

Racial Disparities in Individual Earning Profiles: Recent Cohort Trends in the U.S.*

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Abstract

This paper adds the person-year layer to the conventional cohort trend analysis and examines the black-white gap in the growth factors of individual earning profiles over the same young adult stage across 18 birth cohorts. Rather than annual earnings, we use cumulated earnings for its useful properties. An unprecedented data opportunity enables the pursuit of our purpose. Using multi-level latent growth modeling with random growth factors we provide three major findings. First, the trend analysis of the racial gap in growth factors provides much richer information on the timing and duration of racial discrimination responsible for the unfolding racial earning gap over the ages 26-35. Second, the effects of race on the growth factors for men exhibit no significant change, resulting in an overall picture of the persistent racial earning gap. In contrast, the effects of race show significant changes for women, resulting in an overall picture of closed racial earning gap. Third, the much greater percentage changes in race effects for women than for men suggest that efforts to reduce racial discrimination must be large enough to make an impact on the racial earning gap.

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Introduction

The stagnation of black-white wage gap since the 1970s has been widely observed. Scholars have contributed it to the post-1970s macro factors, such as reduced Equal Employment Opportunity Commission (EEOC) resources, increased black incarceration, slowing educational gains and ceased progress among black youth, the skill biased technological change, and rising wage inequality (Smith 1993; Card and Kruger 1993; Western 2002). These macro factors affect individuals' educational attainment, probability of employment, and the shape of earning profiles. Previous research has generally examined the linkage between time periods of distinct macro factors and aggregate black-white wage gaps of birth cohorts without looking into the micro process of individual earning profiles. This paper brings in this micro process to enrich the linkage and to address racial gaps in the growth factors of earning profiles rather than aggregate group earnings. We examine and compare birth cohorts of individuals under the same macro conditions. The within-cohort analysis of follow-up observations of individuals examines micro factors determining individual earning profiles. The cross-cohort analysis reveals the role of periods of distinct macro factors on the growth factors of earning profiles.

Using the life course framework, we emphasizes the interplay between macro factors and individuals through *historical time* that records profound social transformation and economic restructuring, *cohort time* that identifies social change around the transitions of a cohort of people to various life stages, and *individual time* that is indicated by age (Elder and O'Rand 1995). This perspective guides us to examine within- and cross-cohort patterns. Our analysis exploits the unique data on uninterrupted individual earnings available in the SIPP Gold Standard Complete files. The paper's two analytic tasks use multilevel latent growth curve

modeling with random growth factors for the 10 years of individual work life from age 26 to age 35. The analysis of annual birth cohorts provides convergence or divergence or stagnation patterns of the racial gaps in the earning profile. We then test whether the race effects changed between the earlier cohort group and the later cohort group.

Background

The historical roots of slavery and Jim Crow Law led to contemporary racial discrimination against blacks. The Civil Right Movement outlawed racial discrimination and the EEOC provided resources to protect minority status. But the elimination of racial discrimination requires changes in institutions of the labor market, education, criminal justice, housing market and lending market as well as individual prejudice and bigotry (Massey 2007). Trend studies of black-white wage gaps asked whether the progress in reducing the racial gap in the 1970s has continued or stalled and sought to uncover the sources of stagnation.

Changes in employment probabilities between blacks and whites can contribute to their wage gap in two important ways. First black incarceration grew after 1980 and comparing only employees while ignoring the incarcerated population would underestimate the gap (Western 2002; Chandra 2003). Second, employed ex-offenders are generally lower-paid, thereby increasing the gap. To resolve the sample selection problem that usually occurs when repeated cross-sectional data are used, our analysis includes all individuals in the birth cohorts and account for their cumulated actual earnings over a range of ages.

A second source of stagnation in reducing black-white earning gap is the slowing educational gains and ceased educational progress among black youth (Smith 1993). Different functional forms of schooling may lead to different conclusions (Heckman et al. 2000). In our

analysis, we use levels of education rather than years of schooling and allow free estimates of the effect of each level of education on earnings.

While gender wage gap was reduced due to both women's increasing educational attainment and their inroad to employment, gender wage gap has remain substantial due to persistent occupational gender segregation (Reskin 1993). Moreover, the micro process of work and home spheres is different between men and women, especially during the reproduction period. For this reason, we conduct separate analysis for men and women.

The household specialization thesis (Becker 1981) posits that a husband specializes in the labor market and a wife specializes in housework, leading to married men's wage premium. While the household specialization principle applies to traditional families, the rise of married women's labor force participation beginning in the 1970s suggest that married men's wage premium declined somewhat due to married women's employment (Gray, 1997). Yet, married men continued to enjoy a wage premium between 16 and 35 percent higher than those of separated, divorced, and never-married men, controlling for education and experience (Lerman, 2002). Family responsibility subjects working married women to a second shift in the household (Hochschild 1989), suggesting wage penalty for married women. Regardless of marriage, motherhood imposes childrearing tasks on women that affect workplace performance and career development. Our analysis includes marital status for the separate analysis of men and women and motherhood for the analysis of women.

The foreign-born share in the lower and upper end of the labor skill distribution has been growing. The labor market reception, language barrier, unfamiliarity with the U.S. labor market, transferability of home-trained skills are chief reasons why the earning profiles of immigrants

differ from that of natives (Portes and Rumbout 2006; Massey et al. 2002). Our analysis accounts for the effect of foreign-born status.

After controlling for education, marital status, motherhood, and immigrant status, the black-white gap in the earning profiles over a life course stage for a birth cohort of men or women captures a composite of racial discrimination in the corresponding cohort time. Blocked opportunities to employment were responsible for the creation of an underclass in the labor market and a shrinking pool of marriageable black men in the marriage market (Wilson 1987; 1996). Residential racial segregation resulting from discrimination in the labor, housing, and lending markets leads to socially and spatially isolated racial groups (Massey 2007). Our analysis examining black-white disparities in latent growth factors derived from individual earning profiles offers a unique opportunity to understand how multifaceted discrimination works in the micro process of individual work life and how they change through cohort time.

Individual Cumulated Earning Profiles

Typical research on trends of racial wage gap examines the gap in the aggregate wage of racial groups using repeated cross-sectional data. Inter-cohort analysis compares the racial wage gap of different birth cohorts when they reach the same age or age range. Controlling for education, experience, and other demographic characteristics, the difference in the group aggregate (mean or median) of blacks and whites are tracked over time or across birth cohorts. The snapshot of individual wage presents the well-known limitation of lacking information on the individual trajectories of employment and earnings. The composite racial discrimination and forces preventing it, however, do not act in a snapshot manner. We illustrate this point using the EEOC role in hiring and promotion as an example. For low-skilled jobs, racial minorities are the

last to hire and the first to fire if ethnic queuing prevails whereas the EEOC protects racial minorities if sufficient resources are available. Job instability characterizes low-end jobs. Thus it is the trajectory of wage, rather than a one-time measure of wage, that captures how racial discrimination works and the degree to which laws and policies can address it in a persistent, sustainable manner. For high-skilled workers, the EEOC presumably helps getting an entry-level job. However, the EEOC role in entry-level jobs changed over time. Among new college graduates, black men earned 83 percent as much as comparable white men in 1967-1968; by 1971-1972 there was complete wage parity; and the trend reversed afterwards to the 1967-1968 level in 1990 (Smith 1993). The EEOC might play much a small role in promotion which is handled in the internal labor market and regulated by institutional rules. For example, although graduating black law school students are more likely to get into top law firms, they are less likely to be assigned to challenging cases and receive proper mentoring and consequently less likely to be promoted. Without following an individual's work trajectory, we will miss out the timing and duration of an EEOC role and persistent discrimination.

The racial wage gap compares wage rate by race. Wage rate represents the hourly compensation for work. While simple and straightforward, wage rate is inappropriate for some jobs such as contract work or temporary help. Wage rate also does not reflect part-time status, overtime, tips and bonuses. The notion of total earnings, on the other hand, encompasses all components. Earnings and wage rate both capture economic attainment for high-skilled workers because they have stable jobs with annual salary and usually work full time. For less-skilled workers, earnings better measure their economic attainment than wage rate because earnings better captures both work opportunity and compensation.

We emphasize two aspects of economic attainment - trajectory and accumulation. An individual earning profile records how much an individual earned in each consecutive year. When employment is unstable, the earnings fluctuate. A year without earnings could mean quite different economic attainment to different people. With the previously higher-paid ones having greater earning prospect in the future, discounted by older ages. The cumulated earnings in a year sum up the earnings of all years to date. This concept of cumulated earnings is similar to life-time earnings except that cumulated earnings refer to the time-varying life time earnings up to the year being considered.

The concept of cumulated earnings has a number of useful properties. First, it stresses the importance of individual earning growth rather than group aggregate earnings. Second, it is longitudinal at the individual level so that an individual's previous and current earnings are sum up at different time points. Third, the profile is a smooth non-decreasing curve made of cumulated earnings in consecutive years since we carry the previous year's cumulated earnings forward to a year when there are no earnings or the earnings are low in that year. Fourth, latent growth factors can be derived from each individual's cumulated earning profile such that the profile shape can be summarized as the initial state, the linear slope, and higher-order slopes. With these properties, the racial gap in cumulated earning profiles can be analytical, resting on the aggregates of individual latent growth factors within racial group, holding other covariates constant.

The racial gap in the growth factors of cumulated earning profiles over a life course stage enables us to describe the racial gap vis a vis age within a birth cohort. In the simplest case of a linear cumulated earning profile, a negative black effect on the initial state would indicate one of three racial gap patterns with age, depending upon the black effect on the linear slope: if positive

then catching up, if null then maintaining the initial gap, and if negative then enlarging the initial gap. In the case of a quadratic cumulated earning profile, the above three patterns are refined by the black effect on the quadratic slope so that we can further refine the and duration of increased (decreased) racial discrimination as an individual ages since the quadratic slope diminishes the linear rate to a point before it changes the curve direction.

Data and Methods

Data

This paper uses data from four complete data files of multiple-imputed Gold Standard File (GSF). The GSF is a data set containing person-level linked survey and administrative data. The GSF is constructed from the Survey of Income and Program Participation (SIPP), W-2 earnings, and OASDI and SSI benefit information. It is useful for Special Sworn Status researchers conducting research that would not be possible with survey or administrative data alone (Abow et al. 2006). I used the GSF and its multiple-imputed complete data files within the Census Bureau firewall and the results presented here were released after Census Bureau's disclosure analysis. The data on linked survey and administrative variables provide uninterrupted earning histories from age 16 to the age in 2006 for all SIPP respondents, providing an unprecedented opportunity to pursue the goal of this paper.

Respondents aged 15 and older from seven SIPP panels (1990, 1991, 1992, 1993, 1996, 2001, and 2004) are selected and stacked into a data file. Respondents' identifiers are mapped to Social Security Numbers (SSN) using the Census Bureau's Person Information Validation System. The Detailed Earnings Records from SSA's Master Earnings File based on W-2 from IRS (and other variables) are merged into the stacked SIPP file by SSN, creating the GSF.

Approximately 12% of individuals in the GSF did not have valid SSNs and consequently missed administrative data (see more detailed description in Abowd et al. 2006). It is likely that racial minorities are more likely to have no valid SSNs and the lack of their earnings presents a threat to the validity of racial earning gaps. In addition, missing data in the SIPP survey variables also raise a question about the representativeness of the sample with only valid data. Specifically, the multivariate distribution of variables in GSF after list-wise deletion or other traditional missing data imputation is a distortion of the true multivariate distribution, leading to biased point estimates and underestimated standard errors. In contrast, multiple-imputed complete data will have the multivariate distribution approximating the true distribution for the population. Under the assumption of missing at random (MAR) conditional on observed variables and ignorable missing mechanism in substantive modeling¹, the multiple imputation method simulates the missing mechanisms and imputes the missing values (Rubin 1987). In the process of producing synthetic data from the GSF for public use, the Census Bureau created four complete data versions of the GSF using the multiple imputation method in Rubin (1987) to 173 SIPP variables, 443 SSA/IRS variables, and 5 SSA benefit variables in the GSF. This paper takes advantage of these four complete data files of the GSF, where all SIPP respondents have the originally-measured (if not missing) or multiple-imputed (if missing) value on all variables used in this study.

The analytic sample in this paper includes individual respondents born 1952-1969 whose detailed recorded earnings are available from age 26 to age 35. The birth year coverage from 1952 to 1969 is to maximize the available detailed earnings (from 1978) and education and marital histories at the second wave of SIPP panels 1990 to 2004, by which the SIPP history

¹ Missing at random (MAR) is defined by two conditions: (1) missing at random conditional on observed variables in the multiple imputation equations, and (2) distinctive missing mechanisms in the multiple imputation equations unrelated to the equations for substantive research questions.

variables on education, marriage, and fertility are valid. The total sample size is about 51,000 men and 54,000 women, each of whom has 10 years of observations, resulting in 510,000 person-years for men and 540,000 for women. These numbers of observations permit multiple-level analysis of earning profiles of annual birth cohorts. The 1952 birth cohort reached age 26 in 1978, the first year of available detailed earnings, and age 35 in 1987. The 1969 birth cohort reached age 26 in 1995 and age 35 in 2004. Thus for each birth cohort, the earning profile observed in a particular decade was influenced by the macro conditions of racial discrimination and laws and policies aiming to correct it during the decade. Two birth cohort groups are made for estimating the changing effects of race on earning profiles. The earlier cohort group includes individuals born 1952-1955 (n~15,000 men or women). The later cohort group includes those born 1962-1969 (n~14,000 men or women).

Measurement

The dependent variable is cumulated earnings in a year from age 26. Annual total earnings are defined as the sum of four categories of detailed income by FICA (Federal Insurance Contribution Act) and the timing of tax: non-deferred FICA, non-deferred non-FICA, deferred FICA, deferred non-FICA. Not all jobs are subject to FICA. For example, teachers in 14 states opted not to participate in FICA. Although employees are likely to have most of their earnings falling into the non-deferred categories, a substantial amount of total earnings of higher-income people goes to the deferred categories. Since “deferred” is a tax-related term and the deferred earnings occur during the year, all four categories of detailed earning are included in our definition of earnings. After converted to constant dollars, the annual earnings are summed from age 26 to the subsequent ages up to age 35 to construct the cumulated earnings at each age. This measure ignore earnings before age 26, which is available for only 8 birth cohorts and

unavailable for 10 older birth cohorts in our analysis because detailed earning records are available from 1978. Log transformation of the skewed cumulated earnings fit the regression models better. Exploratory analysis shows that a quadratic time function best describe the aggregate relationship between log cumulated earnings and age.

Time-constant independent variables include race/ethnicity (black, Hispanic and a residual category, with white as the reference), nativity (foreign born with native-born as the reference) for men and women separately, and levels of education attainment (lower than high school, high school, some college, Bachelor’s degree, and advanced degree). We treat education attainment as time-constant because most people have completed their formal education by the age of 26. These time-constant indicators are at the individual level.

Time-varying independent variables include marital status, which is created based on marital history information on the formation and dissolution of up to four marriages. We have also created an indicator of motherhood for women, defined as the state after the first child was born. See the descriptive statistics of variables used in analysis in the Appendix Table.

Analytic Strategies

Our analysis uses the multi-level latent growth curve modeling, allowing for unobserved individual heterogeneity in the random growth factors (Raudenbush and Bryk 2003). Let y_{it} be the log cumulated earnings for individual i at time t ($t = age - 26$), a quadratic time function, t and t^2 , z_i a vector of time-constant variables (race/ethnicity, foreign born, education), x_{it} a vector of time-varying variables (marital status for both men and women and motherhood for women only). The two-level growth curve model with random growth factors is expressed in (1a) and (1b):

$$(1a) \quad y_{it} = \beta_{0i} + \beta_{1i}t_i + \beta_{2i}t_i^2 + \beta_3x_{it} + e_{it} \quad e_{it} \sim N(0, \sigma_e^2)$$

$$(1b) \quad \beta_{0i} = \gamma_{00} + \gamma_{01}z_i + u_{0i} \quad [u_{0i}, u_{1i}, u_{2i}]' \sim N([0, 0, 0]', \Sigma)$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}z_i + u_{1i}$$

$$\beta_{2i} = \gamma_{20} + \gamma_{21}z_i + u_{2i}.$$

We assume that e_{it} is univariate normal with mean 0 and variance σ_e^2 and uncorrelated with $[u_{0i}, u_{1i}, u_{2i}]'$, which are assumed multivariate normal with mean $[0, 0, 0]'$ and a covariate matrix Σ . Substituting (1b) to (1a) leads to a single-equation expression (1):

$$(1) \quad y_{it} = \gamma_{00} + \gamma_{01}z_i + \gamma_{10}t_t + \gamma_{11}z_i \cdot t_t + \gamma_{20}t_t^2 + \gamma_{21}z_i \cdot t_t^2 + \beta_3 x_{it} + (u_{0i} + t_t u_{1i} + t_t^2 u_{2i} + e_{it})$$

Equation (1) shows that the model specifies a set of interaction terms between t and z_i , and another set between t^2 and z_i . Another important feature of (1) is its complex error structure, which is decomposed into the person-time level error e_{it} and the individual-level errors $[u_{0i}, u_{1i}, u_{2i}]'$ with scaling factors t and t^2 . Such a feature allows for the unobserved individual heterogeneity in earning profiles, such as motivation, perseverance, and psychological predisposition, after taking into account measured education and demographic characteristics. Allowing for the random effects of unobserved heterogeneity is important not only substantively but also methodologically because the standard errors of estimates will not be underestimated as in the absence of these random effects.

We estimate the model for each birth cohort of men and women separately. The estimation is based on the four complete data files of the GSF, one at a time. We obtain the average estimates from the four complete data files and their standard errors by following the Rubin rule (Rubin 1987). For $l = 1, \dots, m$ multiple-imputed data files (here $m = 4$ GSC files), let $\hat{Q}^{(l)}$ be the point estimate from the l -th data file and the average point estimate is:

$$(2) \quad \hat{Q}_m = \frac{1}{m} \sum_{l=1}^m \hat{Q}^{(l)}.$$

The standard error for \hat{Q}_m should include uncertainty from two sources: (1) imputed missing values rather than the true values are used in estimation, and (2) estimates rather than the true parameters are used to generate imputed missing values. Let $\hat{U}^{(l)}$ be the variance for $\hat{Q}^{(l)}$ obtained from the l -th data file and the average variance is:

$$\hat{U}_m = \frac{1}{m} \sum_{l=1}^m \hat{U}^{(l)}.$$

The between variance of the point estimates of the m data files is

$$\hat{B}_m = \frac{1}{m-1} \sum_{l=1}^m (\hat{Q}^{(l)} - \hat{Q}_m)^2.$$

Then the variance for \hat{Q}_m is

$$(3) \quad \hat{T}_m = \left(1 + \frac{1}{m}\right) \hat{B}_m + \hat{U}_m$$

A statistical issue concerns the complex survey design of the SIPP panels, which is multi-stage, stratified probability sampling. While the public-use SIPP provide a number of sampling weights variables in addition to an estimated version of PSU and strata identification for the complex survey design, the complete data files of the GSF have not yet included appropriate probability sampling weights or survey design variables. For our analysis, the 10-year observations of each birth cohort occur in different years and the population of those observations differs from the population represented by the original SIPP samples. Due to these reasons, the analysis in this paper is unweighted. Our interpretation of results focuses on the growth factors arising from individual trajectories rather than inferences to the population.

Results

Cohort Trends of Log Cumulated Earning Profiles

Cumulative earning profiles describe earnings from the payroll information filed by employers or the self employed, regardless of FICA-relevance or tax-deferment. Thus this measure is accurate and reliable for earnings from all jobs in the formal labor market but leaves out earnings from the informal labor market where payroll tax cannot be enforced. Earnings from jobs such as household care, temporary service help, restaurant work, baby sitting, and day labor, typical for immigrants, are likely excluded. Because blacks have exited from these informal jobs in the last four decades, the black-white earning gap is relatively less affected. Because of the log transformation, we expect to see diminishing growth rate in log cumulated earning profile. We present the results for men first and women second.

Figure 1 shows the observed and estimated black-white gap in log cumulated earning profiles for four selected birth cohorts of men born in 1952, 1958, 1964, and 1969. The observed black-white gap averages black and white log cumulated earnings at each age from 26-35 using one complete data file. The estimated gap is based on the estimates from the latent growth curve model and the Rubin rule using all four complete data files. The estimated gap has taken out the influence of education and demographic variables and unobserved individual heterogeneity. The estimated profiles represent men who were low-educated (no high school education), never married, and native born. The model assumes that the estimated linear and quadratic slopes apply to other demographic groups within race. The racial hierarchy in earnings is clear in both the observed and estimated gaps but subtle difference in trends can be seen between the two sets. The estimated gap is expected to be smaller than the observed gap. This is true for the three earlier cohorts but not the 1969 cohort.

(Figure 1 about here)

Figure 1 provides concrete views of the profile as a whole but drawing trends from 18 birth cohorts would be difficult. As we discussed before that the growth factors summarizing the profile shape offer analytical lens to understand the timing and duration of decreased (increased) racial discrimination within individual life course and comparing them across birth cohorts can reveal their trend cross cohorts. Using estimates from 18 birth cohorts of men, we plot each of the three growth factors against the cohort birth years in Figure 2.

(Figure 2 about here)

The black-white gap in the intercept in Plot (a) indicates the gap in the initial state at age 26. This gap increases from cohort 1952 to cohort 1956 and remains relatively constant afterwards, partitioning the trend into two parts along birth years. In the second part black men aged 26 (in the calendar years 1982-1995) were subject to a similar and relatively high level of discrimination.

The racial gaps in the linear age function in Plot (b) and the quadratic age function in Plot (c) are more volatile. Black men's earnings grew faster from cohort 1952 to cohort 1958 and from cohort 1963 to cohort 1967, both with a relatively large negative quadratic rate. This further divides the second part of the trend into 4 segments with cutoffs at 1959, 1963, and 1967. Thus the three growth factors together divide the cohort trend into 5 segments. The larger scale of the initial state (7 to 9 on the log scale) and the annual linear growth rate (.57 to .73 on the log scale) for an increment of one year than the quadratic scale (-.04 to -.03 on the log scale) suggests that the initial state and the up-sloping of log cumulated earning profiles dominate. In Segment 1, black men in cohorts 1952-1956 experienced a smaller earning gap at age 26, a higher linear rate from age 26 to 35 with a small diminishing rate that does turn the growth to

negative by age 35. In Segment 2, black men in cohorts 1957-1959 saw a larger earning gap at age 26 but an increased linear rate with a very small diminishing rate. Black men in Segment 3 (cohorts 1960-1963) experienced persistent earning gap throughout ages 26-35. Segment 4 shows a higher linear growth rate and a larger negative quadratic growth rate for black men. This suggests shorter-lived measures of correcting racial discrimination than in the case of segment 2 with in a larger linear growth rate. Finally, Segment 5 shows a new pattern of growth –crossover. Cohort 1969 saw a lower linear growth for black men than for white men and a smaller quadratic rate. This may suggest a change to more pessimistic black-white gap but we are cautious because the size is relatively small for the 1969 cohort.

Taken together, Segments 1 and 2 suggest mechanisms by which reducing racial discrimination and the racial earnings gap could be done through improving growth factors of earning profiles – reducing initial gap, increasing linear growth rate, and decreasing quadratic growth rate. Unfortunately the scale of the linear growth rate change is too small to make a significant change in Segments 1 and 2 and the change in the intercept goes to the opposite direction in Segment 2. Segment 3 represents persistent inequality as people age.

Plot (d) in Figure 2 provides the trends of the standard deviation of the second-level equation errors, which are stable across the 18 birth cohorts. This suggests comparability of estimates from our latent growth curve modeling.

Figures 3 and 4 are the corresponding trends of black-white gap in log cumulated earning profiles for women. Figure 3 for the four selected cohorts shows a trend from a black advantage in Cohort 1952 to virtually no black-white earning gap in Cohort 1969, especially in the estimated pattern. Figure 4 shows how the racial gap is closed through the life stage from age 26 to 35. From the patterns in Plots (a) to (c) we can divide the trend into three segments. Cohorts

1952 to 1955 saw greater black earnings at age 26, a mildly faster linear growth rate for white women than black women and little difference in the quadratic growth rate. Segment 2 for Cohorts 1956-1957 is a transition where the initial gap is closing, the linear and quadratic growth rates are crossing. Segment 3 starting from Cohort 1958 is characterized by a lower initial earning, a dominant higher linear rate and a moderately larger negative quadratic rate for black women. Segment 3 results in the closing racial gap for Cohorts 1958 to 1969. The error standard deviations are also stable and somewhat reduced across cohorts of women.

(Figures 3 and 4 about here)

Changing Effects of Race on Growth Factors of Log Cumulated Earning Profiles

The trend analysis in the last section has not considered whether the cross-cohort changes in growth factors are statistically significant. This section turns to this task by testing the significance of differences in race effects on growth factors of cumulated earning profiles between the earlier cohort group 1952-1955 and the later cohort group 1962-1969. The aggregate log cumulated earnings by race and birth cohort groups and the cell sizes are presented in Table 1. The observed racial earning gap appears stable for men. The observed race gap for women shows a black disadvantage for both cohort groups and a decrease from the earlier cohort group to the later cohort group. The black group sizes of either cohort group are over 1,000, providing sufficient testing power.

(Table 1 about here)

We present the results for men in the left section and women in the right section of Table 1. The results are from the latent growth curve modeling that controls for education and demographic characteristics and unobserved individual heterogeneity. The results for men show that within each cohort the main effect of the three growth factors are significant. The black-

white gap captured by the interaction between a growth factor and race reach statistical significance only for the initial state at age 26. The racial gap in the slopes does not reach statistical significance for either cohort group of men. This suggests that black men and white men have virtually the same linear and quadratic slope and black men's initial disadvantage was carried forward through to age 35. This pattern also retains from earlier cohort group to later cohort group with only one significant difference in the main effect of linear slope that increased for both blacks and whites. The overall picture is stable, persistent racial inequality in men's earning profile over ages 26-35 between the earlier and later birth cohort groups.

(Table 2 about here)

The picture for women is very different. First, for the earlier cohort group, it is black women who had an earning advantage in the intercept. In addition, no significant racial gap is detected in the linear and quadratic slopes. The racial gap in the intercept flipped in the later cohort group – now black women were disadvantaged. This disadvantage is compensated by a significantly more positive linear slope and a significant more negative quadratic slope. Between the two cohort groups, women experienced significant changes. White women saw a higher initial earning and a faster diminishing rate of the profile; black women saw a lower initial earning, a faster linear growth rate, and a slower diminishing rate in the profile. The end product is what we saw in Figure 3 that the racial gap was closed for later cohorts.

A practical way to look at the changing effects of race on the growth factors of earning profile is to assess the percentage change using the earlier cohort group as the basis. The percentage changes for men seem substantial but are much lower than women's. For example, the one third increase in the racial intercept gap is substantial but much smaller than the over 150% for women. Likewise the over 200% change in the racial linear slope gap for men is much

smaller than the over 300% for women. These relative changes suggest that very large percentage changes are likely to be needed to close racial gaps in earning profiles.

Conclusions

This paper seeks to gain a better understanding of the stagnation in the racial wage gap among men and the very different trend for women from adding a consideration of individual dynamics. Conventional inter-cohort analysis of the racial earning gap examines aggregate earnings of racial groups cross cohorts, leaving out individual trajectories of earning growth. By adding the person-year layer, we are able to expand the aggregate earnings to growth factors that describe the shape of earning profile. Rather than annual earnings, we use cumulated earnings at a year that sums up all earnings from the initial age because of its useful properties such as the ability to include unemployed years, smoothing earning fluctuations, and its resemblance to the concept of life-time earnings. Our multi-level latent growth factor modeling method is suitable for our purpose of identifying the racial gap in latent growth factors with education and demographic characteristics held constant and unobserved individual heterogeneity taken into account. Our models are applied to a rarely available data source that provides data from seven survey panels of the SIPP and the merged administrative data from the SSA/IRS at the individual level. This unprecedented opportunity enables the establishment and analysis of individual earning profiles over the same life stage from age 26 to 35 for 18 annual birth cohorts. Finally, our analysis uses multiple imputed-complete data files to approach the multivariate distribution of the sample to that of the population. This is especially important to prevent sample selection bias given 12% of the survey respondents do not have merged administrative earning variables.

Even this best available data source is not free of limitations. The SIPP surveyed non-institutionalized population and excluded the incarcerated population, causing bias in the estimated racial earning gap. While being subject to this limitation, our study reduces the bias by using cumulated earnings for each of the 10 years that may cover incarcerated years of SIPP respondents who were ex-offenders. A second limitation lies in the earning information from payroll tax, which leaves out earnings from informal labor markets. In addition, the number of multiple imputed complete data files provided by the Census Bureau is smaller than desired, which may contribute to larger standard errors of estimates and insignificant findings.

With these caveats, our trend analysis and changing effect analysis provide three major findings. First, the trend analysis of the racial gap in growth factors provides much richer information on the timing and duration of racial discrimination responsible for the unfolding racial earning gap over the ages 26-35. For men, we identify five segments of the 18-cohort trend with some segments more promising than the more recent cohorts. For women, the early black advantage disappeared and the overall closed gap masks the dynamic subtlety in the compensation of the initial disadvantage by steeper growth slopes. Second, the effects of race on the growth factors for men exhibit no significant change, resulting in an overall picture of the persistent racial earning gap between earlier and later birth cohort groups. In contrast, the effects of race show significant changes for women, resulting in an overall picture of closed racial earning gap. Third, the percentage changes based on the insignificant changing race effects for men are substantial but considerably smaller than the percentage changes based on the significant changing race effects for women. This suggests that efforts to reduce racial discrimination must be large enough to produce significant changing race effects.

The drastically different findings for men and women highlight the importance of race and gender intersection. Moreover, the changing race effects on the growth factors suggests that labor market institution and occupational structure may be the major playing field of gendered racial discrimination given our respondents passing through their young adulthood in the same time period under the same larger social context.

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Appendix Table 1. Descriptive Statistics of Variables Used in Analysis

Variable	Men		Women	
	Prop.	SD	Prop.	SD
Race/ethnicity				
Black	0.10	0.31	0.13	0.34
Hispanic	0.10	0.30	0.10	0.30
Other	0.05	0.22	0.06	0.23
Foreign born	0.13	0.33	0.12	0.33
Level of education				
< high school	0.32	0.47	0.31	0.46
High school	0.30	0.46	0.33	0.47
Some college	0.17	0.38	0.17	0.38
Advanced	0.09	0.29	0.08	0.27
Marital status				
Married	0.66	0.47	0.66	0.47
Divorced/separated	0.16	0.36	0.20	0.40
Motherhood			0.79	0.41
n	51,221		54,651	

Table 1. Observed Log Cumulated Earnings by Race and Cohort Groups

Race	Men				Women			
	Cohort 1952-1955		Cohort 1962-1969		Cohort 1952-1955		Cohort 1962-1969	
	Log cumulated earnings	n	Log cumulated earnings	n	Log cumulated earnings	n	Log cumulated earnings	n
White	28.0	10,095	28.8	8,007	24.5	9,985	26.0	8,481
Black	23.0	1,370	24.1	1,330	17.9	1,828	23.0	1,784

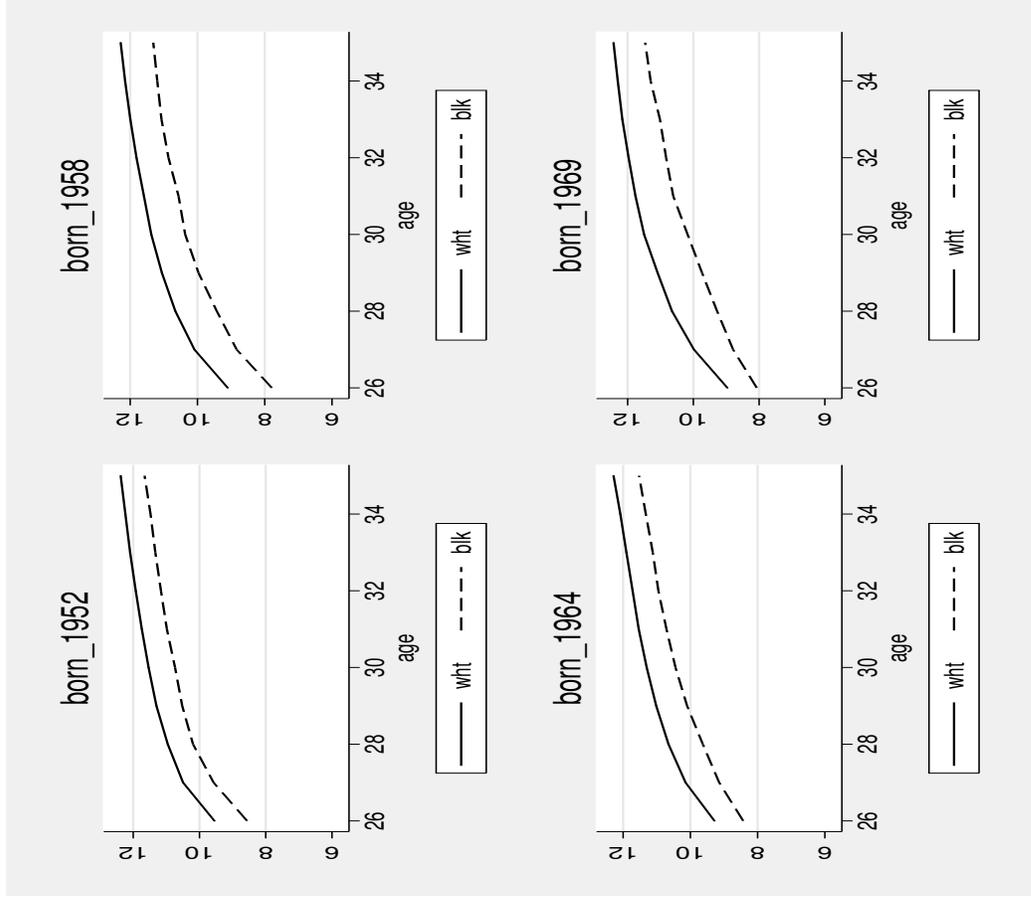
Table 2. Changes in Effects of Race on Growth Factors of Log Cumulated Earning Profile from Earlier to Later Cohort Groups

Growth Factor	Men			Women		
	Cohorts 52-55	Cohorts 62-69	% difference	Cohorts 52-55	Cohorts 62-69	% difference
Intercept	8.363 **	8.487 **	1.5	4.937 **	6.112 **	1.175 **
Intercept*black	-0.708 **	-0.955 **	34.9	0.631 **	-0.38 **	-1.011 **
Linear growth rate	0.592 **	0.641 **	8.3	0.747 **	0.734 **	-0.013
Linear rate*black	0.013	0.042	223.1	-0.042	0.085 **	0.127 **
Quadratic growth rate	-0.034 **	-0.036 **	5.9	-0.037 **	-0.041 **	-0.004 **
Quadratic rate*black	0.000	-0.001	--	0.001	-0.004 **	-0.005 ^

Note: Estimates are from latent growth curve modeling that controls for education, marital status, foreign born status, and motherhood for women.
 *** p < .01 * p < .05 ^ p < .10.

Figure 1. Observed and Estimated Black-White Gaps in Individual Profiles of Log Cumulative Earnings Over Ages 26-35: Men

(a) Observed



(b) Estimated

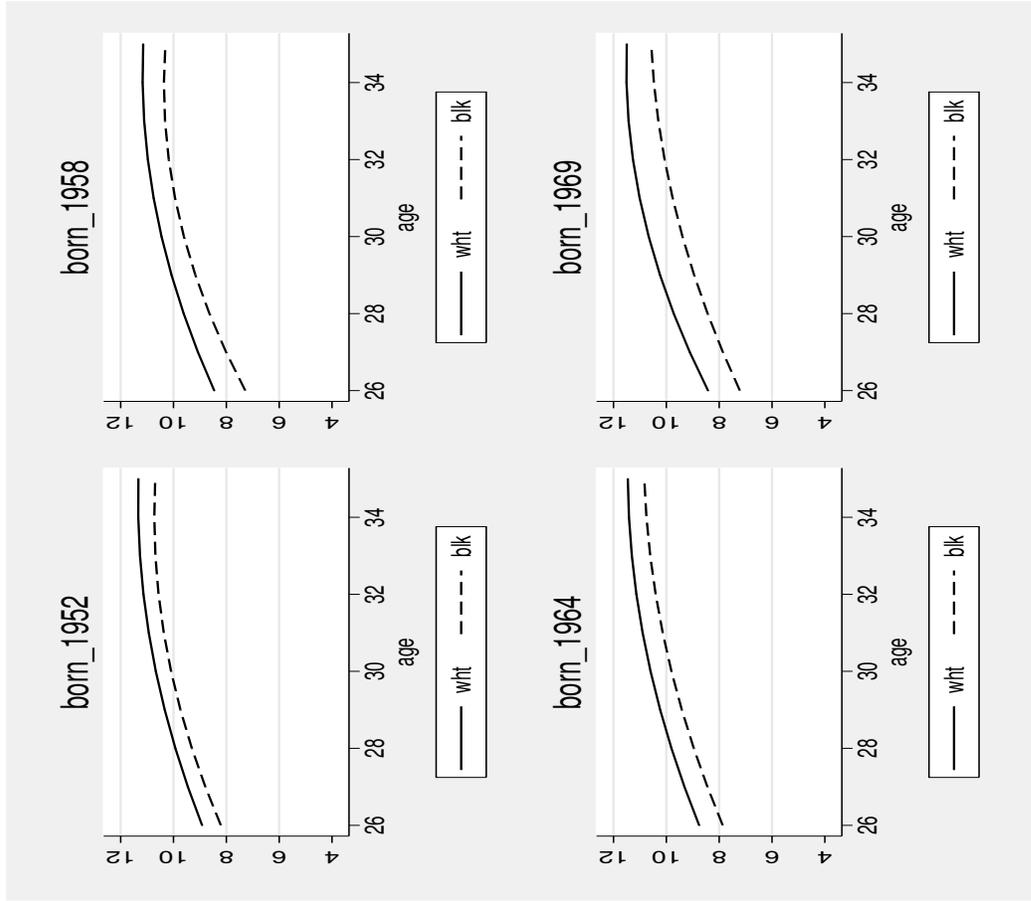


Figure 2. Cohort Trends of Black-White Gaps in Latent Growth Factors of Individual Profiles of Log Cumulative Earning Over Ages 26-35. Men Born in 1952-1969

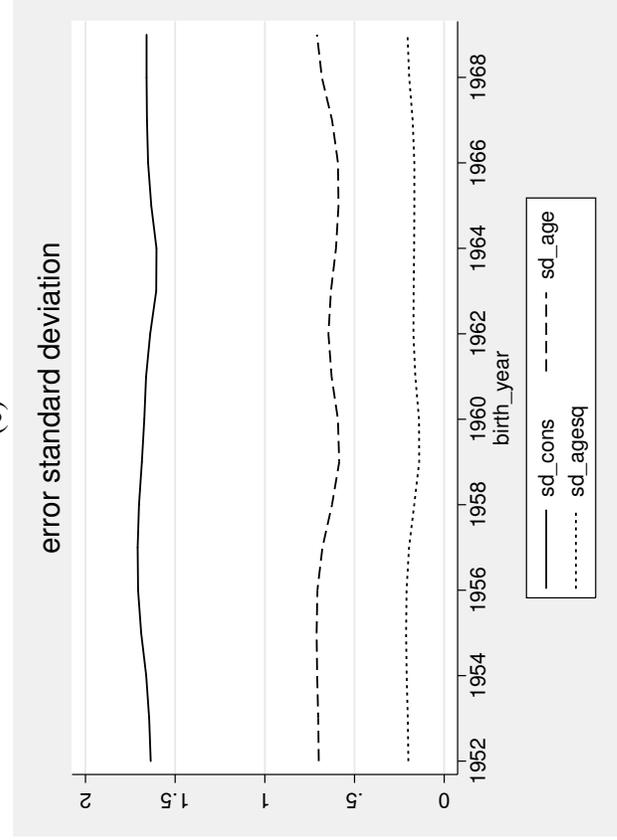
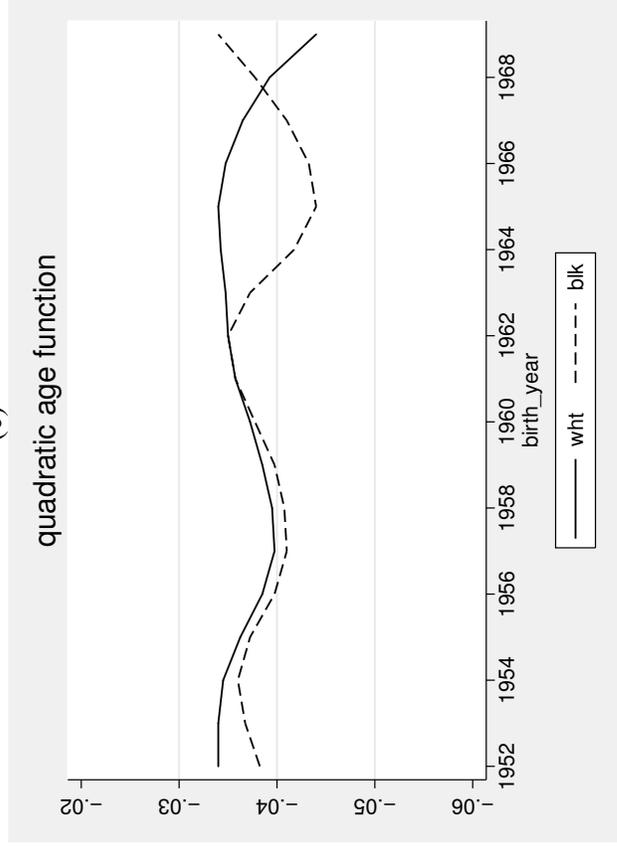
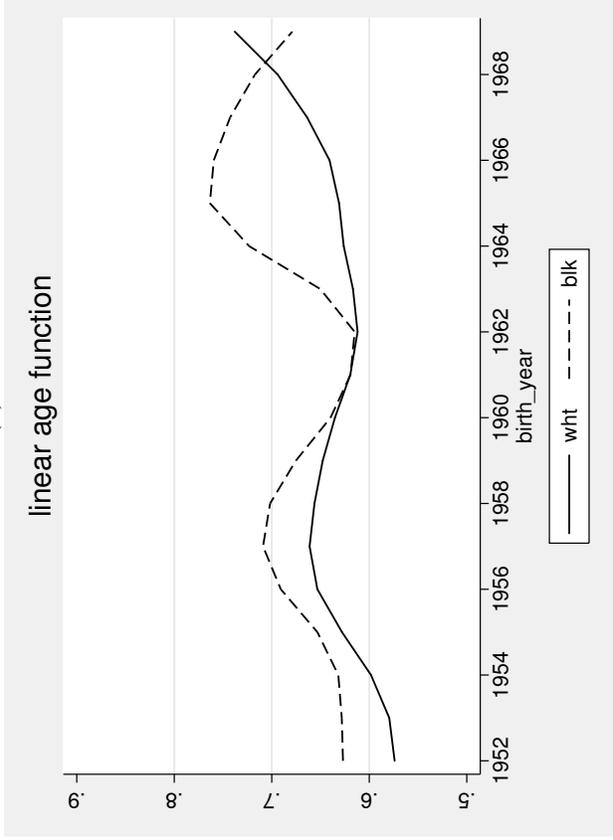
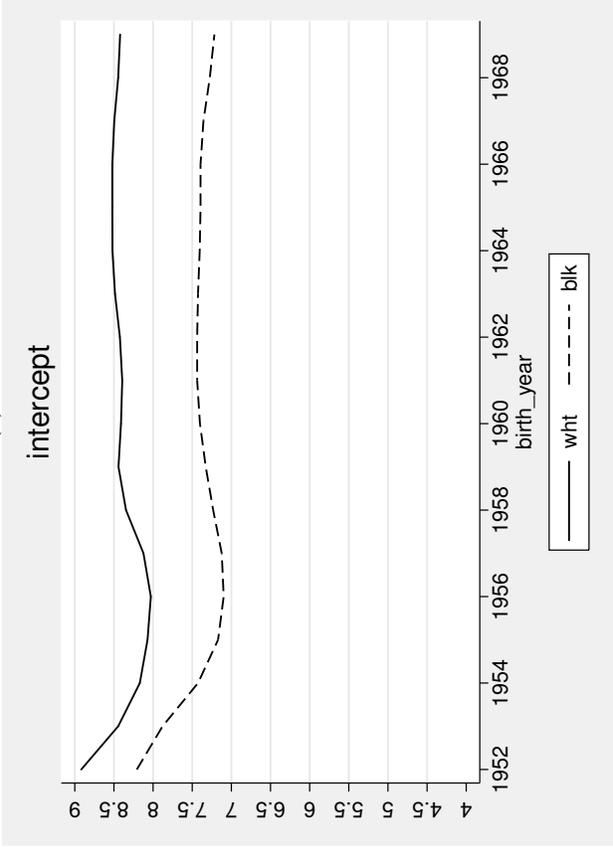


Figure 3. Observed and Estimated Black-White Gaps in Individual Profiles of Log Cumulative Earnings Over Ages 26-35: Women
 (a) Observed
 (b) Estimated

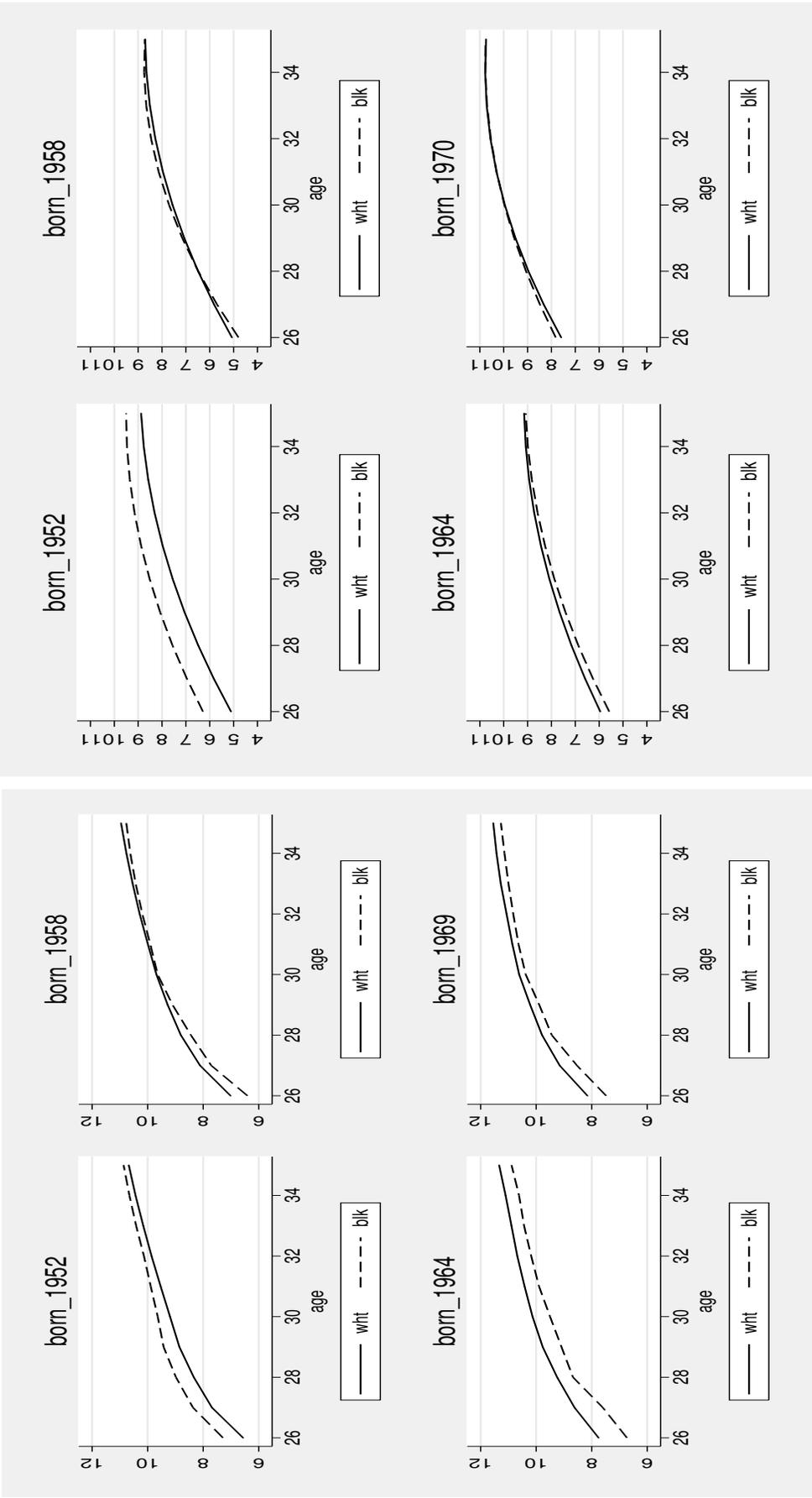


Figure 4. Cohort Trends of Black-White Gaps in Latent Growth Factors of Log Cumulative Earning Over Ages 26-35. Women Born in 1952-1969

