



Educational Variations in Cohort Trends in the Black-White Earnings Gap Among Men: Evidence From Administrative Earnings Data

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Abstract

Despite efforts to improve the labor market situation of African Americans, the racial earnings gap has endured in the United States. Most prior studies on racial inequality have considered its cross-sectional or period patterns. This study adopts a demographic perspective to examine the evolution of earnings trajectories among white and black men across cohorts in the United States. Using more than 40 years of longitudinal earnings records from the U.S. Social Security Administration matched to the Survey of Income and Program Participation, our analyses reveal that the cohort trends in the racial earnings gap follow quite different patterns by education. Race continues to be a salient dimension of economic inequality over the life course and across cohorts, particularly at the top and the bottom of the educational distribution. Although the narrowing of the racial gap among high school graduates is in itself a positive development, it unfortunately derives primarily from the deteriorating economic position for whites without a college degree rather than an improvement in economic standing of their black counterparts.

Keywords Life course · Cohort trends · Racial and ethnic inequalities · Labor market · Administrative data

Introduction

An important feature of demographic change and population dynamics is the way in which economic positions evolve over the life course and across cohorts. Given that

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racial and ethnic differences in earnings remain substantial in the United States (Bound and Freeman 1992; Morris and Western 1999; Neal and Rick 2014; Semyonov and Lewin-Epstein 2009; Wilson and Rodgers 2016), it is important to understand how the life course trajectories of racial inequality in the labor market change across cohorts of the population. Ample research has found that although the earnings disadvantage among African American men declined in the aftermath of the Civil Rights movement, the black-white earnings gap has stagnated since 1980 despite labor market regulations and public policy measures designed to reduce racial discrimination and enhance the socioeconomic attainments of African Americans (Fryer 2011; Grodsky and Pager 2001; Kim 2010; Manduca 2018; Wilson and Rodgers 2016). The black-white ratio in weekly earnings among men was 76.3% in 1980, 73.3% in 1990, 77.0% in 2000, and 73.9% in 2015 (U.S. Bureau of Labor Statistics 2016). Yet, to date, most prior studies on racial inequality have focused on its cross-sectional or period patterns. In this study, we adopt a demographic perspective to examine the evolution of earnings trajectories among white and black men across consecutive cohorts (Cheng 2014; DiPrete and Eirich 2006; Tomaskovic-Devey et al. 2005; Western et al. 2012). Adopting life course and cohort perspectives allows us not only to investigate the evolution of racial inequality across the life span but also to ascertain the ways in which the life course trajectories for both races have shifted across cohorts.

More specifically, our study aims to contribute to current scholarship on racial inequality in three ways. First, we simultaneously examine cohort changes in earnings trajectories among white and black men. Previous work on racial inequality has primarily focused on either the economic status of blacks (e.g., Bound and Freeman 1992; Chandra 2003) or the economic standing of blacks compared with their white counterparts (e.g., Donohue and Heckman 1991; Smith and Welch 1989; Western and Pettit 2005), largely ignoring the changes in economic outcomes within both racial groups. We emphasize instead that the trend in racial inequality is a two-sided story that involves possible changes in the earnings trajectories of both racial subgroups. For instance, a narrowing of the racial earnings gap over time can result from improvement in the economic position of blacks, the deterioration of economic position of whites, or some combination of both. By examining whether white and black men, respectively, have gained and lost economically across cohorts, we offer a more complete picture about not just whether the racial gap has narrowed or widened across cohorts but also the potential sources behind these changes.

Second, moving beyond prior studies that have mainly included educational attainment as a control variable, we investigate the educational variations in the cohort trends of the black-white earnings gap. Although increased educational attainment over past decades is associated with rises in blacks' average earnings overall (Chay et al. 2014; Heckman and LaFontaine 2010; Ryan and Bauman 2016), racial inequality may persist or worsen within educational groups. Importantly, the improvement in blacks' educational attainment occurred against the backdrop of rising economic inequality and the continued labor market polarization by educational levels, which has affected earnings for both black and white workers (Autor and Dorn 2013; Juhn et al. 1993; Morris and Western 1999). It has been widely documented that since the 1970s, real earnings among college-educated men have grown steeply, while those of men with only a high school diploma or some college experienced stagnation in earnings growth, and those without a high school diploma endured declining earnings (Autor et al. 2008).

However, what has escaped significant empirical investigation is the ways in which these trends lead to very different patterns of racial inequality at different educational levels. At the top (i.e., college graduates) and bottom (i.e., those with less than a high school diploma) of the educational spectrum, earnings polarization can pull the ceiling and floor of earnings farther from the middle, which in turn widens the racial gap. At the middle of the educational distribution, however, the deterioration of economic positions for both racial groups—but particularly whites—might pull whites' and blacks' earnings closer to each other, resulting in a reduced racial earnings gap. By considering the trends in the racial earnings gap in this broader context of rising inequality and educational differences, we offer a fuller account of the interaction of race and education in shaping trends in earnings inequality.

Third, most prior studies on trends in racial inequality have relied on survey data. Our analysis utilizes data from the Survey of Income and Program Participation (SIPP) matched to more than 40 years of longitudinal earnings and benefit records compiled at the U.S. Social Security Administration (SSA). These linked administrative data provide large samples of long-term, repeated records of annual earnings that do not suffer from the selective attrition problem that is typical of longitudinal surveys. Additionally, administrative earnings data substantially improve the quality of earnings measures by reducing errors that are due to inaccuracy of recalling, confusion with earnings concepts, and errors in proxy reports (Bound et al. 2001; Kim and Tamborini 2014). Using these newly available restricted-use data in this study allows us to generate more reliable estimates of individual- and group-specific earnings profiles across the life course and for different cohort groups.

We estimate multilevel growth curve models and examine hypotheses about the cohort trends in earnings trajectories for different educational groups based on model predictions. Our analyses show that race continues to be a salient dimension on which economic inequality is generated and maintained over the life cycle and across cohorts, particularly at the top and bottom of the educational spectrum. What appears to be a positive sign of a narrowing racial gap among workers with only a high school diploma is actually the manifestation of the deteriorating economic position for whites without a college degree. Our findings point to the importance of considering the cohort shifts in earnings trajectories for both whites and blacks in understanding trends in racial inequality. They also suggest that policies targeting racial inequality should take into account the unevenness of trends across educational levels.

A Cohort and Life Course Approach to Racial Inequality

Earnings differences between white men and Asian American men, Mexican American men, and Native American men derive almost entirely from compositional differences in education, region, and other demographic characteristics (Hurst 1997; Trejo 1997; Zeng and Xie 2004). However, in the case of African American men, their average wages are about 15% lower than for white men after these demographic characteristics and occupational attainment are controlled for (Couch and Daly 2002; Farley 1996; Grodsky and Pager 2001; Neal and Rick 2014). Black-white earnings inequality has been substantially reduced in the last half of the twentieth century up to the 1980s (Holzer 2001; Semyonov and Lewin-Epstein 2009; Smith and Welch 1989; Wilson and

Rodgers 2016). During the period of the declining racial wage gap after World War II, black men's wages increased substantially more than those of white men (Bayer and Charles 2018; Smith and Welch 1989). During that period, the relative wage gain of black college graduates was four times larger than that achieved by black high school graduates (Smith and Welch 1989). However, in the three decades after the 1980s, the racial earnings gap has either remained stagnant or expanded (Bayer and Charles 2018; Neal and Rick 2014; Semyonov and Lewin-Epstein 2009; Wilson and Rodgers 2016).

Previous literature has mostly examined the cross-sectional patterns and period changes in whites' and blacks' earnings. In doing so, it has tended to treat individuals as single points of observations. This assumption holds if the economic positions of blacks and whites follow stable and parallel trajectories over the life cycle, but it may otherwise lead to biased—or at least incomplete—conclusions. For example, if blacks' and whites' earnings trajectories diverge over the life cycle, the black-white earnings gap calculated as a snapshot measure will overstate the gap at younger ages and understate the gap at older ages. Indeed, recent studies have documented diverging earnings trajectories between blacks and whites over the life course after controlling for education, indicating a cumulative earnings disadvantage for blacks (Cheng 2014; Tomaskovic-Devey et al. 2005).

Examining the earnings trajectories for different racial groups over long stretches of their lives also provides a window into the social and historical changes that altered the career prospects and employment situations for black and white workers. As Elder (1985) elaborated in his theory of the life course, the human life course should be seen as a long-term process through which social and historical factors influence the distribution of economic rewards among racial and educational groups. It then follows that the cohort shifts in the life course trajectories of racial inequality will be a reflection of the social and historical changes that have shaped individuals' careers (Bernhardt et al. 2001; DiPrete and Eirich 2006).

Finally, cohort and life course perspectives also lead us to emphasize that the trend in racial inequality is a two-sided story that involves intercohort shifts for both blacks and whites. Whether increasing or decreasing, the relative economic positions of black and white workers depend on how the life chances of both subgroups respond to changes in the economic and institutional contexts of the labor market. For example, a reduction of the racial earnings gap across cohorts may appear to be a positive finding given that it can result from real progress in blacks' economic status, but this can also result from a deterioration among their white counterparts. Therefore, teasing out these different sources of changes in the black-white earnings inequality is important.

Variations in Cohort Trends by Educational Levels

Most prior work has focused on the trends in racial inequality, with or without educational attainment included as a control variable. By contrast, our study emphasizes that to fully understand the educational differences in examining the black-white earnings gap, one must consider the context of decades of changes in the labor market that affect workers at different positions in the educational spectrum in different ways and to different degrees. These labor market changes include the continued rise of economic inequality (Autor et al. 2008; Morris and Western 1999), declining

unionization (Western and Rosenfeld 2011), increasing precariousness of jobs (Kalleberg 2009), technological upgrading (Kristal 2013), and stagnation in the low-wage labor market (Bernhardt et al. 2001; Newman 2006). When combined with widening educational differences in employment and earnings outcomes associated with the aforementioned institutional changes in labor markets, the sources of the observed level of racial inequality undoubtedly derive from complex heterogeneous processes that are shaped simultaneously by their membership in racial and educational groups. Our primary goal in this study is to examine the ways in which life course earnings trajectories among black and white workers have evolved across cohorts. The following discussion provides the theoretical basis for anticipating different or similar cohort trends in different educational groups but does not generate hypotheses about specific mechanisms underlying these trends.

We begin with those at the top of the educational spectrum: college graduates. Although the increase in black men's college attainment across cohorts has contributed to the narrowing of the racial earnings gap overall (Bound and Freeman 1992; Lee 2002), black and white college graduates may still face quite different labor market prospects over the course of their lifespan. In fact, period trend studies suggest that the racial earnings gap has widened most among college graduates and that the expansion of the racial gap is most pronounced among older workers (Bound and Freeman 1992; Wilson and Rodgers 2016). This widening gap may relate to several factors. One prominent explanation for the gap is the role of human capital accumulation in the labor market. Tomaskovic-Devey (1993) illustrated the importance of training and skill accumulation for explaining racial differences in career progression. Tomaskovic-Devey et al. (2005) demonstrated the organizational and institutional processes through which earnings disparities not only exist at labor market entry but also are reproduced as workers progress with their careers. Black and white college students also tend to major in different fields. White college graduates are more likely to major in higher-paying fields, such as science, technology, engineering, and mathematics (STEM) (Xie et al. 2015) and medicine (Rumala and Cason 2007), as compared with other majors, such as the social sciences and education. Among those who study in these high-paying fields, African Americans may lack the cultural capital necessary for staying in these fields (Archer et al. 2012; Chang et al. 2014; Davies and Guppy 1997). Additionally, black college graduates are less likely than their white counterparts to pursue lucrative professional degrees (Bowen and Rudenstine 1992), which may further contribute to the growing racial divergence in earnings trajectories among college graduates.

Meanwhile, the continued polarization of employment and earnings in the past decades has been associated with expanding earnings differences among workers, particularly among high earners (Piketty and Saez 2003). This implies that even when the relative rankings of white and black college graduates hold constant, the absolute magnitude of their earnings gap may still expand over time because of rising inequality at the upper end of the earnings distribution (Blau and Kahn 1992; Manduca 2018). Additionally, the reproduction of black-white wealth gap through intergenerational transmission can provide whites with an additional advantage: high-skilled whites may be more likely than their black counterparts to invest in human capital that does not pay off immediately but has a considerable long-term earnings payoff (Barsky et al. 2002; Charles and Hurst 2002). We therefore expect earnings trajectories of college graduates for both races to shift upward from cohorts entering the workforce in the

1970s to cohorts entering in the 1980s and 1990s, when most of rise in skill premium and labor market polarization occurred. We also expect that white college graduates enjoyed greater economic benefits of college than their black counterparts. These cohort shifts may be particularly pronounced at older ages. We therefore propose the following:

Hypothesis 1a: At the top of the educational distribution (college graduates), earnings trajectories shifted upward for both blacks and whites across cohorts.

Hypothesis 1b: Among college graduates, earnings gains for whites were greater than those for blacks, leading to a widening racial earnings gap across cohorts.

At the bottom of the educational distribution—that is, those with less than a high school diploma—workers are experiencing stagnant or decreasing real wages and earnings (Bernhardt et al. 2001). This trend is believed to be associated with a combination of several factors, including the declining union membership (Card 2001; Kim and Sakamoto 2010; Western and Rosenfeld 2011), increased globalized competition and manufacturing decline (Acemoglu and Autor 2011; Wilson 1987), a declining value of the minimum wage (Lee 1999; Mishel 2013), eroding internal labor markets for lesser-skilled workers (Cappelli 1999), and increasing automation of many routinized job tasks (Autor and Dorn 2013). Although both black and white workers at the bottom of the educational spectrum were negatively affected by these trends, less-educated African Americans may be the most affected by the trends of manufacturing decline and the decreasing demand for lesser-skilled workers (Sakamoto et al. 2018; Wilson 1987, 1996). Further, the overall downward trend in unionization may have greater adverse consequences for less-educated black men given their historically higher union membership rates (Bound and Freeman 1992; Card 2001; Rosenfeld and Kleykamp 2012; Wilson and Rodgers 2016). African American workers with low educational attainment are further disadvantaged relative to their white counterparts because of greater neighborhood segregation, racial isolation, limited community resources, and other social problems that are more common in African American neighborhoods (Iceland and Wilkes 2006; Massey and Denton 1993; Rankin and Quane 2000; Sampson et al. 2002; Wilson 1987). To be sure, economic segregation among whites also exists, but compared with their black counterparts, low-income whites are more likely to live in middle-class neighborhoods (Reardon and Bischoff 2011) and hence are less disadvantaged in their access to quality schools and educational resources (Owens et al. 2016). Moreover, as the share of black men without a high school diploma declines over time, the average ranking of this education group will also decline. This composition change may lead to the worsening of average economic standing for black men at the bottom.

Another important factor driving down the economic standing of less-educated men is lack of labor force attachment. The labor force participation rates of less-educated men have declined in recent decades, but the decline has been significantly greater for black men in this group (Bound and Freeman 1992; Charles et al. 2016; Sum et al. 2011; Wilson 1996). Non-employment has major implications for earnings trajectories because it disrupts the accumulation of job skills and hinders earnings growth (Tomaskovic-Devey et al. 2005). Furthermore, non-employment is associated with

relatively high rates of incarceration among less-educated black men (Chandra 2003; Mare and Winship 1984; Western and Pettit 2005). Incarceration not only results in the exclusion of black men with potentially very low earnings from the labor force and therefore an understatement of the racial earnings gap (Western and Pettit 2005) but also has negative net effects on employment, wages, and promotion chances in subsequent years (Western 2002). In fact, one important strength of the longitudinal, trajectory-based analysis adopted in our analyses is that unlike cross-sectional analyses, which often simply exclude black men who are not working, our longitudinal data enable us to include these men's earnings trajectories after they reenter the labor force so long as they were not incarcerated at the time of the survey (Sakamoto et al. 2018). Furthermore, predictions from the individual-level growth curve models allow us to extrapolate beyond the range of the observed earnings data and predict potential earnings for nonworking years based on earnings both before and after labor force reentry. Hence, we expect our cross-cohort analysis to more accurately reflect the declining economic standing among black men with less than a high school diploma, particularly in regard to their stagnant earnings growth due to non-employment. These considerations lead to our next pair of hypotheses:

Hypothesis 2a: At the bottom of the educational distribution (those with less than a high school diploma), earnings trajectories shifted downward for both blacks and whites across cohorts.

Hypothesis 2b: Among workers without a high school diploma, earnings loss was greater among blacks than among whites, leading to a widening racial earnings gap across cohorts.

The situation for men in the middle of the educational spectrum—that is, those with a high school diploma or some college—seems mixed. On the one hand, both whites and blacks may be negatively affected by changes such as reduction in union membership, globalization, deindustrialization, automation, and a declining minimum wage, as discussed earlier. On the other hand, it is unclear from previous literature whether these changes will be more consequential for whites or for blacks. Workers in the middle education groups are more sensitive to reduced unionization and increased job polarization. If labor unions tend to protect white workers' earnings to a greater degree than black workers' (Glenn 2004; Kaufman 1986), declining unionization might result in a greater earnings drop for the white workers than for black workers, leading to a narrower racial gap among middle education groups. However, if unions work as an equalizing institution, the reduction in union membership might widen racial inequality (Rosenfeld and Kleykamp 2012).

The impacts of automation and job polarization can similarly vary by race. Since the 1980s, middle-skill jobs have been disappearing while low-skill service jobs and high-skill professional and managerial jobs have been growing (Autor and Dorn 2013). Occupations that have contracted most dramatically are those that rely on routine nonmanual tasks that can be more easily replaced by machine technologies (Autor 2013). To the extent that white men with only a high school education are more likely than their black counterparts to be concentrated in these middle-skill, routine nonmanual jobs, we expect job polarization to result in a worsening economic position among whites and thus to narrow the racial gap.

In addition, the racial earnings gap among those with some college is affected by the quality and returns to their schooling. The quality of sub-baccalaureate education for blacks may be worse than that for whites. In fact, less than two-fifths of those who enroll in community college go on to graduate or transfer to a four-year institution in six years, and the racial gaps in the likelihood of obtaining an associate's degree or transferring to a four-year institution are substantial (Moore and Shulock 2010). Additionally, blacks with a sub-baccalaureate education are disproportionately enrolled in for-profit colleges, which are not associated with improved earnings (Cellini and Turner 2016). To adjudicate between these different expectations, we test two competing hypotheses:

Hypothesis 3a: At the middle of the educational distribution, earnings trajectories diverged between blacks and whites, leading to a widening racial earnings gap.

Hypothesis 3b: At the middle of the educational distribution, earnings trajectories converged between blacks and whites, leading to a narrowing racial earnings gap.

The Value of Linked Administrative Earnings Histories

We use national survey data linked to administrative earnings histories to examine our hypotheses. The linked administrative data have three major advantages. First, although synthetic cohorts can be constructed with cross-sectional data to reflect changes over the life course, that type of analysis elucidates only aggregate changes—not individual trajectories. Longitudinal surveys, in theory, can overcome this problem by generating repeated measures for the same individual over time. But in practice, longitudinal survey data usually consist of small sample sizes for racial minorities, suffer from large and selective sample attrition, and may not follow up with respondents every year. In the linked administrative data that we use, the earnings are obtained from respondents' own administrative earnings records, avoiding the need to rely on repeated survey reports. Hence, this data set enables us to construct full-length earnings profiles for individuals over a long stretch of their lives.

The second advantage is measurement. For various reasons—including the inaccuracy of recalling earnings, confusion associated with earnings concepts, and errors in proxy reports by other household members—earnings in survey data often suffer from various measurement errors (Bollinger 1998; Bound et al. 2001; Duncan and Hill 1985; Gottschalk and Huynh 2010). These errors, in turn, may vary by socioeconomic covariates and earnings levels, and their interactions (Bound et al. 2001; Kim and Tamborini 2014). Additionally, survey data contain an increasing amount of imputed values for missing earnings, which may bias estimated between- and within-group earnings gaps (Bollinger and Hirsch 2006; Hirsch and Schumacher 2004; Mouw and Kalleberg 2010). These drawbacks can be largely overcome by linking survey respondents with their own records in administrative data, which provide more accurate and consistent measures of earnings over time.

Third, the use of longitudinal earnings allows us to account for the selection into being an income earner (or the selection out of employment). Given the black-white gaps in labor force attachment (e.g., Chandra 2003; Neal and Rick 2014; Western and

Pettit 2005), the earnings measures in repeated cross-sectional data will be available only for those who were working and may thus generate biased estimates of the racial earnings gap on the aggregate level. On the other hand, earnings measures in longitudinal data—as opposed to cross-sectional data—can help adjust for non-employment by using a person’s observed earnings both prior to and after non-employment years to predict the potential earnings in those years. This is done by estimating the individual-specific intercepts and slopes from the longitudinal data and relying on the model-predicted earnings trajectories instead of the observed earnings (which are subject to employment selection) to determine the cross-cohort shifts in black and white men’s economic standing.

Data, Sample, and Methods

We use a restricted-use data set that contains the 2004 and 2008 panels of the SIPP matched to longitudinal earnings and benefit records compiled at SSA. The SIPP is a nationally representative panel survey administered by the U.S. Census Bureau. Our base sample comes from Wave 2 of each panel because this wave contains modules that collected retrospective educational histories. The 2004 and 2008 panels are pooled to increase sample sizes, particularly of African Americans of different educational groups.

The linked longitudinal earnings records cover 1970 to 2014. As previously discussed, a chief advantage of these linked data is that they contain the annual earnings of each linked SIPP respondent over long stretches of their life, allowing us to examine intragenerational earnings trajectories of real birth cohorts over prime working years well before and after the SIPP panel. As noted, survey data suffer several disadvantages when used for long-term analysis of earnings trajectories, such as measurement error, and appreciable longitudinal attrition. The linked SIPP–SSA data do not suffer from attrition as long as the SIPP respondents were successfully matched to their administrative records. Although we fail to construct administrative linkages for some SIPP respondents, the match rate is high (80% for 2004 SIPP and 90% for 2008 SIPP). Following prior published work using these data (Couch et al. 2015; Villarreal and Tamborini 2018), we adjust the SIPP person-weights for nonmatches to maintain the national representativeness of the sample. We do this by estimating a logistic regression of a successful match across a range of characteristics. Then, based on the predicted matching probability, we multiply the inverse of this match probability given the characteristics by SIPP person-weights.

We select native-born, non-Hispanic black and white men from three 10-year birth cohorts in the SIPP–SSA data set. For simplicity, we label these cohorts Early Baby Boomers (1945–1954), Late Baby Boomers (1955–1964), and Generation X (1965–1974). We examine these men’s annual earnings from ages 25 to 45. That is, we focus on earnings from 1970 to 1999 for the Early Baby Boomer cohort, from 1980 to 2009 for the Late Baby Boomer cohort, and from 1990 to 2014 (the last year of available data) for the Generation X cohort. As discussed earlier, these cohorts experienced different labor market trends during the prime ages for work career development. To avoid differential mortality selection, which may affect the likelihood of being in the

SIPP surveys, we do not include individuals from earlier cohorts.¹ Figure A1 (online appendix) summarizes the observation window of the three cohorts as it relates to our data structure. Section B of the online appendix presents additional technical details on the data.²

Our key dependent variable is the natural logarithm of inflation-adjusted annual earnings (in 2014 dollars) in each calendar year. The main administrative data source is the Detailed Earnings Record (DER), which provides respondents' annual earnings based on employer-provided W-2 forms submitted to the Internal Revenue Service (IRS) for all jobs in a year from 1980 to 2014. We use the SSA's Summary Earnings Record (SER) to ascertain earnings prior to 1980 for our earliest cohort.³ To avoid possible issues from extreme outliers, we cap earnings at \$400,000, which is about the 99.5 percentile.

Given that workers of different skill levels may face different trends of labor market opportunities, our models include education additively as well as interacted with race. We categorize four groups based on the highest educational attainment completed at the time of survey: less than high school, high school graduate⁴, some college, and bachelor's degree or higher. A robustness check restricting the analysis to only those years after the respondent had completed the highest educational level shows consistent results. We also include controls for calendar year, a time-varying dummy variable indicating positive self-employment earnings, and a dummy variable indicating the wave of the SIPP panel.

We use a multilevel growth curve model to analyze earnings and earnings growth in the longitudinal data (Cheng 2014; Raudenbush and Bryk 2002). The model involves two levels. The Level 1 model is organized around the person-year observations:

$$W_{it} = \beta_{0i} + \beta_{1i}t + \beta_2t^2 + e_{it}, \quad (1)$$

where W_{it} is the person-specific time-varying log annual earnings. The time dimension, t , is calculated as age – 25. The random coefficients β_{0i} and β_{1i} are allowed to vary in the

¹ We also exclude a tiny fraction of respondents who received a Social Security disability benefit (either through the disability insurance or needs-based Supplemental Security Income programs) before age 25 using a merged administrative variable. To construct earnings trajectories, we also require individuals to have more than one year of positive earnings over their observation period.

² As far as we are aware, this is the first study to look at racial gaps in annual earnings by cohort using the SIPP-matched data. Sakamoto et al. (2018) used similar data, but their work focused on cumulative 20-year earnings, used different methodologies, and did not examine cohort differences. Others have used these data to examine other aspects of earnings inequality, such as lifetime earnings by field of study (Kim et al. 2015), intergenerational income persistence (Dahl and DeLeire 2008; Mazumder 2005), and women's life cycle employment patterns (Goldin and Mitchell 2017). Our use of these data is generally consistent with their work.

³ The SER file contains annual earnings covered by the Social Security program. See the online appendix, section B, for a description of earnings measures in the DER and SER files. We switched our earnings measure from the SER file to the DER file in 1980 (the first year available) onward because the DER includes earnings that are not limited to the Social Security taxable maximum as well as earnings from jobs not covered by Social Security. Importantly, we replicated our regression models using individuals' Social Security earnings (from the SER) for the entire analysis, up to 2014 (instead of switching to earnings from the DER beginning in 1980). Results were unchanged. We include taxable earnings from self-employment in our earnings measure in order to observe earnings in the most comprehensive way. Annual self-employment income comes from IRS Form 1040 Schedule SE. Our models include a dummy variable for self-employment as a control.

⁴ We define high school graduates as those with 12 completed years of schooling and/or a high school diploma or G.E.D. In this paper, we consider a G.E.D. equivalent to a high school diploma.

population. For parsimony, we assume that the coefficient on the quadratic term (β_2) is fixed, but results are unchanged when we allow it to vary by race, education, and person.⁵

The Level 2 model predicts the person-specific baseline earnings and person-specific earnings growth rate using the person's educational attainment (S_{1i}) and race (S_{2i}), as well as their interactions:

$$\beta_{0i} = \gamma_{00} + \gamma_{01}S_{1i} + \gamma_{02}S_{2i} + \gamma_{03}S_{1i} \times S_{2i} + u_{0i}, \quad (2)$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}S_{1i} + \gamma_{12}S_{2i} + \gamma_{13}S_{1i} \times S_{2i} + u_{1i}. \quad (3)$$

For each cohort, we estimate a *baseline model* with race as the independent variable, an *additive model* with educational attainment added to these equations, and finally a *race-education interactive model* with race and education included additively and interactively in Eqs. (2) and (3). We predict earnings trajectories and black-white earnings gaps based on these models and then compare their differences across the cohorts.

Descriptive Patterns by Race and Cohort

Figure 1 presents the trajectories of men's mean log annual earnings by race and cohort and the black-white earnings gap by cohort. We start by describing the intercohort shifts in average earnings trajectories for white men (left panel) and black men (middle panel). Among whites, the average earnings trajectories remained largely unchanged across cohorts. By contrast, among blacks, the earnings trajectories appear to have shifted substantially across cohorts. Average earnings shifted modestly downward from Early Baby Boomers to Late Baby Boomers, and then rose for Generation X. These cohort changes indicate that on average, black men in the Late Baby Boomers cohort consistently experienced lower earnings over their lives relative to the other two cohorts. Black men's earnings trajectories rose in the Generation X cohort, with average earnings reaching similar levels as Early Baby Boomers.

The right panel of Fig. 1 demonstrates the age-specific racial earnings gap by cohort. For all three cohorts, the racial earnings gap widened from age 25 to 45, which is consistent with the cumulative disadvantage phenomenon documented in previous studies (Cheng 2014; Tomaskovic-Devey et al. 2005). The average racial earnings gap increased from Early Baby Boomers to Late Baby Boomers and then declined in Generation X. Still, the cohort trends based on population average may mask important heterogeneity by educational attainment (see Fig. E1 in the online appendix for descriptive results by education). We focus on such heterogeneity in the model-based analysis below.

⁵ In our context, the multilevel growth curve model refers to the random-effects model, where the random effects take the form of either random intercepts or random slopes. The model was fit via maximum likelihood estimation. We specify the residual term as an autoregressive process of order 1 (AR(1)): $\epsilon_{it} = \rho\epsilon_{i,t-1} + v_{it}$. This specification implies that the residual term contains a nontransitory part and a transitory part: the coefficient ρ captures the dependence of the residual on the residual in the previous year. The latter term of the residual structure, v_{it} , is assumed to be independently distributed at different ages. The results are also robust with and without the inclusion of SIPP weights (see online appendix, section H).

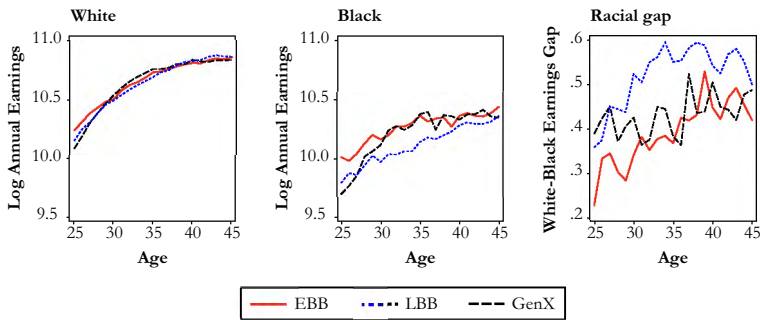


Fig. 1 Trajectories and racial gaps in log annual earnings. Data are from the SIPP matched to more than 40 years of longitudinal earnings and benefit records compiled at the SSA. Early Baby Boomers (EBB) include 8,888 individuals; Late Baby Boomers (LBB) include 9,953 individuals; and Generation X (GenX) includes 7,807 individuals. SIPP person weights adjusted for nonmatches are used.

Predicted Trajectories Based on Growth Curve Models

We next present results from race-education interactive growth curve models, as specified in Eqs. (2) and (3).⁶ The results are presented in Table 1. Overall, being black is associated with lower initial earnings and lower earnings growth, but the pattern varies by education. Among men with less than a high school diploma, blacks exhibit lower earnings in early adulthood in all three cohorts. Yet, there are no statistically significant differences in the earnings growth rate between blacks and whites without a high school education, implying that the racial earnings gap persists but does not widen over the life course for this education group. Among men with a college degree, blacks from the Late Baby Boomer cohort and Generation X have lower relative earnings at age 25, and this earnings disadvantage magnifies over their life course.

It might not be intuitive to describe the race- and education-specific earnings trajectories for each cohort based on the estimated model coefficients. Therefore, to facilitate visualization of our results, we present predicted racial earnings gaps by cohort and education in Fig. 2, and we show the predicted earnings trajectories for black and white men in each cohort in Figs. 3, 4, and 5. The following discussions focus on these trajectories.⁷

We begin with the results for the top of the education distribution (Fig. 3). Among bachelor's degree holders, blacks' earnings trajectories climbed on a slower trajectory than whites' in all three cohorts, suggesting a cumulative disadvantage among black workers in this education group relative to their white counterparts. From the Early Baby Boomers to Late Baby Boomers, the earnings trajectories for whites and blacks diverged, resulting in an increase in the racial earnings gap not only within cohort across the life cycle but also across cohorts. Both racial groups experienced a moderate downward shift, with the size of the shift being larger among whites at younger ages

⁶ The baseline and additive models are presented in the online appendix, sections F and G. Because the additive models may mask important heterogeneity by race across educational groups, we focus on interactive growth curve models in our discussion.

⁷ Section I of the online appendix presents the predicted earnings trajectories with their 95% confidence intervals.

Table 1 Estimated coefficients from models predicting log annual earnings

	EBB	LBB	GenX
Intercept	10.186 ***	10.031 ***	9.869 ***
Age – 25	0.052 ***	0.063 ***	0.057 ***
Age – 25, Squared	–0.001 ***	–0.002 ***	–0.002 ***
Effects on Initial Earnings (ref. = high school graduate)			
No high school	–0.339 ***	–0.529 ***	–0.449 ***
No high school × black	–0.326 ***	–0.343 **	–0.606 ***
High school graduate × black	–0.296 **	–0.437 ***	–0.529 ***
Some college	0.040 *	0.118 ***	0.158 ***
Some college × black	–0.381 ***	–0.489 ***	–0.388 ***
Bachelor's degree or higher	–0.074 **	0.270 ***	0.292 ***
Bachelor's degree or higher × black	–0.063	–0.283 ***	–0.177 **
Effects on Earnings Growth Rate (ref. = high school graduate)			
No high school	–0.018 ***	–0.002	0.003
No high school × black	–0.001	–0.009	–0.003
High school graduate × black	–0.006	–0.007 **	0.006
Some college	0.006 **	0.005 **	0.015 ***
Some college × black	–0.002	–0.009 **	0.001
Bachelor's degree or higher	0.044 ***	0.033 ***	0.051 ***
Bachelor's degree or higher × black	–0.014 **	–0.015 **	–0.024 ***
Number of Person-Year Observations	171,230	194,249	142,941
Number of Individuals	8,888	9,953	7,807

Notes: Data are from the SIPP matched to more than 40 years of longitudinal earnings and benefit records compiled at the SSA. EBB = Early Baby Boomers (born 1945–1954); LBB = Late Baby Boomers (born 1955–1964); GenX = Generation X (born in 1965–1974).

* $p < .05$; ** $p < .01$; *** $p < .001$

(around age 25) and larger among blacks at older ages (around age 45). Contrary to Hypothesis 1a, among those with a college degree, only white men experienced earnings gains across cohorts. Black workers, in contrast, actually experienced declining economic positions across cohorts. This intercohort racial divergence translated into an increase of the racial earnings gap across cohorts for this education group (see Fig. 2), a finding that supports Hypothesis 1b.

Why did white college graduates experience greater earnings growth relative to black college graduates across cohorts? Although it is beyond the scope of this study to test specific mechanisms, we explore two potential explanations. First, substantial horizontal stratification exists among college degree holders (Gerber and Cheung 2008). The racial gap among those with a college degree may be due to racial differences in field of study: whites are more likely to major in higher-paying fields—such as STEM, law, and medicine—than their black counterparts (Fischer and Hout 2006; Gerber and Cheung 2008; Kim et al. 2015; Xie et al. 2015). Table J1 in the online appendix shows that in terms of the field of study of their highest degree, for all three cohorts, white and black college graduates have similar proportions of business majors, but the proportion in high-paying

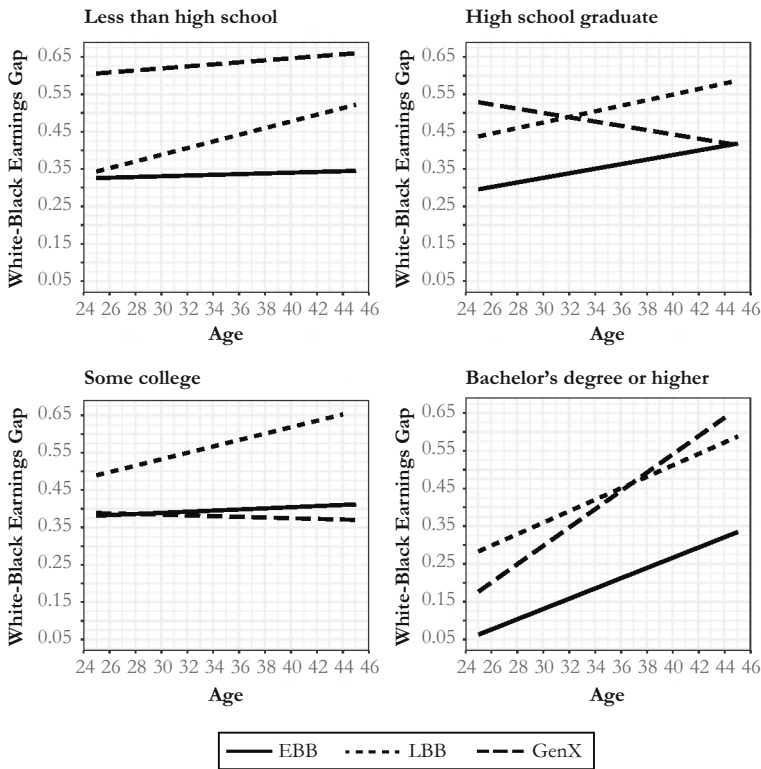


Fig. 2 Predicted racial gaps in log annual earnings by education. Data are from the SIPP matched to over 40 years of longitudinal earnings and benefit records compiled at the SSA. Early Baby Boomers (EBB) include 8,888 individuals; Late Baby Boomers (LBB) include 9,953 individuals; and Generation X (GenX) includes 7,807 individuals.

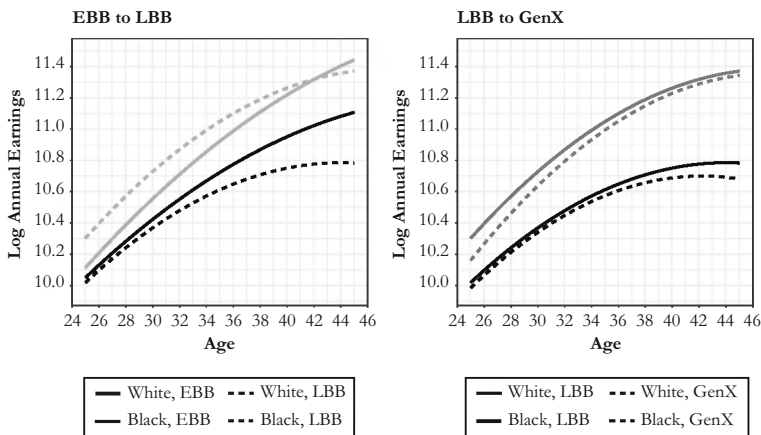


Fig. 3 Predicted cohort-specific earnings trajectories among college graduates. EBB = Early Baby Boomers. LBB = Late Baby Boomers. GenX = Generation X. Data are from the SIPP matched to more than 40 years of longitudinal earnings and benefit records compiled at the SSA.

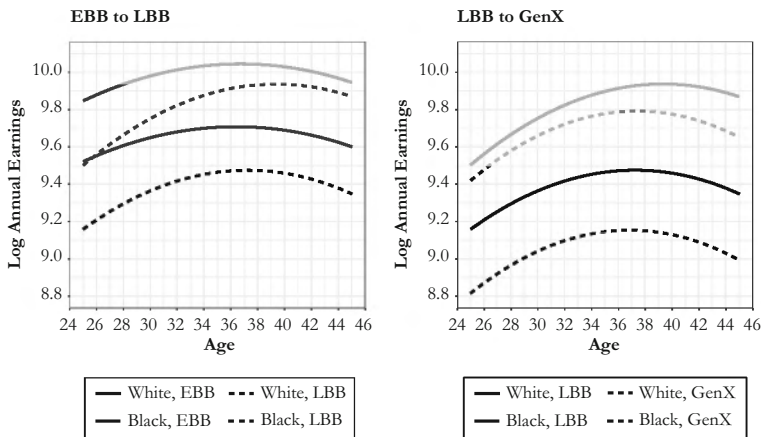


Fig. 4 Predicted cohort-specific earnings trajectories among individuals with less than a high school diploma. EBB = Early Baby Boomers. LBB = Late Baby Boomers. GenX = Generation X. Data are from the SIPP matched to more than 40 years of longitudinal earnings and benefit records compiled at the SSA.

(STEM, law, and medicine) majors is substantially greater for whites than for blacks. If this horizontal stratification among college graduates underlies our finding of greater earnings growth among white college graduates from more recent cohorts, we would expect to see a smaller divergence in earnings by race *within* high-paying and non-high-paying college majors when they are analyzed as separate groups. To explore this idea, we estimate an additional set of growth curve models, with the sample for college graduates now separated into a subgroup of those who majored in fields traditionally associated with higher remuneration (e.g. STEM, business, law/medicine) and a subgroup consisting of those with other majors (see Fig. J1, online appendix). The results suggest that horizontal stratification is unlikely to be a main factor underlying the cohort trend in the racial earnings gap: that is, the widening of the racial earnings gap holds within groups of college-educated men who majored in high-paying and non-high-paying fields.

Another potential explanation for the racial differences in earnings across cohorts among college graduates is that college-educated whites are more likely than their black counterparts not only to attain graduate degrees (Table J2, online appendix) but also to obtain a professional or doctorate degree relative to a master's degree (Table J3, online appendix). These patterns, in turn, may underlie observed growth in the racial earnings gap among college graduates. To provide further understanding, we estimate separate growth curve models for subsamples of college graduates consisting of those with only a bachelor's degree and those with a graduate degree. The results provide partial support for this explanation: the widening of the racial earnings gap from Late Baby Boomers to Generation X appears to apply mainly to those with a graduate degree (Fig. J2, online appendix). In fact, the racial earnings gap narrowed moderately between the Late Baby Boomers and Generation X cohorts among those with only a bachelor's degree. The small sample size for black graduate degree holders in our data, however, warrants caution in the interpretation of this trend and prohibits a more detailed investigation. We call for future work to examine this mechanism with larger-sample data on graduate degree holders.

We next turn to the bottom of the educational spectrum, those with less than a high school diploma. As shown in Fig. 4, earnings trajectories in this group shifted

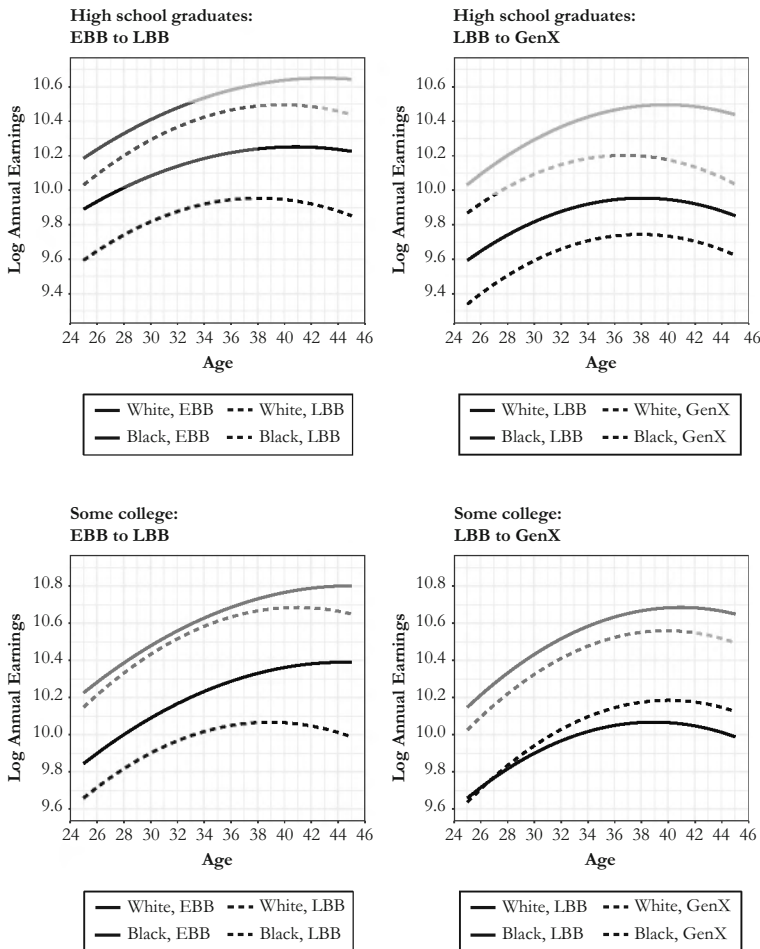


Fig. 5 Predicted cohort-specific earnings trajectories among high school graduates and individuals with some college. EBB = Early Baby Boomers. LBB = Late Baby Boomers. GenX = Generation X. Data are from the SIPP matched to more than 40 years of longitudinal earnings and benefit records compiled at the SSA.

downward for both races from Early Baby Boomers to Late Baby Boomers, and then from Late Baby Boomers to Generation X. The finding of downward shifts for both races supports Hypothesis 2a. Moreover, the magnitude of these downward shifts is greater among blacks than among whites, which led to a widening of the black-white earnings gap across cohorts (see Fig. 2). This finding supports Hypothesis 2b. Black men in this education group—who were already disadvantaged relative to their white counterparts—experienced even greater decline in their economic positions across cohorts. As discussed earlier, this greater decline may have been driven by declining unionization, neighborhood segregation and racial isolation, lack of access to quality school, and rising incarceration, all of which disproportionately exacerbated the economic standing of the least-educated black men relative to their white counterparts.

Additionally, the declining economic position for black men with less than a high school diploma may result from the cohort shifts in educational composition.⁸ In our

data, the racial gap in the proportion of men without a high school diploma has declined steadily from those born in the 1940s to those born in the 1970s (see Table C1, online appendix). As the share of black men without a high school diploma declines over time, the average ranking of this education group in the population will also decline. Thus, this bottom educational group will contain an even more disadvantaged group of workers in more recent cohorts, such as those with more disadvantaged family background or living in neighborhoods with high poverty rates and low employment opportunities. This compositional change may partly explain the decline of the average earnings among black men in this bottom education group.⁹ Another possible underlying factor is the Great Recession, which may have had a particularly large negative effect on the earnings of lower-skilled blacks in Generation X (Neal and Rick 2014).

The two middle-tier education groups, however, tell quite a different story. As with the other two groups, the two middle groups experienced an increase in the racial earnings gap from Early Baby Boomers to Late Baby Boomers. However, unlike the top and bottom education groups, the two middle education groups showed a reduction in the racial earnings gap from Late Baby Boomers to Generation X. As the upper two plots of Fig. 5 show, among those with only a high school diploma, both races experienced downward shifts in earnings trajectories across cohorts. Yet, the timing of these downward shifts occurred differently for blacks and whites in this education group: black high school graduates experienced a larger drop in the two earlier cohorts, from Early Baby Boomers to Late Baby Boomers, whereas their white counterparts experienced a larger drop from Late Baby Boomers to Generation X. As a result, for those with a high school diploma, a divergence in blacks' and whites' earnings trajectories occurred from Early Baby Boomers to Late Baby Boomers (supporting Hypothesis 3a), followed by a convergence in these earnings trajectories in Generation X (supporting Hypothesis 3b).

Another middle-tier education group is some college. White men in this group experienced a small drop from Early Baby Boomers to Late Baby Boomers, followed by a larger downward shift in Generation X. By contrast, blacks in this group experienced a large downward shift from Early Baby Boomers to Late Baby Boomers, followed by an upward shift in Generation X. As the lower two plots of Fig. 5 suggest, from the Late Baby Boomers to Generation X, the earnings trajectories for blacks and whites converged. The racial earnings gap consequently increased from Early Baby Boomers to Late Baby Boomers (supporting Hypothesis 3a) but then decreased because of the convergence in the earnings trajectories (supporting Hypothesis 3b). This can be seen in Fig. 2. These findings suggest that more recent cohorts of black men with some college experienced economic gains in the labor market, which may be driven by their improved human capital through increased years of schooling as well as anti-discrimination policies in the workplace. Yet, this improvement is still not sizable enough to account for the observed narrowing of the racial earnings gap. A large part of

⁰ The narrowing racial gap in educational level, per se, will not affect our estimation of the racial earnings gap because we conduct our analyses separately for different education groups. However, the relative ranking of a given level of educational attainment may change over time as a result of the compositional changes within race-education groups.

⁹ The sample sizes for blacks without a high school diploma in our linked data are still quite small, typically less than 100 individuals at each age (see Tables D1, D2, and D3, online appendix). Larger sample sizes are needed to examine these potential mechanisms.

the narrowing of the racial earnings gap is driven by the continued downward shifts for white men rather than the improving economic positions for their black counterparts.

In sum, although the two middle-tier education groups exhibited narrowing racial earnings gaps in the most recent cohort, a cross-cohort comparison reveals that this narrowing may be a sign of whites' deteriorating status rather than of blacks' improving economic position. How much would the racial earnings gap change if there had not been any changes to white men's earnings trajectories? To further clarify this key finding, Fig. 6 compares the racial earnings gap for Late Baby Boomers and Generation X as well as a counterfactual condition in which we assume that whites' earnings trajectories had remained the same as those in the Late Baby Boomer cohort. The difference between the predicted and counterfactual racial earnings gaps corresponds to the extent to which the closing of the racial earnings gap across cohorts is attributable to the cohort shifts among whites. As Fig. 6 shows, if white men's earnings had not deteriorated, the racial earnings gap would have *widened* rather than narrowed among high school graduates (left panel), and it would have narrowed by a much smaller degree among those with some college (right panel).

Robustness Checks and Limitations

We conduct robustness checks to assess the sensitivity of the results to alternative specifications. To examine the sensitivity of our results to work experience, we replicate our analysis with time-varying controls for the lagged proportion of full-time-earnings years and positive-earnings years. Because the longitudinal earnings data do not contain information about work hours, we develop a proxy to indicate full-time employment in a given calendar year. To do so, we define full-time-earnings years as years in which the worker's annual earnings exceed the expected annual earnings for a

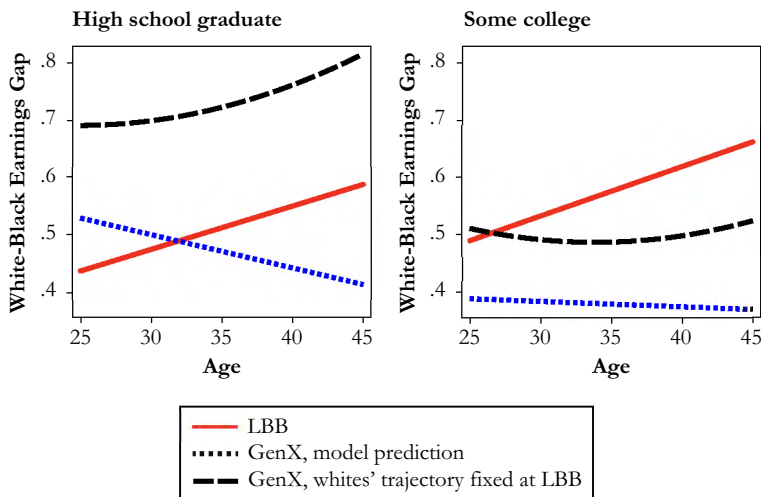


Fig. 6 Predicted and counterfactual trajectories of the racial gap in log annual earnings. LBB = Late Baby Boomers. GenX = Generation X. Data are from the SIPP matched to more than 40 years of longitudinal earnings and benefit records compiled at the SSA.

full-year, full-time worker working at the federal minimum wage (i.e., the federal minimum wage \times 35 hours per week \times 50 weeks per year). The covariate for positive earnings shows only participation in the labor force at any level. The results suggest that none of these controls alter our main findings (see Figs. K1 and K2, online appendix). The lagged labor force attachment or experience variables positively affect earnings, and the effects are somewhat larger among more recent cohorts (Table K1, online appendix). We also estimated our main models on a sample of individuals with annual earnings levels that would suggest working at least half-time and, separately, full-time at the federal minimum wage in a given year (i.e., using the same measures as described earlier). The results are consistent with our main conclusions (Figs. K3 and K4, online appendix). To examine the sensitivity of our results to the functional form of age in the earnings determination function, we conduct an additional set of analysis that allows the coefficient on squared age to vary across race-education subgroups. The results show no substantive differences (Figs. K5 and K6, online appendix). To explore the sensitivity of our results with regard to those with zero earnings, we replicate our analysis on a slightly larger sample that includes years with zero earnings. Here, instead of setting years with zero earnings to missing, we impute the potential earnings of zero-income earners by 60% and 80% of the mean earnings of the positive-income earners who are in the same age, race, and educational group. Our findings are again consistent (Figs. K7 and K8, online appendix).

Our results, however, should be interpreted in the context of several limitations. First, the administrative tax records contain longitudinal information related to respondents' annual earnings (obtained from W-2 records), but these data do not contain other interesting variables, such as hours worked, occupation, industry, firm characteristics, workplace organization structure, and region of employment. We acknowledge that survey data, such as the PSID or NLSY, have the advantage of containing more detailed measures of individuals' life experiences, which we believe will be fruitful areas for future work. Second, a wealth of literature has shown that the racial disparities in family structure have exacerbated the persistent black-white differences in economic standing, especially for lower-income individuals and their families (Bloomer 2014; McLanahan 2004). We do not have direct measures of SIPP respondents' childhood family structure to formally test these mechanisms, and our findings of growing and persistent racial earnings gaps may be partly a result of such racial disparities in family structure that carried over across generations. Also, personal earnings may not fully capture the family's economic standing because the latter also depends on how personal earnings are pooled (or not) in the household. Third, we limit the analysis in this study to men, whose labor market behaviors are affected to a lesser degree by union status and spousal characteristics than women's (Budig 2003; Budig and England 2001). We await future research to incorporate additional outcome measures, more micro-level mechanisms, and other population subgroups.

Discussion and Conclusion

The persistence of the racial earnings gap has long been a puzzle in inequality research. This study revisits this topic by adopting cohort and life course perspectives to examine the intra- and intercohort patterns of racial inequality. We draw on more than 40 years

of administrative earnings records linked to nationally representative surveys to investigate how earnings trajectories unfold over the life course for white and black men across three consecutive cohorts of the U.S. population born between 1945 and 1974, focusing specifically on how these cohort trends vary by education levels. Our study contributes to current scholarship on three levels.

First, instead of focusing only on the relative earnings differences between the two races, we examine the cohort changes in race-specific earnings trajectories, which allows us to depict a fuller picture of the sources of changes in racial earnings inequality. For example, a narrowing gap would be a positive sign for a progress on reducing racial inequality but only if it derives from improvements in earnings prospects for the disadvantaged race across cohorts. In fact, our analysis indicates quite the opposite: spanning from the Early Baby Boomers (who are now mostly at retirement age) to Generation X (who are just beyond mid-career), blacks at the bottom and top of the educational spectrum have continued to experience a disadvantaged and deteriorating earnings position relative to their white counterparts. The narrowing of racial gap among those in the middle tiers of educational attainment from the Late Baby Boomers to Generation X, as we show, is primarily the reflection of the worsening situation among whites instead of improving labor market outcomes among blacks. Together, these findings highlight our argument that the trends in black-white earnings gap should be understood as a two-sided story that involves intercohort changes from *both* races.

Second, by examining the educational variations in the cohort trends in racial inequality, our findings speak to a broader literature on how the rise of economic inequality in the past decades has evolved along the dimension of race. From the Late Baby Boomers to Generation X, the earnings disadvantage of black men relative to their white counterparts at both the top and bottom of the educational spectrum has widened both within and across cohorts. These findings suggest that the increasing economic polarization in the U.S. labor market has evolved along the race dimension as well. On one hand, although college-educated men experienced earnings gains over time, white college graduates experienced greater relative gains than their black counterparts. On the other hand, although both white and black men with less than a high school diploma experienced significant decreases in real earnings, the decline was greater among blacks than among their white counterparts. At the middle of the educational spectrum, our findings are consistent with arguments that “good jobs”—those providing stable employment and improving economic remuneration—are increasingly less accessible to American workers who have only a high school diploma but have not completed college (Autor and Dorn 2013; Kalleberg 2009). Although both blacks and whites in this group are affected, the cohort changes among white lower- to middle-skill workers appear to be larger because unlike their long-disadvantaged black counterparts, earlier cohorts of the white working class used to have much better career prospects (Cherlin 2004; Morris and Western 1999).

Finally, the substantial educational variations revealed by our analysis suggest that a single, universal solution to the persistence of the racial earnings gap may not exist. Instead, researchers and policy scholars should attend to the specific situations that black and white workers face in different educational groups. Among college graduates, our findings show that a college degree is clearly not sufficient for black men to achieve the same earnings level as their white counterparts. Instead, if a goal is to boost earnings of black men through expanding their college attendance and completion,

strategies might also seek to improve opportunities for black men who went to college. At the bottom of the educational spectrum, the finding that more recent cohorts of white men with only a high school diploma have experienced deteriorating economic positions is consistent with previous work citing factors such as deindustrialization, skill upgrading, globalization, and deunionization as forces behind growing earnings inequality by educational level (Autor and Dorn 2013; Card 2001; Lee 1999; Morris and Western 1999). Our finding of an uneven impact by race also points to the importance of considering factors such as economic restructuring (Wilson 1987), residential segregation (Massey and Denton 1993), incarceration (Western 2002), and intergenerational family processes (Bloome 2014). Among those with only a high school education, our results indicate that what appears to be a narrowing racial earnings gap is primarily driven by the greater decline in white men's economic positions. Indeed, the labor market prospect of this middle-tier educational group for *both* races has continued to stagnate or decline across cohorts. We urge future work to explore the mechanisms and potential policy solutions to address the declining economic outcomes for both white and black men in this group.

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