the Health and Retirement Study, we analyze retirement determinants for Blacks and Hispanics. We link this data to the Working Trajectories file and restricted SSA individual-level files to determine Social Security wealth by race and ethnic origin. Using sociodemographic, health, and economic covariates, we construct a conditional probit model that identifies the probability a given individual will retire from the workforce over time. We find that Hispanics, Blacks, and non-Hispanic whites respond similarly to Social Security, private pension incentives, and other institutional (e.g., health insurance) influences on retirement. In their retirement decisions, non-Hispanic Blacks are not responsive to some sociodemographic characteristics (male, couple, and number of household members), but they are responsive to physical and mental health problems. Hispanics are less responsive than non-Hispanic whites to most sociodemographic characteristics (male, education, and couple) and mental health problems in their retirement decisions. Our findings for non-Hispanic whites are consistent with previous literature. Our research can inform programs and policies to improve the quality of life for older adults, especially those isolated by cultural, economic, educational, or other barriers.

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Introduction

Blacks and Hispanics combined will nearly double as a proportion of the U.S. population 65 and older by 2050 (United States Census Bureau 2018). Given their higher poverty rates, this growth may pose increasing challenges for income security and retirement financial preparedness among older adults (Flores and Radford 2017). Blacks and Hispanics have also been disproportionately affected by the nation’s increasing income inequality, a result of the decreasing proportion of middle-income households generated by the rapid automation of mid-skilled jobs and the growing prosperity of high-income households (Goos et al. 2014; Horowitz et al. 2020). The large proportions of Blacks and Hispanics in the lowest-income strata who, because of their lower levels of educational attainment, work low-paying jobs with few benefits (Tali et al. 2018) and increasingly face labor market competition from former middle-income workers who now seek lower-income jobs (Acemoglu and Autor 2011; Goos et al. 2014).

Because labor market opportunities diminish as one ages (Billett et al. 2011; Johnson and Neumark 1996; Roscigno et al. 2007), the financial insecurity of older Black and Hispanic adults may be particularly high. Indeed, among U.S. households headed by persons 30 to 59 years of age, the proportion “at risk” for old-age financial insolvency increased from 44% in 2007 to 50% in 2016, with Hispanics and Blacks most at risk (Munnell et al. 2018).

In this paper, we examine work and retirement incentives among Blacks and Hispanics. To do so, we use the Health and Retirement Study (HRS) data from 2000 to 2018. The HRS is a nationally representative biennial panel survey of individuals 50 or older, with oversamples of Blacks and Hispanics. We link HRS data with Social Security Administration (SSA) records as well as the Working Trajectories data that trace HRS respondents' monthly employment statuses to calculate Social Security wealth and retirement incentives. In doing so, we account for respondents' distinct earnings histories and gaps in their employment histories.

Despite their disadvantaged position, research on retirement determinants for Blacks and Hispanics is limited. Previous research on retirement determinants mainly applies to non-Hispanic whites and may not apply equally to Blacks or Hispanics, particularly those of lower income or education. This project fills research gaps on retirement patterns and determinants for older Blacks and Hispanics of lower income and education. The rapid aging of the population, particularly among Hispanics and Blacks, and increasing poverty in old age makes this topic relevant and timely.

Data

We draw our data from the HRS, a nationally representative biennial panel survey of older adults fielded with oversamples of Hispanics and Blacks. The RAND HRS, which we use, includes variables on income, wealth, family transfers, occupation, health, health care use, health insurance, receipt of Supplemental Security Income (SSI) and Social Security Disability Insurance benefits, and receipt of Social Security benefits. We analyze data of the 10 waves from 2000 to 2018 for respondents 50 to 80 years old to understand retirement patterns of lower income older adults.

To compute Social Security wealth and the peak value retirement incentives based on realistic work trajectories of HRS respondents, we link, wherever possible,[1] RAND HRS data to past earnings records using *Social Security Administration data* and the *Working Trajectories file.* The *Social Security Administration (SSA) data* includes past records of earnings of both salaried- and self-employed individuals, as well as the SSA-designated monthly earnings caps for each year needed to calculate respondents' average indexed monthly earnings (AIME; i.e., one of the key components to calculate the Social Security retirement benefits). The *Working Trajectories data* includes information on HRS respondents' individual-level monthly labor statuses from 1992 to 2016.

The HRS from 2000 to 2018 included 6,545 Hispanic, 9,283 non-Hispanic Black, and 39,297 non-Hispanic white respondents. Among the 6,545 Hispanic individuals, we found earnings histories through HRS-SSA linkages for 3,427 respondents (52.4%) and imputed earnings for 3,118 (47.6%). Among the 9,283 non-Hispanic Black individuals, we found earnings histories for 5,528 (59.6%) through HRS-SSA linkages and imputed earnings for 3,755 (40.4%). For the 39,297 non-Hispanic whites, we found earnings histories for 29,908 (76.1%) through HRS-SSA linkages and imputed past earnings for 9,389 (23.9%). After excluding from our sample those who were outside the age bracket of 50 to 80, who were not working in 2000, who had no follow-up after initial participation, or who had missing covariates, our sample consisted of 4,497 Hispanics,

[1] Not everyone's past earnings records are available through the SSA administrative data. For instance, foreign nationals and undocumented workers will be missing the earnings records through the SSA data regardless of their past contributions to Social Security.

6,757 non-Hispanic Blacks, and 30,665 non-Hispanic whites. We provide further information on sample selection in the **Appendix**. We ensured that everyone in the final sample had monthly labor statuses between 2000 and 2018—either provided by the Work Trajectories file or imputed as described in the **Appendix**.

Measures

Outcome variable

Our outcome variable is a dummy variable that classifies individuals as working full- or part-time (1) or retired (0) as follows:

$$R_t = \begin{cases} 0 \text{ if working in t and t + 1} \\ 1 \text{ if working in t and fully retired in t + 1} \end{cases} \qquad \textbf{(1)}$$

Hence, we compare those who worked in all survey waves (=0) with those who reported working in the current wave and retiring by the following wave (=1). Once an individual retires in *t+1*, we assume he stays so and mark subsequent waves on this indicator as missing. We identify as fully retired respondents who self-report their labor status as retired and have zero salary income while excluding those who report being disabled, unemployed, or out of the labor force (for reasons other than retirement).

Social Security wealth

We determine respondents' Social Security benefits from lifetime salary earnings, work trajectories (including number of months worked per year or gaps in employment), survival probabilities, and age at retirement (U.S. Social Security Administration 2019b). We calculated each respondent's Social Security benefits by taking the following steps.

First, we obtained the *past annual earnings* for sample respondents from age 25 onward. For respondents with HRS-SSA linkages, we used SSA records of past earnings. For individuals with missing HRS-SSA linkages, as well as for HRS respondents whose labor statuses were shown as working but whose earnings were incorrectly recorded as zero or negative, we imputed past annual earnings. We used a multiple imputation technique that involved iterative stochastic imputation strategies. This method allowed for imputation of zero as a possible value and imputation of earnings brackets used in the surveys to recover nonresponse (Wong and Espinoza 2015). We used age, sex, race, cohort, and education covariates for imputations conducted separately by racial group. In the multiple imputation technique, we used overall distributions of the observed data to estimate multiple imputation values, accounting for the uncertainty around the true earnings value that was missing (Johnson and Young 2011; White et al. 2011). We generated five multiple imputations of earnings for each person-year observation, and set the median of the five imputations as the value to be used for estimating individuals' Social Security wealth (Lokupitiya et al. 2006; Ni et al. 2005; K. White et al. 2018). If the imputed value of earnings was (a) equal to or below zero or (b) above the 99th percentile of the unimputed earnings distribution in the SSA-HRS linked records for each year, we re-imputed the earnings. We repeated this re-imputation process 26 times. Our ultimate earnings distribution was similar to that reported for those with HRS-SSA linked earnings. We provide further details on our imputation procedures in the Appendix.

We imputed *future annual earnings* (i.e., projected earnings past 2017) of respondents by assuming their earnings would increase 1% every year until they reached the maximum age (T) of 120. While the approximation method used for the future annual earnings is a commonly used strategy in the pension literature (e.g., Coile and Gruber 2001, 2007), it assumes that all respondents work continuously in their lifetime. We acknowledge that individuals often encounter truncations in their work histories and therefore applied to future imputed earnings distinct patterns of employment for individuals. Specifically, we counted the number of months the respondents worked between 1992 and 2016 using the *Work Trajectory data*, and imputed the future monthly work statuses so that the same number of working months observed in 1992 to 2016 were assigned randomly to every 24-year timeframe.[2] For example, if an individual works only 144 months (50%) of the 288 months from 1992 to 2016, we assume the individual will work for a random 144 months of every 288 months beyond 2016. We describe these imputations further in the Appendix.

Based on these imputations, we calculated the *number of working months per year for each year beyond 2016 until individuals reached age 120*. The imputed future working months, which closely reflected the unique work trajectories of the respondents (during the observed period between 1992 and 2016), were applied to the *future annual earnings*. If a respondent was expected to work only 6 months out of 12 in 2030, the projected annual earnings for 2030 was halved to reflect his work trajectories.

Following the approximation of the past (pre-1992) and projected (post-2016) annual earnings, we adjusted respondents' lifetime earnings by the yearly National

[2] Of note, respondents' past earnings prior to 1992 (i.e., the year of the first HRS survey) were based on the actual records from the SSA. These records already reflected any truncation in respondents' work histories. For instance, if an individual worked only for five months in one year, the total income reported for the year was a sum of the earnings for those five months. Because the work histories are accurately reflected in the past earnings for the respondents, we did not apply our newly identified work trajectories to respondents' past earnings. Please see the Appendix for detailed explanations.

Average Wage Indices — which serves as the annual earnings cap (U.S. Social Security Administration 2019a). As a result, even when an individual earned above the cap in a year, we recognize in our calculations only earnings up to the indexed cap. This is the first key redistributive feature of the Social Security formula. It ensures that high-income earners do not claim extremely high Social Security benefits relative to those earning below the indexed cap. For simplicity, we excluded any cost-of-living adjustments to which recipients were entitled.

From capped annual salaries that respondents earned across their entire lifetime, we selected the highest-earning 35 years. We then calculated each respondent's AIME by dividing the sum of his highest 35 annual earnings by 420 (i.e., the number of months in 35 years). The common denominator of 420 months ensures that individuals with truncated work trajectories (e.g., individuals who do not work for the full 12 months in some years) receive lower Social Security benefits than their counterparts.[3]

Once we computed the AIME for each respondent, we used a nonlinear function to estimate Social Security benefits an individual would receive should she retire and begin receiving retirement benefits at her full retirement age. This is also known as the *Primary Insurance Amount* (PIA). The nonlinear function sums three separate percentages of portions of the AIME predetermined by the Social Security

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[3] We accounted for employment gaps in individuals' work histories in the AIME calculation. For instance, if individual A constantly worked for fewer months each year than individual B, then A's AIME — calculated by dividing the indexed sum of 35 highest annual earnings by the same denominator, (35 years x 12 months) — was smaller than B's.

Administration to estimate an individual's PIA.[4] These separate percentages serve as the second key redistributive feature of the Social Security wealth formula. We computed PIAs for each retirement age from current year *t* to 120.

Next, using the PIAs, we computed Social Security wealth (SSW_t) (see Equation 2 below) as the expected net present value of a worker's Social Security benefits received until death if retiring at age *t*. We take into consideration the difference between each respondent's retirement age and the FRA and also account for survival probabilities and discount rates.

$$SSW_t = \sum_{s=r}^{S} \frac{pr_{s|t} * B_s}{(1+d)^{s-t}} \tag{2}$$

In the above equation, $pr_{s|t}$ is the probability the individual is alive at time *s* conditional on being alive at time *t*. B_s is the primary insurance amount (PIA) to be collected on a monthly basis if the individual chooses to retire at time *s* (i.e., *s=r,* where *r* denotes the timing of retirement). S is the year in which the individual dies. We set d, the real discount rate, to be 3%,[5] and S, the maximum possible age reachable by an individual, equal to age 120 according to U.S. life-expectancy tables (Arias et al. 2016).

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[4] The PIA is calculated to be a sum of (1) 90% of the earnings up to the first threshold or bend-point, (2) 32% of the remaining earnings, up to the second threshold, and (3) 15% of the remainder. The full list of thresholds or bend-points that vary by year can be found at the Social Security Administration webpage (U.S. Social Security Administration, n.d. a).

[5] This follows the practice of previous literature (e.g. Börsch-Supan 1992; Coile and Gruber 2001, 2000) .

Next, we computed the survival probabilities $(pr_{s|t})$ as $pr_{s|t} = \prod_t^{s-1}(1-\lambda_t)$. Here, λ_t is a hazard function where $\lambda_t = \frac{d_t}{s_t}$, with d_t denoting the number of people dying in period *t*, and S_t denoting the number of survivors at time *t*. We obtained information on survival and mortality prospects for the computation of $pr_{s|t}$ from life-expectancy tables published by the U.S. Centers for Disease Control and Prevention. As we discuss in the Background section, different demographic groups display significant differences in survival probabilities, with Hispanic and female respondents tending to outlive others (Case and Deaton 2015). Accounting for these differences, we applied different survival probabilities by gender and race — generating six distinct probabilities for men and women among Hispanics, non-Hispanic Blacks, and non-Hispanic whites.

We computed Social Security wealth to be nonzero for individuals starting at age 60 and increasing afterward. Although the ERA is 62, this is consistent with previous research that accounts for cases where individuals retire before the ERA (e.g., age 60) but delay claiming benefits until they reach the ERA (Coile and Gruber 2007).[6] We include the Social Security wealth variable in all estimations as the main independent variable of interest.

Lastly, while both the benefit and tax rates of the OASI program influence individual retirement decisions (Coile and Gruber 2007; Fields and Mitchell 1984), we did not consider the tax rates in this study due to the unavailability of data. We do not

[6] Following Coile and Gruber (2007), we assume that, (1) individuals retiring before age 62 delay claiming until age 62 but not later, and (2) individuals retiring at age 62 or later claim Social Security benefits immediately.

believe this poses a limitation to our work because previous research has demonstrated that such benefits have only a small effect on the primary earner's labor supply decisions (Knapp 2014).

Peak value retirement incentive

The financial retirement incentive generated by the Social Security wealth accumulation can be modeled as a *peak value* (PV) (Coile and Gruber 2001). As noted above, for each individual we computed the lifetime Social Security wealth based on the monthly benefits to be received until death with an immediate retirement (today at age t, in year s) as well as the expected lifetime Social Security wealth this individual could accrue by retiring at age t+1, t+2, t+3, and so on.

The peak-value measures the difference in the expected Social Security wealth if an individual retires at a future optimal age (i.e., maximum expected value of SS wealth) rather than retiring immediately at age t, appropriately discounted,

$$PV_t(r^*) = \sum_{s=r}^{S} \beta^{s-t} \pi(s \mid t) E_t(B_s(r^*)) - \sum_{s=t}^{S} \beta^{s-t} \pi(s \mid t) E_t(B_s(t)),$$

where $B_s(r)$ is retirement benefits in year *s* if the individual retires in year *r* (r* is the future optimal year that maximizes the expected value of Social Security wealth), $\pi(s \mid t)$ is the probability of living to age s conditional on being alive at age *t*, β refers to the subjective discount factor, and *S* marks the year in which the individual dies. We include peak value along with Social Security wealth as a main independent variable of interest in all estimations.

The peak value is a metric of retirement incentives comparable to the option value (Ausink and Wise 1996; Lumsdaine et al. 1992)[7] but requiring fewer assumptions than the option value (Stock and Wise, 1990). The peak value does not include salary income and hence provide more accurate estimates of the association between Social Security retirement incentives and the probability of retirement (Coile and Gruber 2007). Following previous studies, we control for salary income in our regressions (Samwick 2000; Friedberg and Webb 2005).

Background

Social Security wealth and generational differences

The U.S. Social Security Administration has two principal programs. These are the Old Age and Survivors Insurance (OASI) program and the Disability Insurance program. This article focuses on the OASI program benefits, which we refer to as Social Security benefits.

Individuals who work for at least 40 three-month quarters are eligible for Social Security benefits. Individuals can claim Social Security benefits once they reach the early retirement age (ERA), which is currently 62 years. Social Security benefits,

[7] In an option value model (Stock and Wise 1990), an employee would compare the expected present value of retiring at the current age with the value of retiring at each subsequent age. This process assumes workers' utility maximization tendencies whereby an employee weights the indirect utility of future income to that of future retirement benefits. The option value of postponing retirement is equal to the maximum of the present value of retiring at each future age minus the expected present value of immediate retirement. Previous studies have shown that the option value model approximates workers' retirement decisions as well as a more complex dynamic programming model (e.g. Ausink and Wise, 1996; Lumsdaine et al., 1992).

however, are reduced for each month of retirement before the full retirement age (FRA), which, for persons born in 1960 or later, is 67 years. Those who work past the FRA see their benefits increase for each extra month of work until they reach age 70 when the monthly benefit no longer increases (U.S. Social Security Administration 2019b). Social Security benefits are provided monthly until death; hence, persons who delay their retirement can see their monthly benefit and, possibly, their lifetime benefits increase with each month they continue to work past the ERA.

The eligibility ages for Social Security benefits have changed over time for *future* beneficiaries. This has resulted in younger cohorts facing further-reduced Social Security benefits if they retire early (before FRA). Originally, the FRA was 65 for those born before 1938. In 1961, the ERA was set at 62 years of age, with persons retiring at that age receiving 80% of the full benefit amount. In 1983, the FRA was set at 66 for persons born between 1943 and 1954, 67 for those born in 1960 or later, and at increments between those ages for individuals born between 1938 and 1955. For individuals born in 1960 or later, persons retiring at age 62 will receive 70% of the full benefit, while those retiring at age 65 will receive 87% of the full benefit. Conversely, while individuals can receive the full benefit by retiring at age 67, they will increase their benefit above the full benefit amount for every month they delay retirement beyond age 67 (National Academy of Social Insurance 2017; U.S. Social Security Administration n.d.-b).

To account for differing FRAs among our analysis age-groups, or cohorts, we apply Social Security system rules for each cohort. We discuss in our methods section how we did this.

Differences in the Social Security benefit accumulation across race

While the discrepancies in how Social Security benefits accumulate across age are well-understood, differences across racial groups, and the reasons for them, have received little attention. We consider three distinct characteristics — income differences, employment gaps, and survival probabilities — of three racial groups that could generate different patterns of Social Security benefit accumulation.

First, racial minorities often suffer from hiring and pay discrimination in the labor market (Bertrand and Mullainathan 2004; Lang and Lehmann 2012). Such discrimination has led to a steadily increasing income gap between non-Hispanic whites and others since the 1970s (Kochhar and Cilluffo 2018). Because racial minorities persistently earn lower income than non-Hispanic whites in the labor market, they are likely to accumulate *lower* Social Security benefits, which are calculated based on the recipient's highest 35-year annual earnings, all else equal. We provide more information on Social Security benefit calculations in our Measures section.

Second, across racial groups, differences in Social Security wealth accumulation may arise because of different truncations in work trajectories. Racial discrimination in hiring and promotion, greater incarceration of minorities, and uneven labor force participation mean that racial minorities may suffer more than non-Hispanic whites from involuntary job separation, leading to larger employment gaps in their working lives (Bayer and Charles 2018; Flippen 2005; Lang and Lehmann 2012). This, in turn, leads to *lower annual earned incomes* and *lower* accumulation of Social Security benefits for racial minorities, all else equal.

Third, changes in mortality rates for non-Hispanic whites, non-Hispanic Blacks, and Hispanics can lead to divergent Social Security wealth accumulations. While the mortality rates of non-Hispanic whites were lower than those for minorities' in the 1990s, these trends were reversed in the 2000s. Non-Hispanic white mortality, driven by declining mental health, stress, and increasing instances of drug and alcohol poisonings, suicide, and chronic liver diseases and cirrhosis, has increased since 1999 (Case and Deaton 2015). At the same time, mortality rates for non-Hispanic Blacks and Hispanics have fallen, with mortality rates for Hispanics remaining below those of the other two groups (Case and Deaton 2015; Cutler et al. 2006). This reversal of mortality patterns by racial groups implies that racial minorities face higher survival probabilities and hence are likely to accumulate *higher Social Security benefits* than non-Hispanic whites do, all else equal. We provide more information on Social Security benefit calculations (i.e., how survival probabilities affect the benefits formula) in the Measures section.

Income differences, employment gaps, and survival probabilities, when working in tandem, could generate significant differences in Social Security benefit accumulation across racial groups. Considering the divergent effects of these three in increasing or decreasing Social Security wealth, it is unclear whether racial minorities will experience systematically lower Social Security wealth than non-Hispanic whites. Furthermore, while the differences in earned income, employment gaps, and survival probabilities could widen racial inequalities in Social Security wealth, the redistributive functions of the Social Security benefits formula could soften these in benefit accumulation.

In this paper, we explore these differences across racial groups by calculating the Social Security wealth while accounting for individuals' distinct earnings histories, work trajectories, survival probabilities, and the redistributive features of Social Security benefit calculations. We further examine the impacts on retirement timing of these system-induced differences, and the different levels of retirement financial preparedness they generate.

Covariates

Among our demographic covariates are cohort identifiers (indicators for those born before 1941, between 1942 and 1947, between 1948 and 1953, and between 1954 to 1959), gender (1=male, 0=female), years of education, marital status (1=married or partnered, 0=no), and number of household members.

We measured respondents' financial conditions with several variables: monthly salary income, net household wealth (all assets less debts), and access to pension (indicators for those with defined-benefit plans, defined-contribution plans, both, or neither). We used the Consumer Price Index to convert individual monthly earnings and net household wealth into 2012 dollars. We then transformed the individual monthly earnings by taking a logarithm in order to compress the right-skewed distribution of the variable. We kept the household wealth variable w in real dollars without undergoing further transformation due to the presence of negative wealth (i.e., having greater debts than assets).

We accounted for respondents' physical health by including an indicator for diagnosed chronic health conditions such as high blood pressure or hypertension; diabetes or high blood sugar; cancer or malignant tumor; chronic lung disease; heart disease or other heart problems; and stroke. For mental health, we added as a covariate the modified CES-D depressive symptoms count (0 to 8 scale), based on the respondent's reporting in the past week feeling depressed, everything was an effort, happy, alone, sad, or tired; restless sleep; or enjoying life (Turvey et al. 1999).

We also generated metrics to ascertain respondents' healthcare expenditures, including annual out-of-pocket health expenditures, respondents' access to employer-sponsored health insurance (1=yes, 0=no), and Medicare eligibility (1=eligible, 0=no). Health care expenditures and insurance coverage could affect respondents' preparedness for unforeseen future medical expenses (Cutler and Zeckhauser 2000) and hence their timing of retirement.

Methods

First, we examined the differences in the evolution of retirement wealth by age for non-Hispanic whites, non-Hispanic Blacks, and Hispanics. Specifically, we calculated the median Social Security wealth respondents accumulated between ages 60 and 70, and compared these levels for Hispanics, non-Hispanic whites, and non-Hispanic Blacks. Such comparisons enabled us to identify the net effects of the variables— earnings histories, work trajectories, survival probabilities, and the redistributive features embedded in the Social Security benefit calculations — that generated Social Security wealth gaps by race and ethnic origin. To further our understanding of differences by race and ethnic origin, we also compared the evolution of median peak values, median monthly earnings, and replacement rates (i.e., how much monthly Social Security benefits replaced monthly salary earnings) for respondents from ages 60 to 70.[8]

Second, we explored how the system-induced differences (i.e., different levels of retirement financial preparedness relative to Social Security wealth accumulation and optimization relative to peak value of benefits) influenced respondents' retirement likelihood. Specifically, for all aging individuals working in period t, we investigated the impact of Social Security wealth and peak value on their retirement likelihood while controlling for other determinants of retirement by using the following probit model:

$$\Pr(\text{Retirement}_{it} = 1) = f(\alpha + \partial SSW_{it} + \gamma PV_{it} + \beta X_{is} + \zeta_t + \varepsilon_{it}) \quad (3),$$

where Retirement_{it} took on the value 1 for individuals who transitioned from working in t to fully retiring in t+1 and the value 0 for those working in t and t+1. Subscripts i referred to individuals, and t referred to time. SSW_{it} was Social Security wealth to be accrued until the time of death by retiring at time t, and PV_{it} was the peak value retirement incentive generated by Social Security wealth. In the baseline covariate specification (Specification 1), we only included two Social Security variables and time fixed-effects (ζ_t) to account for any wave-specific conditions that could have affected respondents' retirement decisions.

Specification 2 added the vector of covariates X_{it} demographic characteristics, and indicators of respondents' financial status (individual income, net household wealth,

[8] We calculated the replacement rate by dividing monthly Social Security benefits (to be collected by retiring at each age and applying as necessary the early or delayed claiming rates) by total monthly salary earnings.

and pension access by type). Specification 3 included in X_{it} controls for health (chronic illnesses and CES-D). Lastly, Specification 4 adds covariates on healthcare expenditures (employer-sponsored health insurance coverage, Medicare eligibility, and out-of-pocket healthcare expenditures) to X_{it}. In all specifications, we clustered standard errors at the household level.

Results

Summary statistics

Table 1 summarizes characteristics for non-Hispanic white, non-Hispanic Black, and Hispanic respondents. It indicates several differences across these groups. Average Social Security wealth was greatest for Non-Hispanic whites. Hispanics also had greater Social Security wealth than non-Hispanic Blacks. The peak value was significantly higher for Hispanics than for others. It shows, for example, that Hispanics could increase their Social Security wealth nearly $8,400 by delaying retirement to a future optimal time *r** while non-Hispanic Blacks would only increase their Social Security wealth by about $3,200 with such a delay. In other words, Hispanics have greater incentives than the other two groups to delay retirement.

As can be seen from the sample averages in Table 1 as well as the age-distribution shown in Figure 5, Hispanic and non-Hispanic Black respondents were younger than non-Hispanic Whites. Blacks and Hispanics were less likely to retire in t+1. Average years of education for Hispanics were also lower than for others. Non-Hispanic Blacks were less likely than others to be married or partnered. Hispanics had higher average household sizes than others.

We also noted cross-race differences in terms of their financial statuses. Non-Hispanic whites and non-Hispanic Blacks earned significantly greater salary income than Hispanics did. Real net wealth for non-Hispanic whites was 3.7 times higher than that for non-Hispanic Blacks and 3.1 times higher than for Hispanics. One-half of Hispanics, one-third of non-Hispanic Blacks, and one-third of non-Hispanic whites reported not having contributed to a private pension — suggesting clear discrepancies in retirement financial preparedness of the three groups.

Non-Hispanic Blacks were more likely to report chronic conditions than Hispanics or non-Hispanic whites were. A lower prevalence of chronic conditions for Hispanics may have been due to underdiagnosis (Kim et al. 2018)—rather than stemming from Hispanics' better health. The average CES-D score indicating the severity of depressive symptoms was higher for Hispanics (1.5) than for non-Hispanic Blacks (1.3) and non-Hispanic whites (0.9).

Social Security wealth accumulation across race

We compared the differences in the evolution of retirement wealth by age, across non-Hispanic whites, non-Hispanic Blacks, and Hispanics. Table 2 shows the 50th percentile of annual salary earnings, Social Security wealth, the peak value retirement incentive measure, and the replacement rates between ages 60 and 70 (see also Figures 1 through 4). We saw that the median salary income is significantly higher for non-Hispanic whites than for non-Hispanic Blacks and Hispanics across all ages between 60 and 70.

Having accounted for the distinct earnings histories, work trajectories, and survival probabilities of the three races in the Social Security wealth calculations, we saw that the Hispanics' median Social Security wealth was comparable — if not higher — between ages 60 and 70 with that of non-Hispanic whites. Their Social Security wealth was significantly *higher* than those accumulated by the non-Hispanic Blacks. For all three groups, Social Security wealth peaked at 67 to 69 and then decreased.

Peak values were, once again, the highest for the Hispanic respondents, followed by non-Hispanic whites, and then non-Hispanic Blacks across ages 60 to 70. Respondents in all three racial groups saw their highest peak value incentive at age 60 to 61, decreasing each year thereafter, and turning negative at ages 67 to69. This implied that Hispanics had the biggest incentives to delay retirement, followed by non-Hispanic whites, then non-Hispanic Blacks.

Next, the median replacement rates were the highest for the Hispanic respondents across all ages. The second highest replacement rates were displayed by non-Hispanic Black respondents. Non-Hispanic whites had the lowest replacement rates for the most part except starting at age 68 when their replacement rates surpassed those of non-Hispanic Blacks. We discuss the implications of the differences in the evolution and accumulation of the retirement wealth across the three groups in the Discussion section.

Impact of the Social Security wealth on retirement likelihood

Tables 3 and 4 show the marginal effects of the probit regressions as described in Equation 3, estimated separately for non-Hispanic whites, non-Hispanic Blacks, and Hispanics. For all models, the outcome variable was a binary indicator for retirement, which took a value of 1 if working in wave t and retiring in t+1, and a value of 0 if working in *t* and *t+1*. Table 3 shows the regression results using the first two covariate specifications. In Specification I, we ran the model with only Social Security wealth and the peak value incentive measure as regressors. The model for Specification II further added to the previous specification controls for the demographic characteristics and financial statuses (i.e., individual salary income, net household wealth, and access to employer-sponsored pension plans). Table 4 shows regression results using two more covariate specifications. Specification III added measures of physical and mental health. Specification IV further included indicators of health care utilization — out-of-pocket medical expense, Medicare eligibility, and access to employer-sponsored health insurance coverage.

In Specification I in Table 3, at the sample mean of all regressors, a $10,000 increase in Social Security wealth increased retirement likelihood by 1.0 to 1.1 percentage points for non-Hispanic whites, non-Hispanic Blacks, and Hispanics (i.e., 6.9% increase for non-Hispanic whites from the mean of 0.14, 7.9% increase for non-Hispanic Blacks from the mean of 0.14, and 10.1% increase for Hispanics from the mean of 0.10). At the same time, a $10,000 increase in the peak value incentive reduced retirement likelihood by 1.9 percentage points for non-Hispanic whites, 1.5 percentage points for non-Hispanic Blacks, and 1.9 percentage points for Hispanics (i.e., 13.2% decrease for non-Hispanic whites from the mean of 0.14, 10.8% decrease for non-Hispanic Blacks from the mean of 0.14, and 17.4% decrease for Hispanics from the mean of 0.10).

The retirement-inducing effects of Social Security wealth and the retirement-deterring effects of peak value remained consistent across all four covariate specifications except for non-Hispanic Blacks. Specifically, as we controlled for demographics, financial statuses, and physical and mental health (Specification II in Table 3, and Specification III in Table 4), non-Hispanic Black respondents were shown to *no longer* respond in a significant manner to the peak value incentives. As we further added controls for health care expenditure (Specification IV) in Table 4, non-Hispanic Blacks responded to the peak value by displaying *greater* retirement likelihood with increasing peak values. Specifically, a $10,000 increase in the peak value incentive raised retirement likelihood by 0.5 percentage points for the non-Hispanic Blacks (i.e. 3.6% increase from the mean of 0.14). While the impact of peak value was no longer significant for the non-Hispanic whites and the Hispanics, the direction of the link between the peak value and their retirement likelihoods was consistent with the previous results shown in Table 3.

As for the covariates, their effects are largely consistent with those found in the existing retirement literature (e.g., Shoven and Slavov 2014). Across the three race groups, respondents who were older, earning less monthly salary income, and having defined benefit pension plans as opposed to defined-contribution plans were more likely to retire than their counterparts. Moreover, respondents in all three groups who were experiencing more chronic conditions and more depressive symptoms, eligible for Medicare, and without employer-sponsored health insurance coverage for the duration of current employment were also more likely to retire.

We noted a few cross-race differences: More years of education decrease the likelihood of retirement for non-Hispanic whites and non-Hispanic Blacks but not for Hispanics. Being married or partnered increased the likelihood of retirement for non-Hispanic whites but not for non-Hispanic Blacks and Hispanics. Having more household members decreased the likelihood of retirement for non-Hispanic whites but not for non-Hispanic Blacks and Hispanics.

We consider the significance or the implication of our empirical findings in the Discussion section.

Discussion

In our empirical specifications, we compared the evolution of income, Social Security wealth accumulation, and peak value at each age from 60 to 70 for non-Hispanic whites, non-Hispanic Blacks, and Hispanics. We found median earnings, the primary determinant of Social Security benefits, were higher for non-Hispanic whites than for non-Hispanic Blacks and Hispanics (U.S. Social Security Administration 2019b). We also found that median Social Security wealth was greater for non-Hispanic whites and Hispanics than for non-Hispanic Blacks across all ages. The fact that the Social Security wealth accumulated by the Hispanics was comparable, if not higher, to that of non-Hispanic whites departs from previous research findings (e.g., Coile and Gruber 2007).

The reason for the difference between our findings and that of previous research is likely in the years of the data we use. While most previous research (e.g., Coile and Gruber 2007) uses data from the 1990s, we use data from the 2000s. During the time period we analyze, the Social Security Administration augmented the redistributive features of the OASI program by altering the indexing of the AIME and the kinks in the PIA (e.g., Crystal et al. 2017). The redistributive formula now ensures that benefits are higher relative to lifetime payroll contributions for lower-wage workers than for higher-wage ones. As a result, benefits are provided more equally than pre-retirement income is. Because racial minorities earned less than non-Hispanic whites, they may have benefitted more from Social Security's progressivity than non-Hispanic whites have. This is also evident in minorities' higher replacement rates shown in Table 2. Furthermore, mortality rates for non-Hispanic whites in the 2000s have deteriorated with declining mental health, stress, and increasing instances of drug and alcohol poisonings, suicide, and chronic liver diseases and cirrhosis, while mortality rates for Hispanics have continued to decrease (Case and Deaton 2015; Cutler et al. 2006; Deaton and Paxson 2001).

Both greater redistribution of Social Security benefits and increasing life expectancy would increase the Social Security wealth of Hispanics relative to that for non-Hispanic whites. At the same time, Social Security wealth did not increase for non-Hispanic Blacks, likely because their mortality rates remain higher (and hence their survival probabilities remain lower) than those for the other groups.

In our estimates, we accounted for the extent of employment gaps in respondents' unique working trajectories. We confirmed that non-Hispanic Blacks and Hispanics experienced more employment gaps. These findings matched those of previous research showing that racial minorities have higher odds of involuntary job separation and subsequent withdrawal from the labor force — especially near the retirement age — and are more likely to have discontinuous work histories as well as poor health, leading to involuntary job loss (Flippen 2005).

Greater truncations in working trajectories of racial minorities contributed to reduced Social Security benefits for them. The more frequent truncations in work trajectories (i.e., more employment gaps) that non-Hispanic Blacks experienced compared to non-Hispanic whites appears to have resulted in them having the lowest Social Security wealth among the three racial groups. At the same time, the redistributive function of the Social Security benefits formula did not increase Social Security wealth for non-Hispanic Blacks because of their higher mortality rates. By contrast, while Hispanics also had more employment gaps than non-Hispanic whites, the redistributive formula helped increase their Social Security wealth because of their higher survival probabilities.

Because Hispanics and non-Hispanic Blacks in our analysis sample were younger than non-Hispanic whites, they had more incentives to delay retirement (see Figure 5). Nevertheless, our regression results suggested that they responded *more* to the incentives (e.g., Social Security wealth) to encourage retirement but not to retirement-delaying or retirement-deterring incentives (i.e., peak values).

Overall, our results across all four covariate specifications indicated that respondents respond strongly and consistently (and in line with theory) to Social Security wealth, but not so much for the peak value. The peak-values especially lacked influence on retirement timing for non-Hispanic Blacks. This contradicted the results shown in Table 2 indicating that non-Hispanic Blacks had the greatest peak value incentives (i.e., most incentives to delay retirement) among respondents 60 to 70 years old.[9]

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[9] In this study, we present the results of the data pooled from 2000 to 2018. We also estimated the same models before (2000 to 2004), during (2006 to 2010), and after (2012 to 2016) the "Great Recession" to compare retirement determinants under different economic conditions. The results are quantitatively and qualitatively similar but much less precise given that the

The primary difference between the Social Security wealth and the peak value incentive measures is the extent of cross-temporal optimization they require of the respondents. In other words, Social Security wealth may be more readily visible to respondents as their benefit amount is often revealed to them at their time of retirement. Therefore, the impact of Social Security wealth on the labor supply is *instantaneous*—generating a dominant income-effect over a substitution-effect in time t.

In contrast, the impact of the peak value on retirement is grounded upon individuals' ability to be forward-looking and optimize across time. Respondents must *be able to* foresee their maximum Social Security benefits to be accrued by retiring at a future optimal time r^* and compare that with the benefits obtainable by retiring now (in time t). Whether and how much the peak value influences individuals' retirement timing may therefore depend not only on the magnitude of the peak value, but also on the ability of respondents to look forward across time. Based on these considerations, the differences in the impact of the peak value measure on retirement likelihood across the three racial groups could stem from the relatively lower engagement of non-Hispanic Blacks in intertemporal optimization.

As for the covariates in the regression results, it is worth noting that Hispanics were less responsive to many of the determinants of retirement than non-Hispanic whites and non-Hispanic Blacks. Non-Hispanic Blacks were relatively less responsive to sociodemographic covariates (i.e., male, couple, and number of household members),

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samples of Hispanics and Blacks become too small if divided into different time periods (results available on request).

but were highly responsive to health drivers of retirement. Our findings for non-Hispanic whites and non-Hispanic Blacks were consistent with previous research (Clark et al. 2006; French and Jones 2011; Karpanzalo et al. 2005). The lack of responsiveness of Hispanics may be due to lower levels of education and income that led to greater to financial insecurity in old age, especially when mental health does not influence their retirement decisions. Non-Hispanic Blacks were not responsive to some sociodemographic conditions even if they faced vulnerabilities similar to those of Hispanics. At the same time, Blacks responded to physical and mental health problems with a higher likelihood of retirement while higher levels of education predicted a lower likelihood of retirement for them.

Another notable cross-race differences was in access to pension plans. Specifically, we found a larger proportion of Hispanics than non-Hispanic whites and Blacks did not contribute to private pensions. Similarly, Butrica and Johnson (2010) showed that employer sponsored plans covered 64.6% of non-Hispanic white workers, 55.7% of Black workers, and 38.4% of Hispanic workers. These differences were explained by differences in firm size, proportion of employees in full-time and part-time jobs, and occupational segregation. Non-Hispanic whites were more likely than Blacks and Hispanics to be employed in firms with more than 1,000 employees, which in turn were more likely to offer employer-sponsored pensions. Blacks were more likely to be employed in the public sector, where participation in pension plans was near universal. Hispanics were more likely than non-Hispanic whites and Blacks to be employed in firms with fewer than 100 employees and to work part-time, both settings that were less likely to offer employer benefits such as pension plans. Hispanics were also more likely to work in occupations, such as service, farming, fishing, forestry, and construction jobs, in which employers were less likely to provide pensions. Both Blacks and Hispanics were more likely to work in low-paying jobs that did not offer employer sponsored pensions (Butrica and Johnsons 2010).

Our work has several limitations. Hispanics are a heterogeneous group including a significant proportion of immigrants from various countries. Our findings may not apply to all groups of nonmigrants and migrants (documented and undocumented). Also, HRS oversamples Hispanics but the sample includes a higher proportion of younger cohorts and our estimates for older cohorts are less precise (see Figure 5). This population distribution resembles the population distribution in the census data where Hispanics are a younger population than non-Hispanic whites.

Conclusion

Previous studies have documented that non-Hispanic Blacks and Hispanics rely more than non-Hispanic whites on Social Security benefits to sustain their post-retirement years (Hendley and Bilimoria 1999; U.S. Social Security Administration 2010). Naturally, the Social Security benefits that comprise a large proportion of the retirement income for non-Hispanic Blacks and Hispanics has a far greater effect on retirement decisions than other sociodemographic and health influences. Given the impact of Social Security wealth in our analyses, we would expect potential future changes in the U.S. Social Security system to affect labor force participation and retirement decisions of non-Hispanic Blacks and Hispanics more than those of non-Hispanic whites. This also may imply that income-assistance programs for older persons could greatly benefit and influence the retirement decisions of low-income older adults.

The lack of responsiveness of Hispanics and non-Hispanic Blacks to drivers of retirement found in our results calls for further research examining the mediating role of financial literacy. It may be that some Hispanics and non-Hispanic Blacks are not making optimal retirement decisions given their socioeconomic and health conditions. Programs to raise their financial literacy levels could help improve their work and retirement decision-making.

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Tables and figures

Table 1: Summary statistics

	Non-Hispanic whites % or Mean (SD)	Non-Hispanic Blacks % or Mean (SD)	Hispanic % or Mean (SD)
Retire in *t*	14.39	13.94	10.85
Covariates			
Age	61.72	60.49	59.38
	(6.99)	(6.38)	(5.64)
Ages 50-61	54.67	62.20	69.47
Ages 62-80	45.33	37.80	30.53
Cohort 1	44.37	34.19	24.86
Cohort 2	20.22	14.41	11.01
Cohort 3	22.22	26.14	35.51
Cohort 4	13.19	25.26	28.62
Male	48.55	38.42	51.26
Years of education	13.88	13.04	10.56
	(2.38)	(2.59)	(4.44)
Couple (1=yes, 0=no)	73.12	49.71	70.01
No. of household members	2.25	2.49	3.14
	(1.01)	(1.37)	(1.72)
Real monthly salary income (USD)	121,477.20	193,178.60	22,100.81
	(21,304,008.40)	(15,900,920.50)	(16,789.50)
Real net wealth (USD)	560,585.50	151,221.90	180,587.20
	(1,323,302.10)	(409,333.60)	(462,596.30)
Health			
Chronic Conditions (1=one or more, 0=none)	59.10	71.53	57.33
CES-D score (0-8)	0.93	1.28	1.53
	(1.54)	(1.68)	(2.05)
Health care			
Medicare Eligibility (1=65+, 0=no)	29.95	23.15	14.81
Health insurance, employer sponsored (1=yes, 0=no)	28.50	24.48	25.15
Real annual out-of-pocket exp (USD)	2523.06	2010.02	2056.07
	(5,394.72)	(4,761.06)	(4,954.16)
Private Pensions (PP)			
Contributed Private Pensions			

Defined benefit plans (1=yes, 0=no)	27.44	30.34	20.57
Defined contribution plans (1=yes, 0=no)	37.63	33.64	26.60
Both (1=yes, 0=no)	2.31	3.08	2.20
None (1=yes, 0=no)	32.95	32.94	50.63
Social Security Wealth (USD)	74,391.14	577,27.46	61,733.42
	(78,168.55)	(66,274.72)	(77,169.88)
Peak Value	4,166.14	3,201.09	8,439.64
	(15,310.86)	(13,315.34)	(20,510.46)
No. observations	30,665	6,757	4,497

Notes: Employer health insurance refers to employer-sponsored health insurance; USD to U.S. dollars. Our sample included the following HRS cohorts: cohort 1 refers to those born before 1941, cohort 2 refers to those born 1942 to 1947, cohort 3 refers to those early baby boomers born 1948 to 1953, and cohort 4 (reference) includes mid baby boomers born 1954 to 1959. Standard deviation (SD) in parenthesis.

Source: authors' calculations

Table 2: Income, Social Security wealth, peak value, and replacement rate

	Non-Hispanic whites				Non-Hispanic Blacks				Hispanic			
Age	**Income**	**SSW 50th**	**PV 50th**	**Replacement 50th**	**Income**	**SSW 50th**	**PV 50th**	**Replacement 50th**	**Income**	**SSW 50th**	**PV 50th**	**Replacement 50th**
60	30,000.00	145,331.10	23,881.17	26.91	24,000.00	128,605.10	16,928.33	32.33	21,235.67	146,330.50	34,382.67	38.38
61	28,689.29	144,296.20	19,991.89	28.62	23,745.32	132,167.00	11,867.77	34.37	19,000.00	149,117.90	28,168.86	42.85
62	25,760.03	138,471.60	16,887.05	31.39	20,335.58	122,877.10	9,532.55	38.15	20,000.20	144,833.70	24,705.78	41.70
63	25,000.10	138,197.20	11,833.84	34.58	19,992.50	127,417.80	6,136.94	42.93	19,000.40	150,291.70	17,055.64	44.65
64	22,866.95	138,035.20	7,764.52	38.30	17,206.13	113,642.10	3,361.22	48.13	18,185.85	142,032.70	11,727.84	46.30
65	21,421.26	136,487.30	4,147.98	41.66	18,933.00	118,843.80	1,396.50	49.42	16,470.74	154,452.30	7,882.50	56.92
66	18,703.30	134,365.60	1,895.37	46.60	17,347.93	110,150.50	472.84	49.43	17,678.89	142,974.90	3,778.54	49.37
67	18,400.10	134,344.40	375.78	50.15	15,500.20	109,319.60	-70.09	51.01	14,000.00	137,745.30	1,856.58	70.75
68	15,325.67	132,929.70	-414.96	60.76	16,585.68	109,308.60	-1,124.23	52.61	13,652.91	128,591.20	379.39	53.40
69	16,737.11	130,951.30	-6,980.45	56.95	13,600.00	104,626.20	-6,712.95	56.24	12,654.35	135,061.20	-6,533.67	73.81
70	15,460.22	121,767.80	-7,253.92	61.18	15,000.00	100,939.20	-6,844.79	62.09	15,090.23	119,052.10	-6,407.62	58.86

Notes: Percentiles are computed for the distribution of their own group. SSW=Social Security wealth and PV=peak value.

Source: Authors' calculations

Table 3: Marginal effects of the probability of retirement

	Non-Hispanic whites		Non-Hispanic Blacks		Hispanic	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Specification I: No controls						
Social Security Wealth (10,000)	0.010 ***	[0.000]	0.011 ***	[0.001]	0.011***	[0.001]
Peak Value (10,000)	-0.019 ***	[0.002]	-0.015 ***	[0.004]	-0.019 ***	[0.003]
Specification II: Demographic and Financial						
Social Security Wealth (10,000)	0.008 ***	[0.000]	0.010 ***	[0.001]	0.009 ***	[0.001]
Peak Value (10,000)	-0.008 ***	[0.002]	-0.001	[0.004]	-0.009 ***	[0.003]
Cohort 1	0.076 ***	[0.007]	0.097 ***	[0.013]	0.107 ***	[0.014]
Cohort 2	0.051 ***	[0.008]	0.062 ***	[0.014]	0.087 ***	[0.017]
Cohort 3	0.005	[0.007]	0.014	[0.011]	0.023 **	[0.012]
Male	-0.022 ***	[0.004]	0.001	[0.008]	-0.006	[0.009]
Years of education	-0.007 ***	[0.001]	-0.004 **	[0.002]	0.001	[0.001]
Couple (1=yes, 0=no)	0.007	[0.005]	-0.016 *	[0.008]	0.012	[0.011]
No. of household members	-0.013 ***	[0.002]	0.003	[0.003]	-0.004	[0.003]
Ln monthly salary income	-0.004 ***	[0.001]	-0.002	[0.002]	-0.006 **	[0.003]
Real net wealth	-0.001	[0.001]	0.001	[0.001]	0.001	[0.001]
Contributed PP						
Defined contribution plans	-0.051 ***	[0.005]	-0.024 **	[0.010]	-0.033 ***	[0.013]
Both	0.009	[0.014]	0.020	[0.026]	0.042	[0.037]
None	0.012 **	[0.006]	0.036 ***	[0.010]	-0.003	[0.013]
Dependent Variable Mean	0.144		0.139		0.109	
No. Observations	30,665		6,757		4,497	

Notes: Social Security Wealth, Peak Value, and Real net wealth are in USD. Our sample included the following HRS cohorts: cohort 1 refers to those born before 1941, cohort 2 refers to those born 1942 to 1947, cohort 3 refers to those early baby boomers born 1948 to s1953, and cohort 4 (reference) includes mid baby boomers born 1954 to 1959. Standard errors (SE) in brackets.

* p<0.1 ** p<0.05 *** p<0.01.

Source: authors' calculations

Table 4: Marginal effects of the probability of retirement

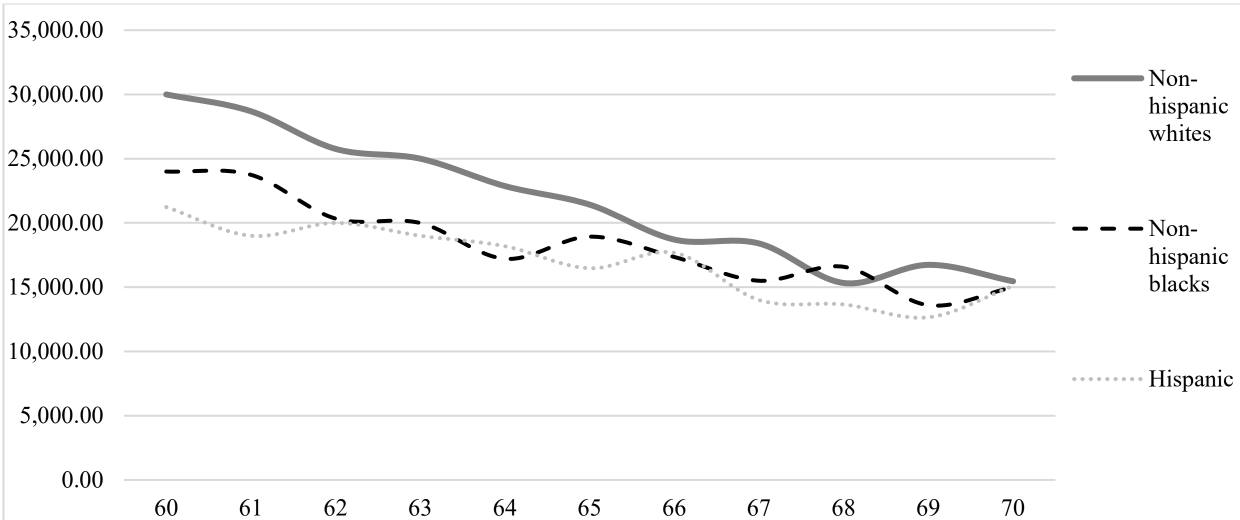
	Non-Hispanic whites		Non-Hispanic Blacks		Hispanic	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Specification III: Demographic, Financial, and Health						
Social Security Wealth (10,000)	0.008 ***	[0.000]	0.010 ***	[0.001]	0.008 ***	[0.001]
Peak Value (10,000)	-0.007 ***	[0.002]	-0.001	[0.004]	-0.008 ***	[0.003]
Cohort 1	0.075 ***	[0.007]	0.097 ***	[0.013]	0.106 ***	[0.014]
Cohort 2	0.051 ***	[0.007]	0.063 ***	[0.015]	0.087 ***	[0.018]
Cohort 3	0.006	[0.007]	0.015	[0.112]	0.025 **	[0.011]
Male	-0.023 ***	[0.004]	0.003	[0.008]	-0.003	[0.009]
Years of education	-0.006 ***	[0.001]	-0.003 **	[0.002]	0.001	[0.001]
Couple (1=yes, 0=no)	0.010 **	[0.005]	-0.016	[0.009]	0.014	[0.011]
No. of household members	-0.013 ***	[0.002]	0.003	[0.003]	-0.003	[0.003]
Ln monthly salary income	-0.004 ***	[0.001]	-0.002	[0.002]	-0.005 **	[0.003]
Real net wealth	-0.001	[0.000]	0.001	[0.001]	0.001	[0.001]
Contributed PP						
Defined contribution plans	-0.051 ***	[0.005]	-0.023 **	[0.010]	-0.034 ***	[0.013]
Both	-0.008	[0.014]	0.020	[0.026]	0.045	[0.037]
None	0.012 **	[0.006]	0.037 ***	[0.010]	-0.005	[0.013]
Chronic Conditions (1=one or more, 0=none)	0.037 ***	[0.004]	0.034 ***	[0.009]	0.038 ***	[0.009]
CES-D score (0-8)	0.006 ***	[0.001]	0.004	[0.003]	0.004 **	[0.002]
Specification IV: Demographic, Financial, Health, and Insurance						
Social Security Wealth (10,000)	0.007 ***	[0.000]	0.008 ***	[0.001]	0.007 ***	[0.001]
Peak Value (10,000)	-0.001	[0.002]	0.005 *	[0.004]	-0.002	[0.003]
Cohort 1	0.067 ***	[0.007]	0.086 ***	[0.013]	0.091 ***	[0.014]
Cohort 2	0.056 ***	[0.008]	0.065 ***	[0.015]	0.091 ***	[0.018]
Cohort 3	0.013 *	[0.007]	0.022 *	[0.012]	0.034 ***	[0.012]
Male	-0.022 ***	[0.004]	0.002	[0.008]	-0.002	[0.010]
Years of education	-0.006 ***	[0.001]	-0.003 *	[0.002]	0.001	[0.001]
Couple (1=yes, 0=no)	0.011 **	[0.005]	-0.016 *	[0.009]	0.015	[0.011]
No. of household members	-0.012 ***	[0.002]	0.004	[0.003]	-0.003	[0.003]
Ln monthly salary income	-0.002 **	[0.001]	-0.002	[0.002]	-0.005 *	[0.003]
Real net wealth	-0.001	[0.000]	0.001	[0.001]	0.001	[0.001]
Contributed PP						
Defined contribution plans	-0.052 ***	[0.005]	-0.024 **	[0.010]	-0.034 **	[0.014]
Both	-0.009	[0.014]	0.019	[0.026]	0.050	[0.039]
None	-0.001	[0.006]	0.027 **	[0.011]	-0.017	[0.013]

Chronic Conditions (1=one or more, 0=none)	0.036 ***	[0.004]	0.030 ***	[0.009]	0.038 ***	[0.009]
CES-D score (0-8)	0.007 ***	[0.001]	0.004	[0.003]	0.005 **	[0.002]
Ln annual out-of-pocket exp	-0.001	[0.000]	0.001	[0.001]	-0.001	[0.001]
Medicare Eligibility (1=65+, 0=no)	0.044 ***	[0.006]	0.043 ***	[0.013]	0.069 ***	[0.017]
Health insurance, employer sponsored (1=yes, 0=no)	-0.029 ***	[0.004]	-0.019 **	[0.009]	-0.024 **	[0.010]
Dependent Variable Mean	0.144		0.139		0.109	
No. observations	30,665		6,757		4,497	

Notes: Social Security Wealth, Peak Value, and Real net wealth are in USD. Cohort 1 refers to those born before 1941, cohort 2 were born in 1942–1947, cohort 3 were born in 1948–1953, and cohort 4 (reference) were born in 1954–1959. * p<0.1 ** p<0.05 *** p<0.01.

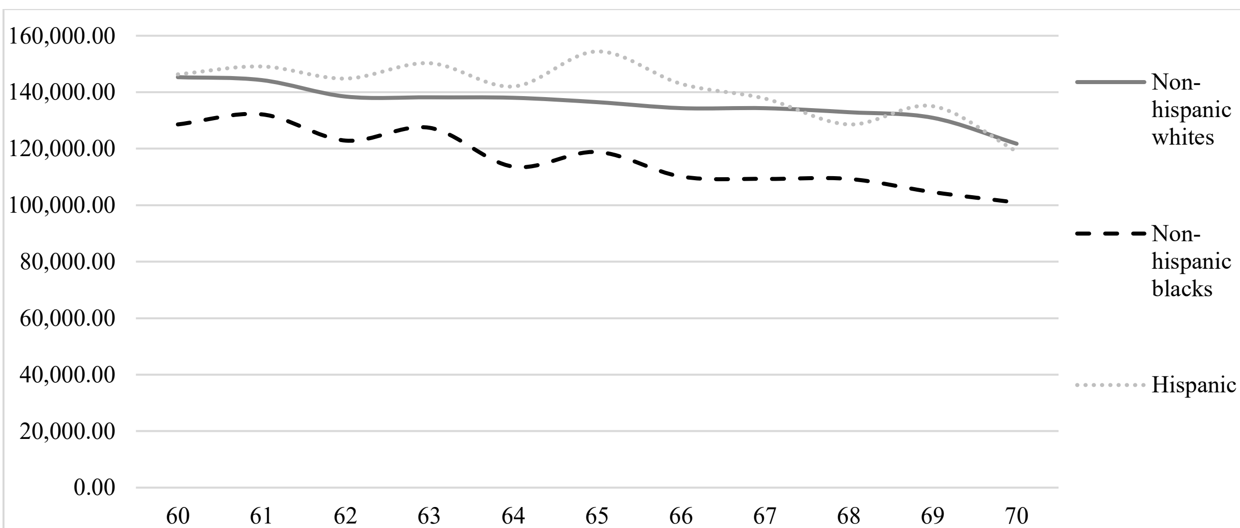
Source: authors' calculations

Figure 1: Earnings (USD) for the 50th percentile



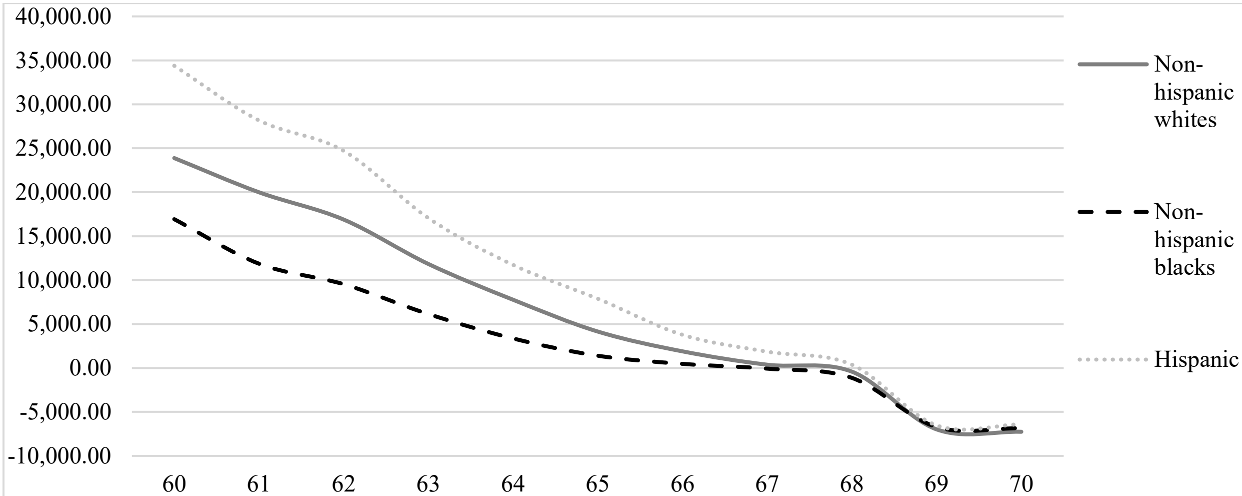
Source: authors' calculations

Figure 2: Social Security wealth (USD) for the 50th percentile



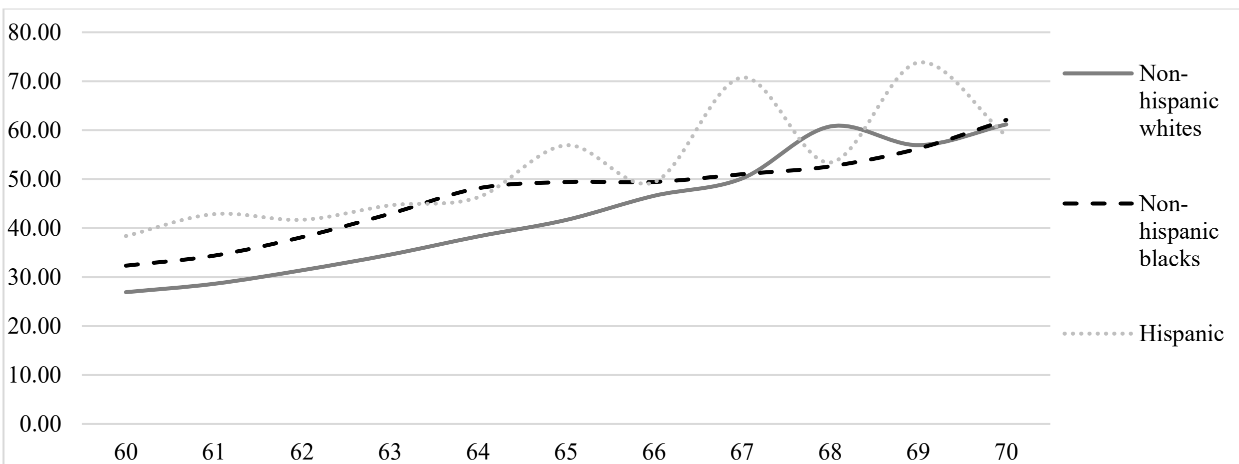
Source: authors' calculations

Figure 3 Peak value (USD) for the 50th percentile



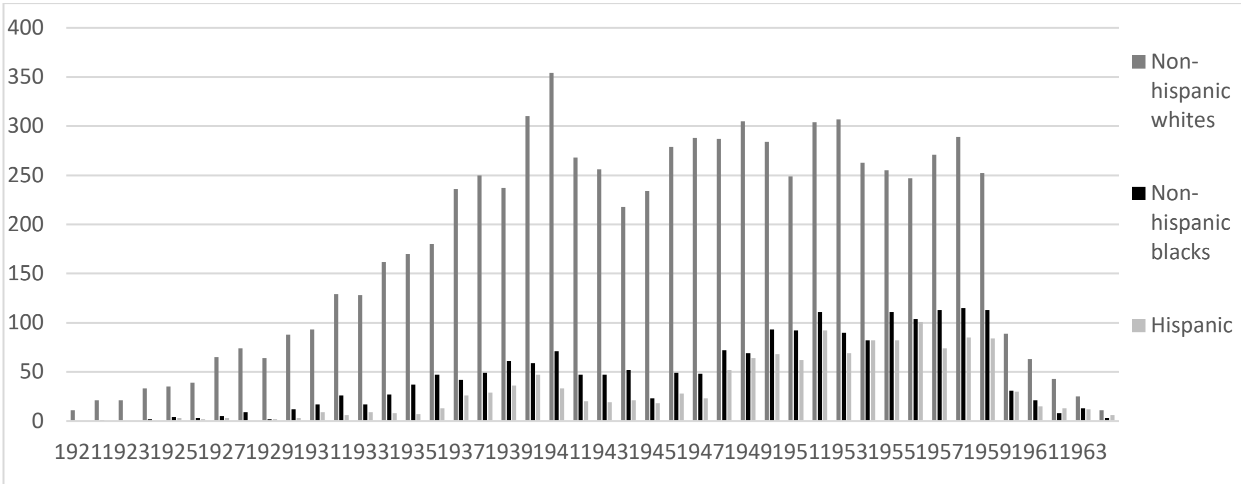
Source: authors' calculations

Figure 4 Replacement rates for the 50th percentile



Source: authors' calculations

Figure 5: HRS Respondent distribution by race and ethnic origin

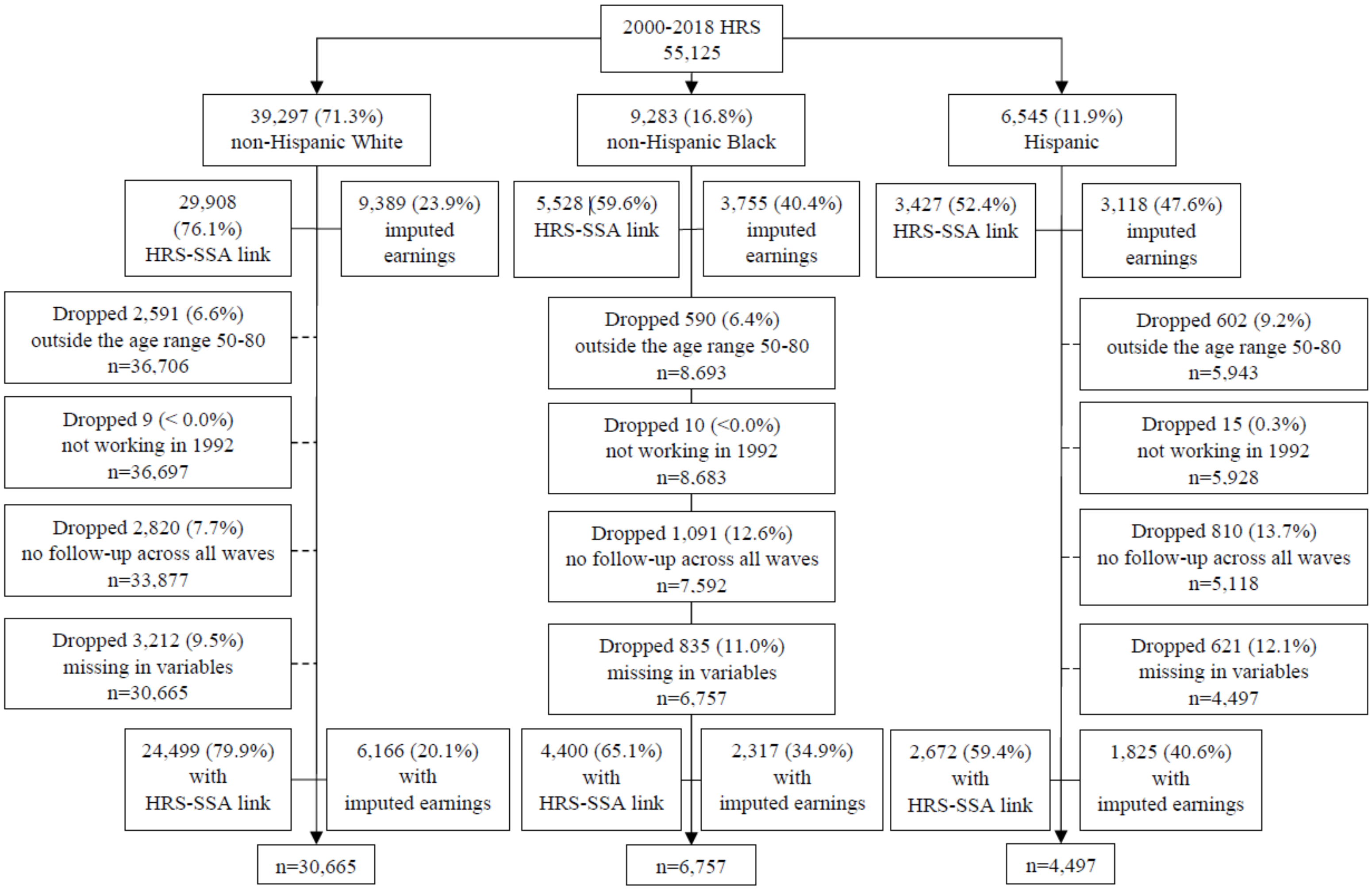


Source: authors' calculations

Appendix

Health and Retirement Study (HRS) Sample

Figure A1: Study Sample



The 2000 to 2018 Health and Retirement Study (HRS) includes 6,545 Hispanics, 9,283 non-Hispanic Blacks, and 39,297 non-Hispanic whites, as shown in Figure A1. Among the 6,545 Hispanic individuals, 3,427 have earnings history through linkages to U.S. Social Security Administration (SSA) data, and for 3,118 we imputed past earnings (see imputation method described below). Among 9,283 non-Hispanic Blacks, 5,528 had earnings history through HRS-SSA linkages, and for 3,755 we imputed past earnings. Among the 39,297 non-Hispanic whites, 29,908 had earnings history through HRS-SSA linkages, and for 9,389 we imputed past earnings. We excluded from our analysis 602 (9.2%) Hispanics, 590 (6.4%) non-Hispanic Blacks, and 2,591 (6.6%) non-Hispanic white respondents for being outside the age range (between ages 50 and 80). We then dropped 15 of the Hispanic individuals (0.3% of 5,943), 10 of the non-Hispanic Black individuals (<0.0% of 8,693), and nine of the non-Hispanic white individuals (<0.0% of 36,706) because they did not work in 1992 — the first wave. We removed 810 (13.7% of 5,928) Hispanics, 1,091 (12.6% of 8,683) non-Hispanic Blacks, and 2,820 (7.7% of 36,697) non-Hispanic whites with no follow-up interviews in any of the subsequent survey waves. Finally, we dropped 621 Hispanics (12.1% of 5,118), 835 (11.0% of 7,592) non-Hispanic Blacks, and 3,212 (9.5% of 33,877) non-Hispanic whites because they had missing covariates. That left us with a sample of 4,497 Hispanic individuals (2,672 with HRS-SSA linked earnings and 1,825 with imputed earnings), 6,757 non-Hispanic Blacks (4,400 with HRS-SSA linked earnings and 2,317 with imputed earnings), and 30,665 non-Hispanic whites (24,499 with HRS-SSA linked earnings and 6,166 with imputed earnings).

Working trajectories: Tracking respondents' monthly labor force statuses

The working trajectories file, publicly available as a contributed file for the HRS, contained information on the respondents' household ID number, personal ID number, year, month, and labor force status (indicators for inactive, disabled, unemployed, retired, employed). The file provided HRS respondents' *monthly self-reported work status* from 1992 to 2016.

For social security wealth imputation, we needed to first impute the work trajectories of the HRS individuals in all the past (pre-1992) and the future (post-2016) years, covering all respondents from age 20 to age 120. We decided to use the patterns of labor force participation observed between 1992 to 2016 (i.e., how many months a respondent worked between 1992 and 2016) and to apply the same patterns to every 24 years to impute the past (pre-1992) and the future (post-2016) years' work trajectories.

First, we imputed missing monthly labor force statuses for the even years between 1992 and 2016 (i.e., the HRS survey years). In addition to the original labor force status variable that contained categories for employed, unemployed, disabled, retired, and out of the labor force (inactive), we generated three additional categories within the variable indicating missing, dead, and censored. The status "Missing" was used when there was no information on the status of a respondent whatsoever, if the information contained in the HRS did not suffice to assign a status, or if no interview date was recorded. The status "Dead" was used when the respondent passed away. The status "Censored" was used for the time when an individual participated in that wave and did not die or drop out of the data before this wave. Missing monthly work status was imputed in two cases. First, if there were missing monthly work statuses in the transition period where the respondent switched from one job to another, the missing months were imputed as unemployed. Second, if a respondent worked multiple jobs and reported more than one monthly status, we marked this respondent as employed as long as he was working in any of the jobs. In the HRS surveys, the self-reported changes in labor status included month and year in which respondents became unemployed, disabled, or retired. We applied this information to identify the beginning of their nonworking periods in the work trajectories. Lastly, using the exit interviews, we identified the exact month and year of respondents' passing away (which caused them to exit the survey).

Second, as the HRS was a biennial survey conducted only in the even years, we had to identify the monthly work statuses of the respondents for the odd years between 1992 and 2016. Information from the (even) year t-1 was used to fill the work statuses in year t, but not thereafter. If a respondent reported being unemployed in July 2014 (HRS survey year), and being employed in June 2016 (next HRS survey year), the status unemployed was assigned to months starting from July 2014 to June 2016. In some cases, not all months between two HRS surveys could be assigned a status, leaving gaps in working trajectories. Respondents' monthly work statuses in these gaps were imputed using the following rules:

- **"LEFT"**: Status A was assigned for all missing months.
- **"RIGHT":** Status B was assigned for all missing months.

- **"MID":** A transition between A and B was assumed to occur in the *middle* of the interval of missing information. First half of the missing months were assigned Status A, and the next half was assigned Status B.
- **"OTHER1"**: The missing months were assigned as out of the labor force — a work status different from Status A or Status B.
- **"OTHER2"**: The missing months were assigned as unemployed — a work status different from Status A or Status B.
- **"OTHER3":** A transition between Status A and a different status was assumed to occur in the *middle* of the interval of missing information. First half of the missing months were assigned Status A, and the next half was assigned unemployed.

Table A1 below summarizes the imputation rules. The initial observed work statuses (Status A) are given in the row, and the subsequent observed statuses (Status B) after the missing monthly statuses are given in the column.

Table A1: Imputation rules for missing monthly labor force statuses

Initial (Status A) \ Subsequent (Status B)	*death*	*out of labor force*	*disabled*	*unemployed*	*retired*	*employed*
out of labor force	left	left	left	left	left	other3
disabled	left	mid	left	left	left	other3
unemployed	left	mid	left	left	left	left
retired	left	mid	left	left	left	left
employed	left	right	other1	other1	other1	other2

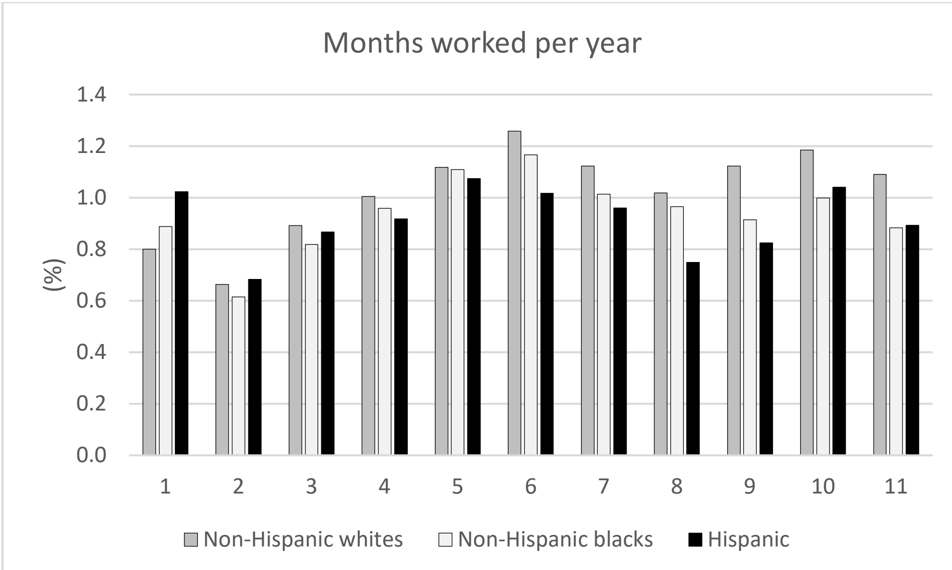
Approximation of future work trajectories

Once the monthly labor force statuses between 1992 and 2016 were identified as explained above, we imputed the respondents' future work trajectories beyond 2016 (i.e., the year of the latest HRS survey). The monthly labor statuses were simplified into a binary variable, indicating whether one worked (1) or otherwise (0). We first counted the number of months the respondents worked between 1992 and 2016, and imputed the future monthly work statuses in a way that the same number of working months as observed in 1992 to 2016 were assigned (randomly) to every 24-year timeframe. We imputed the work trajectories for everyone until the maximum age T=120. For example, if a respondent worked for 240 months between 1992 and 2016, we imputed his past working trajectory by randomly assigning 240 working months for every 24-year bandwidth, beyond 2016. Based on these imputations, we calculated the *number of working months per year for each year beyond 2016 until individuals reached age 120*. The imputed future working months, which closely reflected the observed work trajectories of the respondents, were used to calculate the *annual projected earnings of* *the respondents*. The annual salary is one of the central components of the social security wealth calculation, as explained in the **Data section** of the Manuscript.

Of note, respondents' past earnings prior to 1992 (i.e., the year of the first HRS survey) were based on the actual records from the SSA. These records already reflected any truncation in respondents' work histories. For instance, if an individual worked only for five months in one year, the total income reported for the year was a sum of the five months' earnings. Because the work histories are accurately reflected in the past earnings for the respondents with HRS-SSA linkages, and because the past earnings of the respondents with missing HRS-SSA linkages were imputed based on the existing HRS-SSA linked records of other respondents (see the following section for more details), we did not apply our imputation rules used for the future work trajectories to respondents' past trajectories/earnings.

In the working trajectories file, we found that non-Hispanic whites experienced an average employment gap (i.e., a *period of no work*) of 6.04 years, non-Hispanic Blacks for 5.31 years, and Hispanics for 4.73 years. We also found that non-Hispanic whites worked for *full 12 months* per year on average for 6.95 years, 5.23 years for non-Hispanic Black, and 4.59 years for Hispanics. Figure A2 below shows the share of respondents experiencing yearly work-truncations —working anywhere from 1 to 11 months in a year—by race. We observed a similar pattern across the three groups. Specifically, we saw a slightly higher proportion of non-Hispanic Blacks and Hispanics who worked for only one month per year compared to non-Hispanic whites.

Figure A2: Percent of respondents working 1 to 11 months per year during their working life, by race



Imputations of past HRS earnings

For person-year observations showing respondents working but having zero or negative earnings, as well as for person-year observations with missing HRS-SSA linkages, we imputed the past earnings. We used the multiple imputation technique that involved iterative stochastic imputation strategies, available as a prewritten STATA package. This method allowed for imputation of zero as a possible value and imputation of earnings brackets used in the surveys to recover nonresponse (Wong and Espinoza 2004). We used age, sex, race, cohort, and education covariates for the imputations conducted separately by racial group. In the multiple imputation technique, overall distributions of the observed data were used to estimate multiple imputation values, accounting for the uncertainty around the true earnings value that was missing (Johnson and Young 2011; White et al. 2011). We generated five multiple imputations of earnings for each person-year observation, and set the median of the five imputations as the value to be used for estimating individuals' Social Security wealth (Lokupitiya et al. 2006; Ni et al. 2005; White et al. 2018). If the imputed value of earnings was (a) equal to or below zero or (b) above the 99th percentile of the unimputed earnings distribution in the SSA-HRS linked records for each year, we reimputed the earnings. This reimputation process was repeated 26 times. Our ultimate earnings distribution was similar to that reported for those with HRS-SSA linked earnings.

Approximation of future HRS earnings (projecting to age 120)

For 2019 and subsequent years, we projected the earnings of everyone to increase by 1% every year. However, we recognized that not everyone would work continuously throughout their working lives and applied to the future imputed earnings individuals' distinct patterns of employment (i.e., number of months worked per year) calculated based on their past working trajectories — described above. For example, if an individual was expected to work only six months per year in 2017, we adjusted so that only a half of the imputed annual earnings in 2017 remained in the record.