Convergent Paths? The Evolution of Racial Earnings Differences in Brazil between 1980 and 2022

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Abstract: Although a large literature has investigated long-term changes in the racial earnings gap in the United States, studies of this type are rare in other countries. Here, we employ the methodology developed by Bayer and Charles (2018, QJE) to study changes in racial earnings gaps between white and black Brazilian men between 1980 and 2022. Our results reveal persistent racial differences that fell during the period. The decline occurred for men at the top and middle of the earnings distribution, but the forces driving these changes were different. At the median, a race-neutral compression in the earnings distribution was the main factor that reduced the differences between white and black men. In contrast, changes in the relative position that black and white men occupy in the earnings distribution explain the entire convergence in earnings at the 90th percentile. Examining more closely the role of education, we observe a large convergence effect arising from decreases in the returns to education that was counterbalanced by a divergence in educational attainment and worse relative position of black men in the earnings distribution within educational groups.

Key-words: Racial inequality, education, earnings, decomposition

JEL Classification: J15, J31, J71, K42, N32, N92

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1 Introduction

Brazil and the United States are the two countries with the largest population of African descendants in the Americas. Although sharing a history of slavery and persistent racial inequalities, racial dynamics in the two countries differ in many aspects, such as past institutionalized segregation, rates of inter-racial marriage, and the determinants of racial boundaries (Telles, 2004). In addition, scholarship on these two countries also differ considerably, particularly within Economics. In the US, a vast body of research has explored the long-term determinants of changes in racial disparities, investigating factors such as education quality, regional heterogeneity, minimum wage, occupations, and discrimination.[1] In Brazil, this literature is much smaller and generally does not evaluate changes in earnings gaps over time (Cornwell et al., 2017; Gerard et al., 2021).[2]

The objective of this article is to document and examine the determinants of long-term racial inequality among all Brazilian men. We use data from the Brazilian Census between 1980 and 2010, as well as data from National Household Surveys from 2022 and 2023, to analyze differences in earnings between white and black men at the bottom, middle, and top of the earnings distribution.[3] We follow the framework laid down by Bayer and Charles (2018), which allows us to study the evolution of black-white earnings differentials among workers and nonworkers. Two measures of racial inequality are used: i) *level earnings gap*—differences in earnings at a given quantile; and ii) *rank earnings gap*—differences in the position a black man holds in the black earnings distribution and the position he would hold in the white earnings distribution.

The results reveal significant and persistent disparities between white and black men in different percentiles of the earnings distribution. Our findings indicate that the median racial earnings level gap among workers was slightly below 60 log points in 1980, increased in 1991, and then declined after 2000, reaching its lowest level in 2022 at below 40 log points. The level gap among all men followed a similar trend, but was consistently larger than among employed workers. At the 90th percentile, the racial level gaps were larger

[1] For instance, Smith and Welch (1989); Card and Krueger (1992); Heckman et al. (2000); Derenoncourt and Montialoux (2021); Hurst et al. (2024).

[2] Recent exceptions are Osorio (2021) and França and Portella (2023), both in Portuguese. Some studies cover earlier periods, also in Portuguese (Henriques, 2001).

[3] Future versions of this paper will incorporate data from the 1960 Census, which also include racial classification, but report earnings in ranges. The 1970 Brazilian Census does not include information on race. Microdata from the 2022 Census are not yet available; therefore, we use data from household surveys preliminarily.

than at the median, around 90 log points in 1980. It decreased between 1980 and 1991, and again between 2000 and 2010, stabilizing around 70 log points in 2010 and 2022, being the same among all men and workers only.

In contrast, the earnings rank gaps were larger at the median than at the 90th percentile. Black men at the median were 21 positions below their white counterparts in 1980, with minimal improvement until 2010, but a reduction to 17 positions by 2022. At the 90th percentile, the rank gap started at 20 positions and decreased faster over time, reaching only 13 positions in 2022.

The framework of Bayer and Charles (2018) allows for a natural decomposition of changes in racial earnings level gaps into two components. One is attributed to changes in the overall earnings distribution that are in principle race-neutral, but that affect white and black men differently due to the different positions they occupy in the earnings distribution—*distributional converge or divergence*. The other is attributed to changes in the relative position that white and black men hold in the earnings distribution—*positional convergence or divergence*. This decomposition helps us to understand the different factors driving the reduction in racial earnings gaps over time.

The results show different forces driving racial inequality in the top and middle of the earnings distribution over the period investigated. At the median, almost all the reduction in racial earnings gaps was due to distribution convergence, especially after 1991. That is, the advances of black men in the middle of the distribution were driven by an overall compression in the earnings distribution, not by relative gains of black men with respect to white men. This is in line with research showing the large reduction in inequality in Brazil in the period due to factors such as the increase in minimum wage and the reductions in the return to skills (Firpo and Portella, 2019).

In contrast, the reduction in racial inequality at the 90th quantile between 1980 and 2022 was driven entirely by positional changes, that is, gains in the relative position of black men with respect to white men in the earnings distribution. However, this result hides two distinct movements that arise from changes in the shape of the earnings distribution in the period. From 1980 to 2000, distributional divergence acted against black men, while after 2000 distributional convergence contributed to reduce the distance between black and white men.

Education is one of the main drivers of racial inequality in Brazil and the United

States (Heckman, 2011; Fryer, 2011; Reis, 2017). The decomposition can be extended to evaluate the role of education in driving positional convergence through three channels: i) race-neutral changes in the returns to education, ii) racial convergence in educational attainment; and iii) within-education positional convergence. The results show that educational convergence acted to reduce racial inequality between 1980 and 2000, while a decrease in returns to education contributed to improving the relative position of black men between 2000 and 2022. However, the second effect was more important. Within-education positional convergence had only a small role in the period.

This paper contributes to a large literature that aims to understand the determinants of racial gaps. Most studies have focused in the United States, particularly those that take a long-term perspective (Smith and Welch, 1989; Card and Krueger, 1992; Heckman et al., 2000; Bayer and Charles, 2018; Derenoncourt and Montialoux, 2021; Hurst et al., 2024). Our paper complements this literature by contrasting it with the Brazilian experience. Previous work has already compared Brazil and the United States in terms of racial inequality (Telles, 2004; Gradín, 2014), but none has evaluated possible similarities in the determinants of changes in inequality over time. One exception is Derenoncourt et al. (2021), who show that the minimum wage was an important driver of reduction in racial wage gaps in the 2000s, similar to what happened in the United States in the 1960s (Derenoncourt and Montialoux, 2021).

Here, we show similar forces acting in Brazil and the United States at least since the 1980s, albeit in opposing directions on occasions. Bayer and Charles (2018) shows that the overall increase in inequality in the United States was the main determinant of the widening racial earnings gap at the median, with an important role played by increases in return to education. Analogously, we show that the overall compression in the Brazilian earnings distribution was paramount to the decline in racial differences at the median, precisely the opposite that took place in the US. In addition, the narrowing of earnings disparities between black and white men at the 90th percentile in the United States and Brazil was primarily due to positional convergence. However, the causes of this positional convergence diverge. In the United States, the increase in returns to education counterbalanced the benefits of a convergence in educational attainment, whereas in Brazil the general decrease in returns to education was crucial in fostering positional convergence.

Finally, our article contributes to the literature on racial earnings gaps in Brazil. This research has focused mainly on cross-sectional studies, including topics on occupational segregation, the role of education, and the effects of discrimination (Arcand and D'hombres, 2004; Salardi, 2012; Gradín, 2014; Reis, 2017; Hirata and Soares, 2020; Maciel, 2020; Gerard et al., 2021; Hsu Rocha and Dias, 2021). Our research complements this literature by taking a long-term perspective, highlighting the persistence of racial inequality over time and the forces that acted to change it at different points in the earnings distribution.

This paper proceeds in the following way. In the next Section, we introduce our data and display some descriptive statistics on racial gaps among Brazilian men between 1980 and 2022. In Section 3, we outline our framework and present the methodology used to decompose changes in racial earnings gaps over time. Section 4 presents the main results on the evolution of racial differences at different points in the earnings distribution, contrasting the results based on earnings levels and ranks. Section 5 shows the results of our main decomposition exercise, which separates changes in earnings level gaps into distributional and positional convergence. We complement these results by investigating the role of education in Section 6. Finally, Section 7 concludes.

2 Data and descriptive statistics

We use data from the Brazilian Census for the years 1980, 1991, 2000, and 2010, complemented with data from the Brazilian National Household Survey (PNADC) from 2022 and 2023. We follow Bayer and Charles (2018) and restrict our sample to all men between 25 and 54 years old. We restrict the sample to white, black (*preto*) and mixed-race (*pardo*) men, excluding individuals from other races. We group the last two into a non-white category.[4] We perform robustness tests in which we separate between these two categories.

We measure earnings using monthly usual earnings, as the Brazilian data do not report annual earnings. We include all men in our analysis, workers and non-workers. Figure 1 shows the share of men who reported not being currently working and those

[4] *Pretos* and *pardos* are commonly combined in studies using Brazilian data and are classified as non-white (*negro* in Portuguese, also meaning black). We exclude indigenous and Asian (*indígenas* and *amarelos*), who comprise less than 2% of the Brazilian population throughout the period.

Figure 1: Fraction of Men Not Employed, by Alternative Measure and Race

Figure displays fraction of non-white and white men aged 25–54 not working according to two measures: not currently working and zero earnings in the previous month. Sources: Census, 1980–2010; Brazilian Household Survey (PNADC), 2022. The sample year labeled '2022' combines PNADC samples from 2022-23.

who reported zero earnings in the previous month (including those who reported having worked). It shows a large increase in the share of men with no earnings between 1991 and 2000, especially for non-white men. Differences in employment decline after 2000, but non-whites remain more likely to report not currently working or zero earnings.

Figure 2 shows the reason why non-white men have zero earnings in Brazil. The share of men out of the labor force remained constant in 1980 and 1991, increased considerably in 2000 and more so in 2010. The share of unemployed was small in 1980 and 1991, but increased fast in 2000 to reduce again in 2010 and marginally increase in 2022. The share of workers with zero earnings reached a peak in 2000 and was particularly large for non-white men.

Lastly, Figure 3 shows the evolution of earnings for the 50th and 90th percentiles of white and non-white men. Real earnings have declined for all groups between 1980 and early 2000, especially for white men at the top of the earnings distribution. For them, the average real earnings in 1980 was almost 10,000 *reais*, declining to around 8,000 in 1991 and remaining nearly stable up to 2022. After that period, earnings increased again for all groups, but the gains were higher at the median and for non-white men in the 90th percentile. Non-white men in the top receive around 3,300 *reais* in 2000, but this increased to 4,410 in 2022. Despite the relative gains of non-whites, white men at the

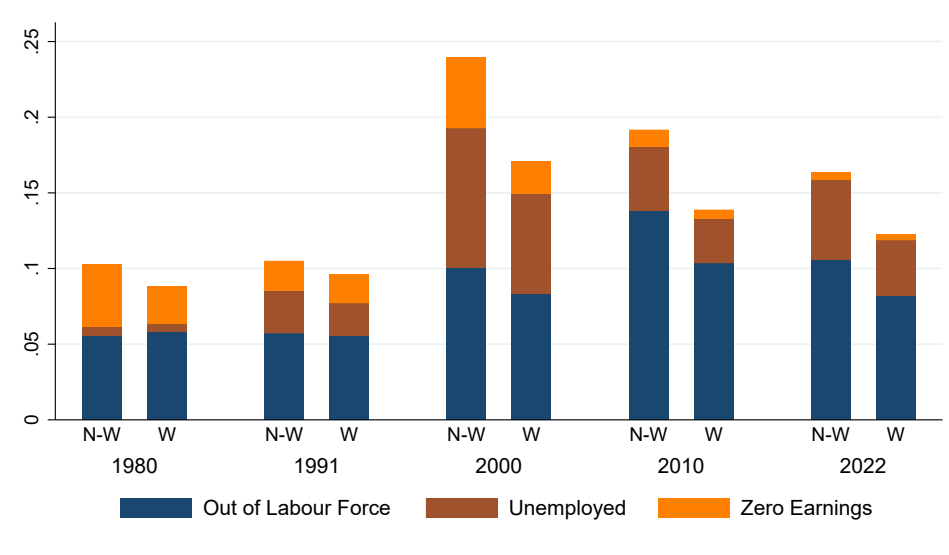


Figure 2: Fraction of Men Not Employed, by Alternative Measure and Race

Figure displays fraction of non-white and white men aged 25–54 with zero earnings for three mutually exclusive reasons: out of the labor force, in the labor force but unemployed, and employed but no earnings in the previous month. Sources: Census, 1980–2010; Brazilian Household Survey (PNADC), 2022. The sample year labeled '2022' combines PNADC samples from 2022-23.

top received 90% more than their racial counterpart in that year. In comparison, the median white men received 47% more than the median non-white men in 2022: 2,310 *reais* versus 1,575. This is smaller than what was observed in 2000, respectively, 1,618 and 902 *reais*, an advantage of almost 80% for white men. These results illustrate the relative gains of black men in the period, at the same time depicting the almost economic stagnation faced by both groups over more than 40 years.

3 Analytical framework and Decomposition Methodology

We follow Bayer and Charles (2018) and represent the log earnings $\log(E)$ of white and black men in period t as a function of invididual's skill level q: $f_t^w(q)$ and $f_t^b(q)$, respectively. White men is used as reference group, and skills are normalized in each period to be distributed uniformly on the unit interval.

This framework naturally leads to two ways of characterizing racial earnings gaps. First, consider a black man placed at the qth percentile of the black men skill distribution. From the perspective of the labor market, the skills of this man can be mapped to some quantile $q_t^w(q)$ in the distribution of white skills. The function $q_t^w(q)$ that maps the skills

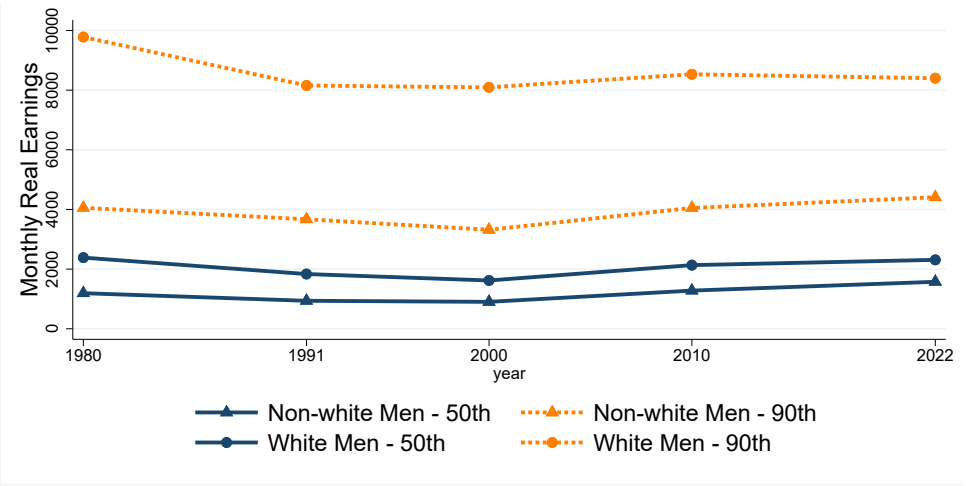


Figure 3: Real Earnings of Black and White Men, Median and 90th Quantile

Figure displays earnings of the median and 90th quantile non-white and white men measured in the population of all men aged 25–54. Earnings are converted to constant 2022 Brazilian Real using the Consumer Price Index (IPCA). Sources: Census, 1980–2010; Brazilian Household Survey (PNADC), 2022. The sample year labeled '2022' combines PNADC samples from 2022-23.

of black men into the skill distribution of white men captures two reasons why black workers might receive lower wages. First, potential skills might differ even for individuals in the same position of their respective skill distribution. This can arise due to differences in the quality of schools, for example. Second, the earnings of a black man in the qth position may be lower than a white man in the same position because of penalties suffered in the labor market, such as those associated with racial discrimination.

Given this formulation, we measure racial differences in two ways. First, we can study the earnings level gap at the percentile q: $G^q(E) = f_t^b(q) - f_t^w(q) = f_t^w(q^w(q)) - f_t^w(q)$. This gives differences in (log) earnings between black and white workers with the same skill level in their group. The second measure is concerned with differences in rank itself, that is, with the differences in the position of a black in the black men's earnings distribution and the position he would have in the earnings distribution of white men. This is the rank gap at percentile q: $G^q(rank) = q_t^w(q) - q$. Figure 4, from Bayer and Charles (2018), illustrates the difference between these two concepts.

These gaps can be easily estimated using quantile regressions (Koenker and Bassett Jr, 1978). For a given quantile q, we can write the following equation:

$$\log(E_{it}) = \alpha_t(q) + \beta_t(q) r_i + \varepsilon_{it}(q). \tag{1}$$

In this case, the coefficient $\alpha_t(q)$ measures the earnings of the white man at the qth

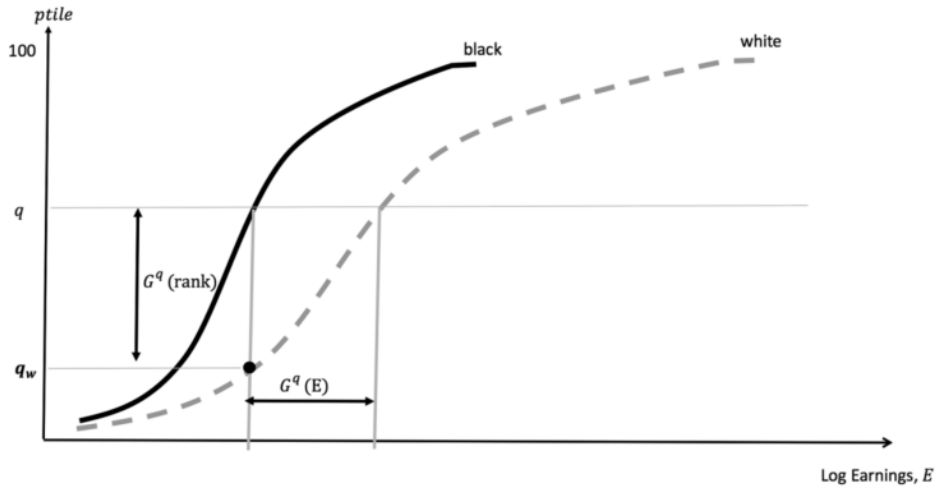


Figure 4: Racial Earnings and Earnings Rank Gaps

Note: Figure 1 from Bayer and Charles (2018).

position in their earnings distribution, while the coefficient β measures the racial earnings gap at the qth percentile:

$$\beta_t(q) = f_t^w\left(q_t^w(q)\right) - f_t^w(q) = G^q(E). \tag{2}$$

Similarly, the earnings rank gap at percentile q is obtained by the quantile regression:

$$\text{rank}\left(E_{it}\right) = a_t(q) + b_t(q)r_i + u_{it}(q), \tag{3}$$

where, a_t is simply the identity function, $a_t = q$ and b_t measures the earnings rank gap $q_t^w(q) - q = G^q(rank)$.

These regressions are estimated using age-group fixed effects. These are intended to control for changes in cohort sizes and related in earnings over the life-cycle. This is particularly important in Brazil, where decreases in the returns to experience were linked to the overall decline in wage inequality between 1995 and 2013 (Ferreira et al., 2022).

3.1 Decomposition of earnings level gaps

The framework above provides two interesting ways to document the evolution of earnings gaps over time. However, it can also be used to understand the forces behind the observed changes in these gaps. Bayer and Charles (2018) show how to decompose changes in racial earnings gaps between two time periods into a force associated with

changes in the earnings structure and another linked to the relative position of white and black men in this distribution. Changes in earnings level gaps over time can be expressed as:

$$\left(f_t^w\left(q_t^w(q)\right) - f_t^w(q)\right) - \left(f_0^w\left(q_0^w(q)\right) - f_0^w(q)\right). \tag{4}$$

By adding and subtracting terms, we arrive at:

$$\begin{aligned} &\underbrace{\left[\left(f_t^w\left(q_0^w(q)\right) - f_0^w\left(q_0^w(q)\right)\right) - \left(f_t^w(q) - f_0^w(q)\right)\right]}_{[A]} \\ &+ \underbrace{\left[f_t^w\left(q_t^w(q)\right) - f_t^w\left(q_0^w(q)\right)\right]}_{[B]} \end{aligned} \tag{5}$$

The first component in brackets, $[A]$, corresponds to changes in the wage structure over time, labeled as *distributional convergence or divergence*. It captures changes in the earnings distribution that are in principle race-neutral but affect the earnings of black and white men differently because they occupy different positions in the earnings distribution. Examples of such types of distributional effects are the minimum wage, which affects primarily the bottom of the earnings distribution (Derenoncourt and Montialoux, 2021; Engbom and Moser, 2022), or changes in the returns to skills, which affect differently the bottom and top of the earnings distribution (Ferreira et al., 2022; Acemoglu and Restrepo, 2022).

The second term in brackets, $[B]$, captures the changes over time in the relative position of black men in the white men skill distribution. Examples of this effect include improvements in the quality of education provided to black men relative to white men (Mello, 2022) or a reduction in discrimination in the labor market (Hirata and Soares, 2020).

Figure 5 illustrates these two effects. The earnings distributions of black and white men are presented in PDF form in solid and dashed lines, respectively. Panel A displays how a compression in the overall earnings distribution around the mean (the solid vertical line) results in a reduction in the median earnings level gaps between black and white men. This is the distributional convergence. Panel B illustrates a case of positional convergence in which the earnings distribution of black men is shifted to the right towards the earnings distribution of white men, which remains unchanged. This also leads to a reduction in the median earnings level gaps. In this case, the shape of the earnings distribution of

white and black men remains the same, with changes only in their relative locations. These are two extreme cases. In general, changes in earnings gaps will result from these two forces.

The method of quantifying the magnitude of these two effects suggested by Bayer and Charles (2018) relies on nonparametric decompositions similar to those used by Juhn et al. (1993) and Machado and Mata (2005). The idea is to simulate a counterfactual earnings distribution by holding fixed the position of workers in the skill distribution, but changing the wage structure over time. Figure 6 illustrates the method. It shows the distribution of earnings of black and white men in CDF form in period zero in dashed lines, and the respective distribution of earnings in period t in solid lines. For an arbitrary skill level q, the top panel shows a reduction in the earnings level gaps from AA' to BB'.

The simulation is obtained by generating counterfactual earnings $f_t^w(q_0^w(q))$ for black men, based on the mapping $q_0^w(q)$ in period zero, but the earnings distribution $f_t^w(q)$ from period t. In this case, a black man in position q of his earnings distribution in period zero would be in position q_w of the white men's earnings distribution from period zero, with an associated earnings level A. However, because of the change in the earnings distribution from period zero to period t, the same position q_w in the white men earnings distribution in period t results in earnings level C. Hence, the simulated earnings level gap in period t would be CB' rather than BB', which represents a larger decline in earnings gaps than what was actually observed.

Details of the procedure for simulating counterfactual earnings $f_t^w(q_0^w(q))$ can be found in Bayer and Charles (2018). In summary, we must generate a simulated sample with age and race composition as observed in period t. We then assign to each observation a random skill level q_i. Next, we apply the rank function $q_0^w(q)$ to this sample. That is, black men are given their position in the white men distribution as would be observed in time zero. Lastly, we apply the white earnings distribution at time t to the rankings based on the relative positions observed at time zero, $f_t^w(q_0^w(q))$. The result is a counterfactual earnings distribution with the relative position of black and white men as in period zero, but with the earnings structure as in period t.

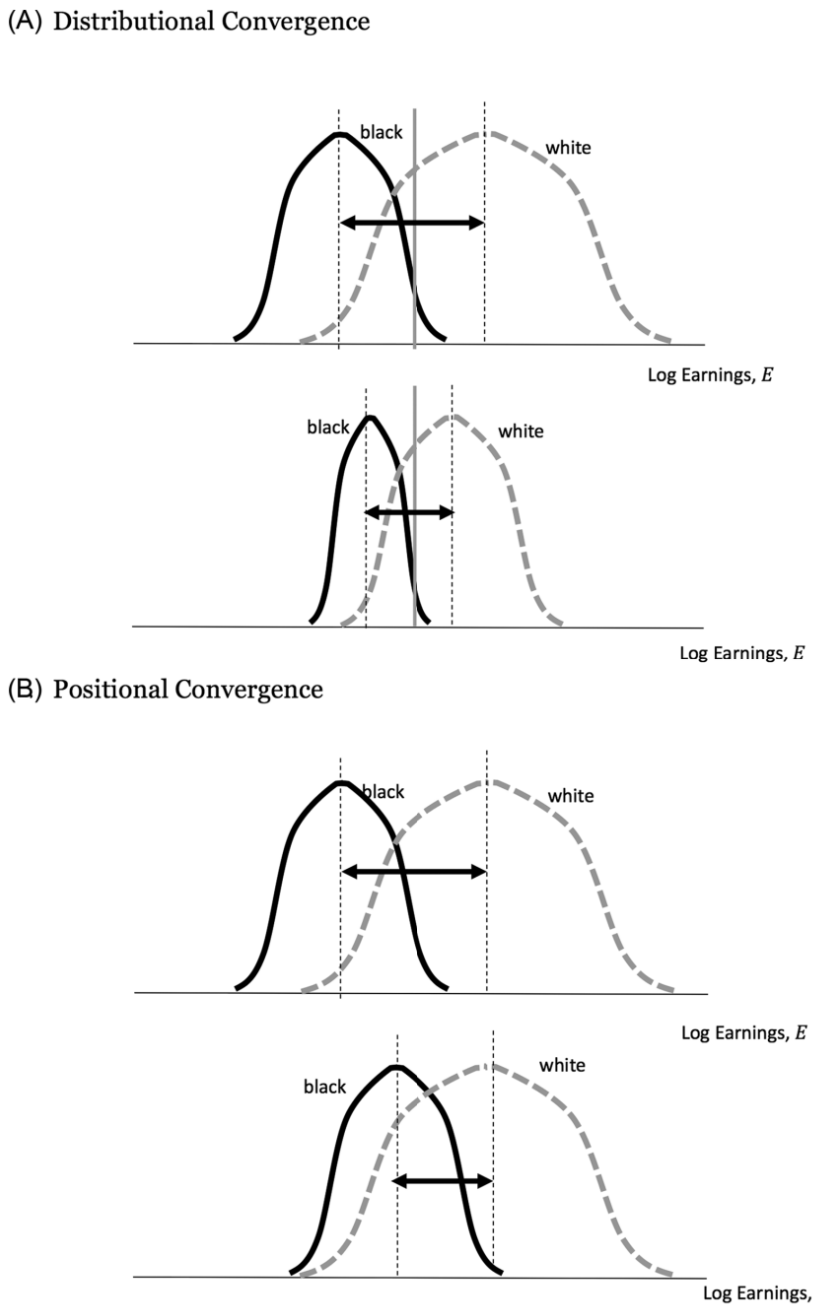


Figure 5: Distribution and position effects

Note: Figure 7 from (Bayer and Charles, 2018, p. 1482). It illustrates how distributional convergence (Panel A) and positional convergence (Panel B) can result in a reduction in earnings level gaps.

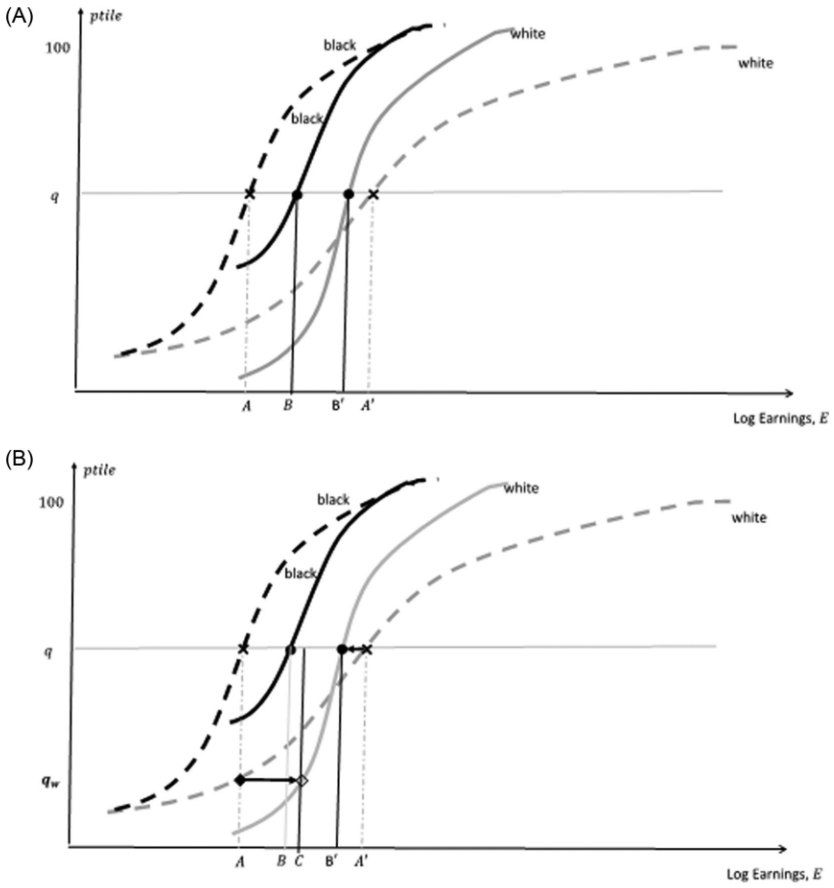


Figure 6: Illustrating Decomposition Method

Note: Figure 8 from (Bayer and Charles, 2018, p. 1484). It shows how to construct counterfactual earnings holding fixed the relative position of black and white men, but changing the earnings distribution over time. Dashed lines represent the earnings distributions in period zero, while solid lines represent the earnings distribution in period t.

4 Benchmark Estimates of Earnings Level and Rank Gaps

This section presents the results of the estimation of quantile regressions in Equations 1 and 3. All regressions condition on five-year age categories that help adjust the racial earnings gap to changes in cohort sizes and life-cycle effects.

Figure 7 shows the estimated earnings level gaps between white and non-white men. It shows results for the median and 90th percentiles, for the population of all men, and restricted to workers with positive earnings. The median racial level gap among workers was slightly below 60 log points in 1980, with almost no difference with respect to all men. The gap increased in 1991, but after that year it continuously declined, reaching its lowest level in 2022, below 40 log points. The level gap among all men is always smaller than that among employed workers, but follows a similar trend. The differences in racial level gaps between workers and the whole population were largest in 2000, the same year that the share of men with zero earnings was also highest.

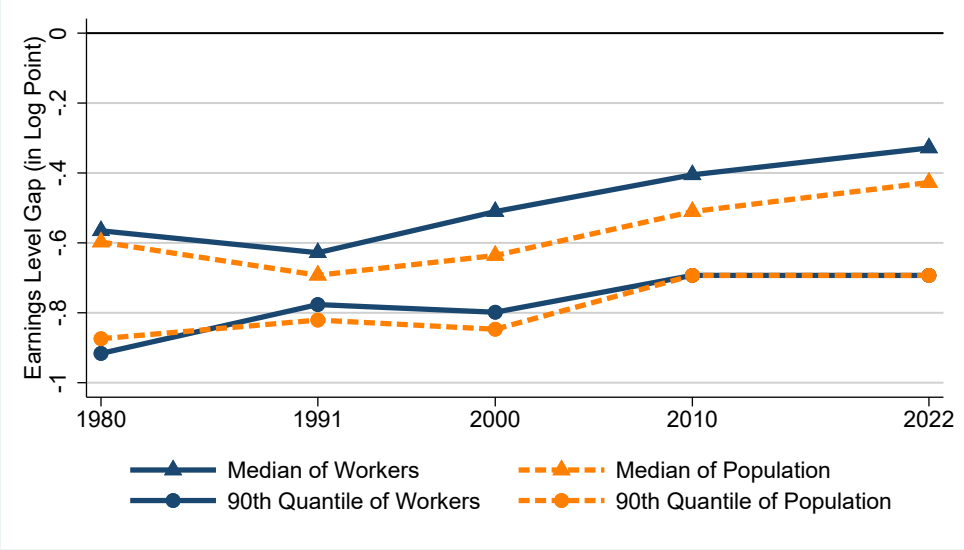


Figure 7: Racial Earnings Level Gap, Workers and Population, Median and 90th Quantile

Note: Figure displays earnings level gap, measured in log points, for the median and 90th quantile for nonwhite and white men aged 25–54. Gaps are reported for the sample of workers and the population of all men, including nonworkers. Sources: Census, 1980–2010; Brazilian Household Survey (PNADC), 2022. The sample year labeled '2022' combines PNADC samples from 2022-23.

Racial earnings level gaps at the 90th percentile were always larger than at the median. In addition, the differences between these gaps among employed men and all men are smaller than these differences at the median, suggesting that non-employment is less

present at the top of the earnings distribution for both white and non-white alike. Similarly to level gaps at the median, there is a downward trend over time for gaps at the 90th percentile, but the timing differs slightly. The racial level gap at the 90th percentile was around 90 log points in 1980 and decreased considerably between 1980 and 1991, reaching around 80 log points. Then it increased slightly between 1991 and 2000. After that year, it declined again in 2010 and remained stable at around 70 log points in 2022.

The overall reduction in earnings gaps among all men between 1980 and 2022 was almost the same for the median and 90th percentile, respectively, 17 and 18 log points. The decline was greater among workers, respectively, 24 and 22 log points. For all cases, the reduction in racial gaps were larger in the second half of the period, after 2000. The exception is racial gaps at the 90th percentile among workers. In this case, the size of the reduction was almost the same between 1980-2000 and 2000-2022.

These results share similarities and differences with those of the United States. The gap in median racial earnings for working men is somewhat aligned with that reported by Bayer and Charles (2018), around 40 log points. However, the difference among all men, including those with zero earnings, is much smaller in Brazil (40 vs. 60-70 log points around 2010). Another difference is the smaller racial difference found in the United States at the top of the wage distribution. There, it is only slightly larger than at the median (40-50 log points), and the difference between working and non-working men is small. In Brazil, the racial difference at the 90th percentile is around 70 log points in 2022. These results are in line with research showing that racial gaps are smaller among high-skilled workers in the United States Lang and Lehmann (2012), while in Brazil racial gaps are larger at the top of the earnings distribution Gradín (2014); Maciel (2020).

Figure 8 shows the racial earnings rank gaps, for the median and the 90th percentil. In 1980, these gaps were similar in the middle and top of the earnings distribution. A non-white man in the 90th percentile would be positioned at the 70th percentile of the white men earnings distribution in 1980, that is, 20 positions below. Similarly, non-white men at the median of their earnings distribution would be placed 21 positions below if their earnings were compared to the earnings of white men. Between 1980 and 2022, the relative position of black men at the top of the earnings distribution evolved faster than that of black men at the median. The rank gap at the 90th percentile reduced to 16 positions in 1991, remained stable in 2000, and then continuously decreased to 13

positions in 2022. In contrast, the position of a median black man in the white men earnings distribution barely changed between 1980 and 2010. In 2010, a black man at the median would be at the 30th percentile of the white men earnings distribution. In 2022, the relative situation for black men improved and the rank gap decreased to 17 positions.

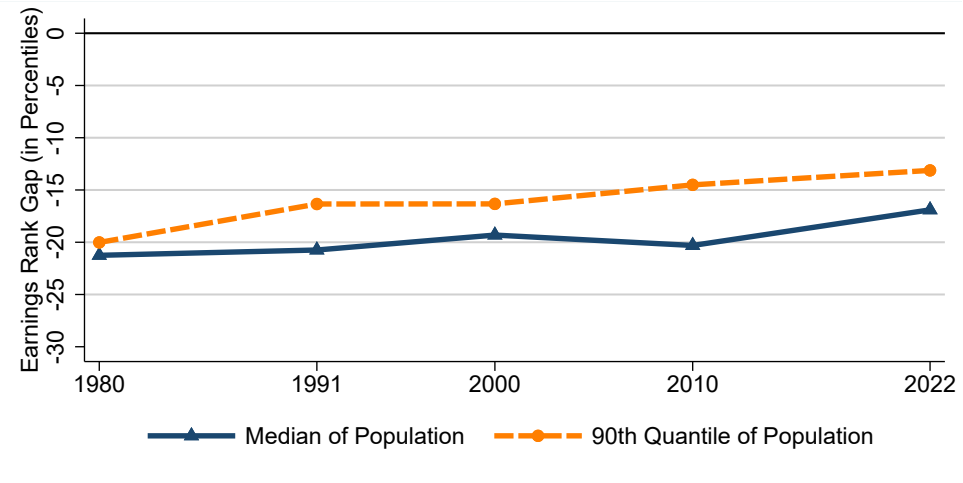


Figure 8: Racial Earnings Rank Gaps, Median and 90th Quantiles

Note: Figure displays earnings rank gap, measured in percentiles, for the median and 90th quantile in the population of all nonwhite and white men aged 25–54, including nonworkers. Sources: Census, 1980–2010; Brazilian Household Survey (PNADC), 2022. The sample year labeled '2022' combines PNADC samples from 2022-23.

Racial earnings rank gaps in Brazil are slightly smaller than in the United States by Bayer and Charles (2018). Similarly to the country, rank gaps are larger at the median than at the 90th percentile. In the US, the rank gaps at the 90th quantile is around 15 position in 2010, only slightly larger than in Brazil in 2022. In contrast, the rank gap at the median in the US was between 25 to 22 positions, while in Brazil it remained close to 20 positions up to 2010 and reduced to almost 15 positions in 2022.

The relatively close results for rank gaps between Brazil and the US contrasted with the larger differences observed for racial earnings level gaps, especially at the top of the earnings distribution. This suggests that the greater overall earnings inequality found in Brazil with respect to the US also plays a role in shaping racial inequality. In particular, the earnings distribution is highly concentrated at the top in Brazil (Souza and Medeiros, 2015), which results in much larger racial level gaps at the 90th percentile than in the US, despite similar rank gaps at this position in both countries.

Differences in racial rank gaps result in part from large differences in income and racial

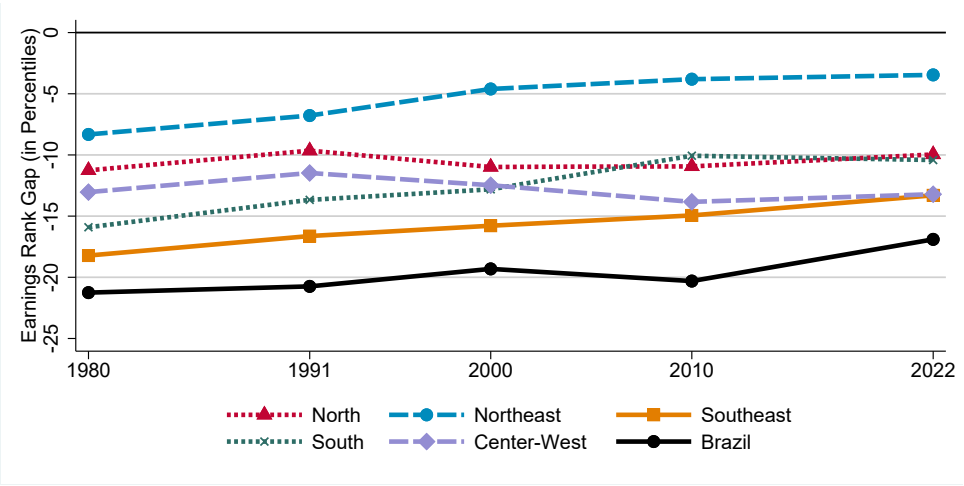


Figure 9: Median Earnings Rank Gaps, by Region

Note: Figure displays median earnings rank gap, measured in percentiles, for the population of all nonwhite and white men aged 25–54, including nonworkers. Gaps are shown for the five major Census regions as well as Brazil as a whole. Sources: Census, 1980–2010; Brazilian Household Survey (PNADC), 2022. The sample year labeled '2022' combines PNADC samples from 2022-23.

composition between Brazilian regions. Figure 9 shows the evolution of racial rank gaps at the median within each Brazilian region for the same period. We observe significant differences between them. Throughout the period, racial rank gaps have been smallest in the Northeast region, which is the poorest region and a population predominantly non-white. The North region, which is also predominantly non-white, exhibited the second smallest rank gap for most of the period. The region with the largest rank gaps is the Southeast, the richest region and predominantly white. The South region, with the smallest share of non-white men in Brazil, is also the region with second largest rank gap at the median in 1980. Overall, the only region in which rank gaps increased in the period was in the Center-West. In the North, rank gaps were more or less stable over the period. The remaining three regions all faced considerable reductions in their racial rank gaps.

The more interesting feature of Figure 9, however, is that the rank gap in Brazil as a whole is larger than all within-region rank gaps. This indicates considerable earnings differences between regions. The national median rank gap of non-white men are partially driven by their higher presence in the poorer regions. Hence, small within-region rank gaps translate into large national rank gaps.

These results contrast significantly with those in the United States. Bayer and Charles (2018) found that national rank gaps were larger than within-region gaps in the US only

before 1980, when blacks were more concentrated in the low-wage South. However, these changed in the later period. Moreover, within-region racial gaps in Brazil are much smaller than in the US. For instance, the smallest within-region rank gap was in the North-American South, around 20 positions. This is greater than the highest within-region rank gap in Brazil, around 15 positions in the Southeast. Nonetheless, national differences are somewhat similar between Brazil and the US, being different by only 2 points in 2010. This suggests that regional differences are much larger in Brazil and that they play a larger role in accounting for racial differences than in the US.

Lastly, we test whether our results change if we separate *pretos* and *pardos* and whether we enlarge our sample to include all men between 19 and 64 years old. These results are shown in Table 1. In general, the earnings level and rank gaps are larger for *pretos* (black) than *pardos* (brown or mixed-race). However, the differences between these groups reduced over time, being the same at the median in 2010 and the 90th quantile in 2022. Expanding the sample to include men between 19 and 64 years old reduces both level and rank gaps. Despite small differences in magnitudes, the trends remain the same. These smaller gaps might arise for two reasons. First, non-white men may enter the labor market earlier because of their lower college attendance rate. Second, they may also leave the labor force later, due to their higher retirement age.

5 Decomposing Changes in Racial Earnings Gaps

In this section, we present results for the decomposition of changes in racial earnings gaps over time, following the methodology in Bayer and Charles (2018) and outlined in Equations 4 and 5. The first results are shown in Figure 10. It plots the observed and simulated racial earnings level gaps among all men, as well as employment gaps. The simulated level gap corresponds to the racial differences that would have been observed if the relative position of non-white and white men in the earnings distribution had remained stable as in 1980, but the earnings structure—the earnings associated with each percentile—had changed as observed. Differences between the earnings level gap in 1980 and the simulated gap in period t measure the effect of distributional convergence. Differences between the simulated and actual gaps in the same period t measure the effect of positional convergence.

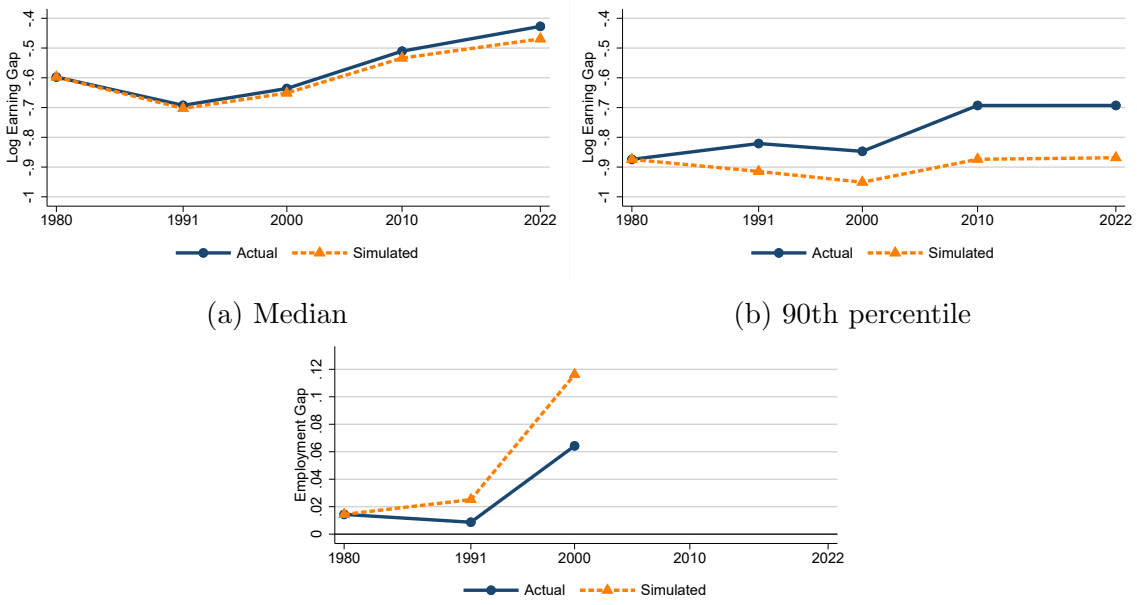
Table 1: Earnings gaps under alternative sample and data specification

	1980	1991	2000	2010	2022
Panel A - Median Earnings Level Gap					
Baseline	-0.597	-0.693	-0.636	-0.511	-0.427
Black (*Preto*)	-0.632	-0.693	-0.641	-0.511	-0.364
Brown (*Pardo*)	-0.587	-0.672	-0.636	-0.511	-0.429
19-64	-0.511	-0.568	-0.499	-0.385	-0.288
Panel B - 90th Quantile Earnings Level Gap					
Baseline	-0.874	-0.821	-0.847	-0.693	-0.693
Black (*Preto*)	-1.070	-0.916	-0.916	-0.744	-0.693
Brown (*Pardo*)	-0.847	-0.798	-0.838	-0.693	-0.693
19-64	-0.791	-0.786	-0.734	-0.693	-0.588
Panel C - Median Earnings Rank Gap					
Baseline	-21.251	-20.742	-19.313	-20.308	-16.899
Black (*Preto*)	-21.958	-22.315	-19.548	-18.577	-15.163
Brown (*Pardo*)	-20.271	-20.380	-19.278	-20.308	-17.870
19-64	-19.328	-17.983	-15.872	-17.694	-15.529
Panel D - 90th Quantile Earnings Rank Gap					
Baseline	-20.018	-16.341	-16.330	-14.509	-13.125
Black (*Preto*)	-24.879	-20.400	-18.577	-14.572	-13.125
Brown (*Pardo*)	-19.257	-15.556	-16.330	-14.193	-13.125
19-64	-12.636	-10.790	-10.691	-9.547	-9.646

Notes. Each cell of the table reports the coefficient that characterizes the differences between non-white and white men from 50th and 90th quantile regressions of the individual's log earnings or percentile rank of earnings on race and controls for age. All specifications include the population of all men, including those with zero earnings. The rows in each panel report results for four alternative specifications/coefficents: (i) baseline results using the dependent variable—monthly labor market earnings, (ii)-(iii) separating the non-white category between *preto* and *pardo*, (iv) expanding the age range to 19–64 from 25–54 years. We do not report standard errors.

In Panel (a), we observe these differences for the median. It shows that the racial earnings gap would be almost the same in 1991 and slightly larger between 2000 and 2022 had no change in the earnings distribution occurred. This indicates that changes in the earnings distribution have played a major role in reducing racial differences in the period, with only a small contribution from positional convergence, especially after 2000. For instance, if there was no change in the relative position of non-white and white men since 1980, the observed level gap at the median would have been 47 log points instead of the observed 43.

In Panel (b) of Figure 10 we observe the trajectory of the actual and simulated racial



(a) Median

(b) 90th percentile

(c) Employment gap

Figure 10: Actual versus Simulated Racial Earnings Level Gaps

Note: These figures display actual and simulated median and 90th quantile racial earnings level gaps. Sources: Census, 1980–2010; Brazilian Household Survey (PNADC), 2022. The sample year labeled '2022' combines PNADC samples from 2022-23.

earnings gaps for the 90th percentile. In this case, positional convergence played a much more important role. Differences between non-white and white men at the top of the skill distribution would have increased up to 2000 if their relative positions had remained the same. This probably reflects increases in the returns to skills in the last decades of the twentieth century in Brazil (Fernández and Messina, 2018; Ferreira et al., 2022). After 2000, there were some small distribution effects at the top, but again, the main changes in earnings level gaps at the 90th percentile were driven by positional convergence, as can be seen from the widening of the difference between the actual and simulated gaps.

Panel (c) displays the actual and simulated employment gaps. The results are only shown up to 2000 because the decomposition can only be applied to study employment gaps when they increase monotonically over the period, what happens only between 1980 and 2000. The figure shows a large increase in racial employment gaps that would have been even larger had no change in the earnings distribution taken place—that is, and overall increase in probability of zero earnings for all men. Hence, it was positional changes in the bottom of the earnings distribution that drove the higher incidence of zero earnings among non-white men between 1980 to 2000.

Table 2 summarizes the results, splitting the period into two, 1980-2000 and 2000-

Table 2: Decomposition of Changes in Racial Earnings and Employment Gaps: Positional versus Distributional Convergence

	1980-2000	2000-2022	1980-2022
Panel A: Median earnings level gap			
Total Change	-0.039	0.209	0.170
Distributional convergence	-0.054	0.182	0.128
Positional convergence	0.015	0.027	0.042
Panel B: 90th quantile earnings level gap			
Total Change	0.027	0.154	0.181
Distributional convergence	-0.076	0.082	0.006
Positional convergence	0.104	0.072	0.176
Panel C: Employment gap			
Total Change	-0.050		
Distributional convergence	0.102		
Positional convergence	-0.152		

Notes. The three panels of this table describe a series of decompositions of the change in the earnings gaps at the 50th and 90th quantiles and the racial employment gap, for the time horizon shown in the column heading. All estimates use the sample of all men including those with zero earnings, conditioning on age. The total change in the earnings gap at each quantile and the racial employment gap is decomposed into two components: the portion due to distributional shifts in the overall structure of the earnings distribution and shifts in the relative position of black and white men within the earnings distribution.

2022. The small increase in median earnings gaps between 1980 and 2000 was driven entirely by changes in the earnings distribution that affected white and non-white men alike (Panel A). It was only offset by a small positional convergence in the period. Analogously, almost all the reduction in the median earnings gap after 2000 was the result of distributional convergence. Throughout 1980 and 2022, distributional convergence accounted for 86% of the reduction in earnings level gaps at the median.

Panel B of Table 2 shows the results of the decomposition of the 90th percentile. The small reduction in racial differences between 1980 and 2000 resulted from a large positional convergence that was partially offset by the a distributional divergence. In contrast, between 2000 and 2022, both distribution and positional effects contributed to reduced racial gaps, but positional convergence played a larger role. Throughout the period, distribution convergence was almost null, while positional convergence accounted for 98% of the reduction in racial earnings gaps at the 90th quantile.

Lastly, the decomposition methodology can also be applied to decompose changes in employment gaps. Between 1980 and 2000, we can see that the increase in the gap in the likelihood of being employed and receiving positive earnings was driven by changes

in positional divergence. This can be interpreted as the chances of non-white men in the bottom of the skill distribution receiving zero earnings increased more than white men in similar positions. Changes in the earnings distribution, that is, the overall increase in non-work rates for white and non-white men alike, counterbalanced the large positional divergence. This result can be seen by contrasting the small racial employment gap observed in 1991 with the large gap in 2000. Although the share of men who did not work and received zero earnings increased rapidly for both racial groups, the increase was proportionally higher for non-white men, suggesting the absence of race-neutral distributional effects.

In general, these results are in line with previous research on the evolution of wage inequality in Brazil (Firpo and Portella, 2019). In the period between 1995 and 2015, wage inequality declined, especially after 2002. The minimum wage increased particularly fast in the 2000s, with important consequences for wage inequality (Engbom and Moser, 2022). The college premium rose in the 1990s, but declined in the 2000s, with similar patterns for the experience premium (Fernández and Messina, 2018).

At the same time, some evidence of reductions in racial discrimination also provides support for positional convergence. For instance, Hirata and Soares (2020) document large reductions in conditional wage gaps in regions more affected by trade liberalization in the early 1990s, suggesting a reduction in taste-based discrimination through increased competition. Ferreira et al. (2022) also document that race and gender conditional gaps contributed to reducing overall inequality, especially between 1995 and 2002.

6 Schooling and Racial Earnings Gaps

Education has long been associated with the worst results for black men relative to white men (Heckman, 2011; Fryer, 2011). Bayer and Charles (2018) highlight three channels through which changes in education can impact racial earnings gaps. First, by a convergence in educational attainment, the relative skill distribution of black men has converged towards that of white men. Here, historical advances since *Brown vs. Board of Education* have been responsible for improving access to education in the US (Collins and Margo, 2006). Second, there might have been within-education positional convergences. This could include improvements in the relative quality of education of black men or a

reduction in discrimination in the labor market. Lastly, given the persistent racial gaps in educational attainment, changes in returns to education may benefit more black or white men. In the case of the United States, where the educational premium has been increasing at least since the late 1970s (Katz and Autor, 1999; Acemoglu and Restrepo, 2022), this force has acted to increase racial earnings differentials in the last decades.

Brazil has gone through important changes in education in the last four decades. There was a considerable expansion in access to basic education, with almost universal coverage in primary education and a similar high school graduation rate for white and non-white children. At the same time, there was rapid expansion in the college system, especially after 1996, when for-profit universities became legal in Brazil.

Table 3 summarizes the large changes that occurred in terms of educational access in Brazil in the period. There were a large inequality in access to education in the earlier period, with the vast majority of Brazilians having less than completed high school. Among them, non-white men were the majority. Over the years, there has been a small convergence in terms of years of schooling, as racial differences decreased from 2.36 to 1.59 years. However, this masks some heterogeneity. Although access to high school degree is almost the same for both racial groups, access to college remains mostly white. Despite a faster relative growth among non-white men, the absolute difference in terms of percentage points increased from 4.6p.p. in 1980 to 6.6p.p. in 2000 and then 13.1p.p. in 2022.

Table 3: Educational attainment of white and non-white men, 1980 to 2022

	1980		2000		2022	
	Non-white	White	Non-white	White	Non-white	White
Less than High School	0.950	0.828	0.852	0.679	0.474	0.325
High School Degree	0.040	0.116	0.130	0.237	0.429	0.448
College Degree	0.010	0.056	0.018	0.084	0.097	0.228
Years of Schooling	2.831	5.196	5.166	7.370	8.786	10.374

Note: This values are computed for all men between 25 and 54 years old.

Table 4 shows preliminary evidence on the patterns of within-education positional convergence in Brazil, by estimating racial earnings rank gaps within education categories. That is, it compares the relative position of non-white and white men in the earnings distribution among individuals with the same educational attainment. We see that these rank gaps were larger in 1980 for all educational groups, at the median and 90th quantile.

Table 4: Racial Earnings Rank Gaps Within Education Category, 1980-2022

	1980	1991	2000	2010	2022
Median					
Less than high school	-18.70	-16.77	-16.96	-14.86	-14.80
	(0.23)	(0.09)	(0.09)	(0.87)	(0.45)
High school	-15.82	-14.45	-10.10	-12.96	-10.86
	(0.11)	(0.11)	(0.67)	(0.17)	(0.38)
College	-22.79	-14.58	-15.39	-10.77	-11.54
	(0.39)	(1.12)	(0.21)	(0.27)	(0.84)
90th quantile					
Less than high school	-13.85	-10.87	-11.37	-9.08	-7.94
	(0.32)	(0.08)	(0.09)	(0.30)	(0.44)
High school	-10.62	-9.29	-6.87	-6.65	-6.47
	(0.60)	(0.26)	(0.54)	(0.06)	(0.34)
College	-14.51	-6.80	-9.04	-7.18	-8.91
	(0.54)	(0.98)	(0.29)	(0.32)	(0.63)

Notes. Each main cell of the table reports the coefficient that characterizes the differences between non-white and white men aged 25–54 years in the education category shown in the row heading from quantile regressions of the individual's percentile rank in the white earnings distribution on race/ethnicity and controls for age categories. All specifications use the sample of all men, including those with zero earnings.

Rank gaps are larger at the median than at the 90th percentile even when we condition on education. More importantly, all these within-education rank gaps are smaller than the overall rank gaps depicted in Figure 8. This highlights the importance of education in determining racial gaps in Brazil. At the same time, it shows some evidence of positional convergence within-education, which might have resulted from reductions in labor market discrimination or improvements in school quality. However, we cannot separate these two forces.

Finally, several studies have shown the evolution of the education premium in Brazil in the last decades. For example, Fernández and Messina (2018) show that the college premium increased between 1990 and the early 2000s and then decreased continuously. Education not only determines earnings, but also the likelihood of being employed. Figure 11 shows the probability that men are employed given their level of education. It shows an increasing importance of education in determining employment in Brazil. Especially after 2000, having a college degree has become more important to guarantee good labor market prospects. In 1980, college graduates were less than 5 percentage points more likely than high school dropouts to have a job. The differences with respect to high school

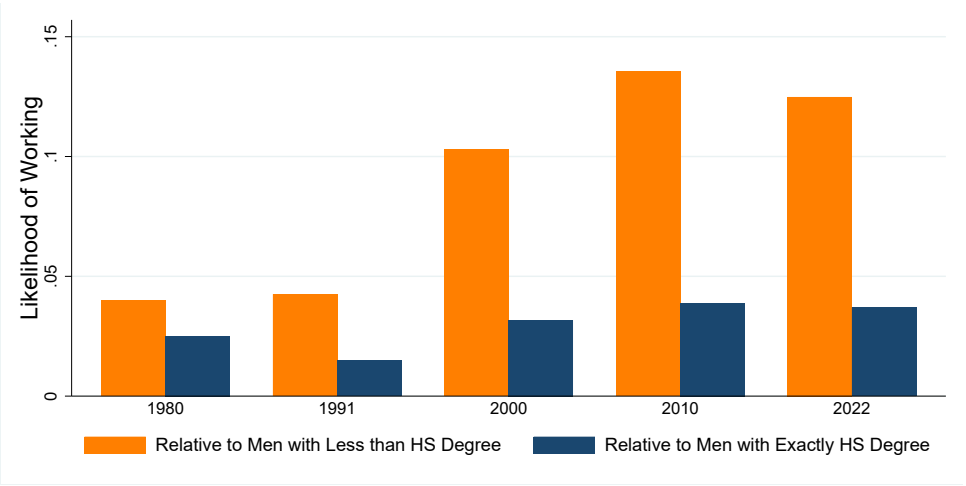


Figure 11: Additional Likelihood of Working for College Educated Men, Relative to Other Education Categories

Note: This figure displays estimates from linear probability regression of employment on education and age. Increased likelihood of working for college-educated workers versus those with less than and exactly a HS degree, respectively, are shown.

graduates were even smaller.

The rapid increase in unemployment between 1991 and 2000 increased the relevance of college degrees in determining non-work in Brazil. The additional probability of working for college graduates with respect to those with incomplete high school increased to more than 10p.p. in 2000, and reached almost 15 points in 2010. Their advantage over high school graduates increased to 5 points in 2000, but decreased slightly in the following decades.

6.1 Positional Convergence: The Role of Education

The decomposition framework outlined in equation 5 can be extended to condition on any observed characteristic X. Following Bayer and Charles (2018), we also condition the decomposition on years of schooling. This amounts to extending the single-dimensional model of skill to two dimensions: educational attainment and residual skill. In practical terms, this is obtained by conditioning the component $[A]$ of equation 5 on education:

$$[(f_t^w\left(q_0^w(q \mid X) \mid X\right) - f_0^w\left(q_0^w(q \mid X) \mid X\right)) - (f_t^w(q \mid X) - f_0^w(q \mid X))] \tag{6}$$

This is a nonparametric version of the framework developed by Lemieux (2006). This allows us to decompose the positional convergence into three distinct effects. First, an

effect that arises from changes in the returns to education. Second, an effect that arises from changes in educational attainment. Third, a residual that corresponds to the within-education positional convergence.

The decomposition conditional on education can be obtained with two additional simulations. In the first, we simulate the earnings distribution holding the share of men in each race-age-education category constant as in 1980 and only changing the wage structure. Comparing this simulation with the first allows us to assess the relative importance of changes in returns to education. The second simulation is needed to separate the importance of convergence in educational attainment from within-education positional convergence. In this simulation, instead of holding fixed the race-age-education composition of 1980, we further allow the educational composition to change to that observed in period t. The difference between these two new simulations measures the importance of changes in educational composition, whereas any residual is associated with within-educational positional change, that is, changes in the relative position of black men compared to white men with the same education attainment.

Table 5 presents the results of including education in the decomposition, as described above. The results for distributional and positional convergence are the same. The advantage of including education in the decomposition is to allow a more nuanced view of the positional convergence, assessing the relative importance of: i) changes in the returns to education; ii) changes in educational attainment of white and non-white workers; iii) within-education positional changes.

The results for the median earnings level gaps show that the small positional convergence observed in the period was the result of two different trends. Between 1980 and 2000, return to education almost did not change. In this period, we observe significant gains due to convergence in educational attainment. This, however, was attenuated by a within-education positional divergence. In contrast, between 2000 and 2022, returns to education decreased, and this contributed to reduce earnings level gaps significantly. However, increases in educational attainment in the period benefited mostly white men and thus reduced the relative gains of non-white men through the lower education premium. Changes in within-education relative positions were almost null between 2000 and 2022. Throughout, we observe a large convergent effect from decreases in the returns to education that was attenuated by a divergence in educational attainment and a smaller

Table 5: Decomposition of Changes in Racial Earnings and Employment Gaps: The Role of Education

	1980-2000	2000-2022	1980-2022
Panel A: Median earnings level gap			
Total Change	-0.039	0.209	0.170
Distributional convergence	-0.054	0.182	0.128
Positional convergence	0.015	0.027	0.042
Returns to education	-0.003	0.158	0.155
Convergence in educational attainment	0.064	-0.141	-0.077
Within-education positional convergence	-0.046	0.010	-0.036
Panel B: 90th quantile earnings level gap			
Total Change	0.027	0.154	0.181
Distributional convergence	-0.076	0.082	0.006
Positional convergence	0.104	0.072	0.176
Returns to education	0.033	0.163	0.196
Convergence in educational attainment	0.091	-0.127	-0.035
Within-education positional convergence	-0.020	0.035	0.015
Panel C: Employment gap			
Total Change	-0.050		
Distributional convergence	0.102		
Positional convergence	-0.152		
Returns to education	-0.014		
Convergence in educational attainment	0.003		
Within-education positional convergence	-0.141		

Notes. The three panels of this table describe a series of decompositions of the change in the earnings gaps at the 50th and 90th quantiles and the racial employment gap for the time horizon shown in the column heading. All estimates use the sample of all men including those with zero earnings, conditioning on age. The total change in the earnings gap at each quantile and the racial employment gap is first decomposed into two components: the portion due to distributional shifts in the overall structure of the earnings distribution and shifts in the relative position of black and white men within the earnings distribution. The shifts in relative position are then further decomposed into components due to racial convergence in educational attainment, within-education category positional convergence, and changes in the relative position of black and white men due to education-related changes in the earnings distribution.

reduction in within-education positional divergence.

Positional convergence at the 90th percentile follows a pattern similar to that at the median, but with larger magnitudes. For instance, returns to education contributed to a slight decrease in racial gaps between 1980 and 2000, and the effect was even greater in the second period. The convergence in education was also larger in the first period, whereas between 2000 and 2022 the divergence in educational attainment was less pronounced. Finally, within-education positional divergence was small between 1980 and 2000 and contributed more to the reduction of inequality in the next period. Overall, the convergence effect from returns to education was large, the divergent effect from educational attainment was lower, and there was a small within-education positional convergence rather than a divergence.

Lastly, returns to education and educational convergence played almost no role in the positional divergence that drove the large increase in employment gaps between white and non-white men. It was actually within-education positional divergence that led to the high reduction in the incidence of zero earnings among non-white men. This is somewhat surprising given the growing importance of college degrees in the likelihood of being employed between 1980 and 2000. However, this puzzle might be solved if we recognize the small share of college graduates among the population and their likely even lower share among non-workers. Hence, any changes in the relative odds of zero earnings between educational categories are potentially dwarfed given the small proportion of high-education jobless men in Brazil.

7 Conclusion

Our study provides a comprehensive analysis of the long-term evolution of racial earnings disparities among Brazilian men. Using data from the Brazilian Census between 1980 and 2010 and National Household Surveys between 2022 and 2023, we have documented significant and persistent racial earnings gaps across different percentiles of the earnings distribution. Our findings reveal that, while there has been some progress in reducing these disparities, substantial gaps remain, especially at the higher end of the earnings distribution.

The decomposition framework we employed highlights the distinct forces driving

changes in racial inequality. At the median, the reduction in racial earnings gaps was primarily due to distributional convergence, driven by an overall compression in the earnings distribution. In contrast, the reduction in racial inequality at the 90th percentile was driven by positional changes, reflecting gains in the relative position of black men compared to their white counterparts.

Our study also underscores the role of education in shaping racial earnings disparities. While educational convergence contributed to reducing racial inequality between 1980 and 2000, the decrease in returns to education played a more significant role in improving the relative position of black men between 2000 and 2022.

By contrasting the Brazilian experience with that of the United States, our research contributes to the broader literature on racial inequality. We show that while similar forces have acted in both countries, their impacts have often been in opposing directions. The overall compression in the Brazilian earnings distribution and a reduction in the returns to education have been crucial in the observed convergence of earnings between white and non-white since 1980. This contrasts to the widening disparities observed in the United States due to increasing inequality in that country over the last four decades.

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