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# A Comparative Portrait of Long-Run Racial Disparity in the United States and Brazil

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**Abstract**

The relative incomes and education-levels of Black and white populations in the United States and Brazil are considered after Abolition, and framed by earlier disparities in their natural rates of increase. For the post-World War Two period, the effects of demography, education, and regional migration on the Black-white income gap are disentangled using census microdata and a single-equation form Blinder-Oaxaca decomposition. These variables explain progressively less of income inequality over time, meaning that discrimination or other unobserved factors have become more-substantial determinants of relative earnings. Education, measured by literacy or years of schooling, was the major reason behind reductions in income gaps during this period, followed by demography and migration. While both countries have made gains towards racial equality, their timing is entirely divergent (and sometimes counter to popular understandings): the best decade in these terms for the US was the 1960s, and the worst, the 2000s or 2010s; and, vice-versa for Brazil.

**JEL Classifications**: N36, N96, O11, O15, O54.

**Keywords**: Race, Inequality, Brazil, United States, Segregation.



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## Introduction

The Americas are a land of economic prosperity for the vast majority of people living there, whether their ancestors arrived by volition or by force. A high standard-of-living vis à vis those from some ancestral homeland is of little comfort to many, however, because ultimately individuals' perceptions of well-being are relative. In this regard, countries like the United States and Brazil have a problem: there are substantial relative gaps amongst people across a host of indicators, like education and income, and these cluster along racial lines. This is not only a source of conflict, but of economic distortions that work counter to everyone's prosperity.

Popular movements for social justice are a welcome development, but how much they change anything is uncertain. In the US, police shootings inspired the "Black Lives Matter" movement; and in Brazil, people were mobilized to establish legislation on affirmative action in university admissions. Yet, in both countries, Black or mixed-race individuals are notably overrepresented among prison populations, and underrepresented among college graduates.

The US has four million institutional inmates (1.3 percent of the population) as reported by the 2010 Census: sixty-three (63.3) percent are white and twenty-nine (29.2) percent are Black.[1] Overall, seventy-two (72.4) percent of the population is white, as of that census, and thirteen (12.6) percent is Black; therefore, *Black people in the US are 2.6 times more likely to be inmates than white people*.[2] Brazil, in contrast, has 580 thousand institutional inmates (0.3 percent of the population) according to the 2015 Prison Census: thirty (30.2) percent are white and sixty-five (64.8) percent are Black.[3] Forty-five (45.2) percent of the total population is white, per that year's national survey, and fifty-four (53.9) percent is Black; therefore, *Black people in Brazil are 1.8 times more likely to be inmates than white people*.[4]

An unusually large share of the US population is in jail, although incarceration rates in both countries are disproportionately higher for the Black cohort than the white. Police shootings in the US are more likely to involve those of African descent and, although statistics are lacking, in Brazil that is almost certainly also the case.[5] After the millennium, Brazil adopted affirmative action legislation—as the US had some decades earlier—and established a new secretary for promoting racial equality.[6] Growth in the numbers of Black Brazilians attending

[1] These figures are based on the ten-percent 2010 Census microdata sample from the University of Minnesota, Minnesota Population Center, Integrated Public Use Microdata Series (IPUMS)-USA (accessed January 2016). The Black/white population shares correspond to those who identify as being of a single race, and exclude the 0.95 percent of inmates (or 2.94 percent of the general population) who self-identify as of two or more major races. The multiple-race option is only available in surveys after 2002.

[2] When considered by sex, Black and white females in the US are inmates with equal probability, but Black males are inmates with 3.9 times greater frequency than white males.

[3] http://dados.mj.gov.br/dataset/infopen-levantamento-nacional-de-informacoes-penitenciarias/ (accessed January 2017). "Black" (*preto*) here includes those who identify as "mixed-race" or, literally, "brown" (*pardo*); both groups are considered jointly because they have similar socio-economic characteristics as compared to whites (see Nelson do Valle Silva 1985).

[4] Total population figures are from IBGE (2017). When regarded by sex, Black females and Black males in Brazil are 1.9 times and 1.7 times more likely, respectively, to be imprisoned than their white counterparts.

[5] Consider the 1,059 people killed by police in the US during the 13 months from January 2015 through January 2016: forty-nine (49.5) percent were white and twenty-five (25.5) percent were Black; granted that 77.5 percent of the US population was white and 13.2 percent was Black as of 2014, *Black people in the US are 3.0 times more likely to be killed by police* (Washington Post 2015; Stephen Rich and Kimbriell Kelly 2015). Total population figures are from the US Census Bureau (2015).

[6] The National Program of Affirmative Action went into effect in 2002, under the Secretary of State for Human Rights, Ministry of Justice; the Secretary of Policy for the Promotion of Racial Equality was established in 2003, and charged with enforcing affirmative action laws and monitoring progress towards achieving related goals.

post-secondary school from 1998 to 2008 was proportionately greater than for white (Irene Rossetto and Marcelo Paixão 2010), yet both there and in the US graduation rates for people of color lag, and particularly in the highest-paid fields.

Non-white persons in the US and Brazil have very unequal results in life as compared to white persons, but recent experiences seem to be in contrast. At this juncture in time, it is appropriate to assess the long-run gains and setbacks which have been made. This article explores these countries' historical similarities (area, population, and government) and differences (volume of the slave trade, and natural increase or manumission of slaves); describes long-run trends in relative Black and white income, literacy, and school completion; and decomposes income gaps after 1950 into several causal factors, whose relative importance in explaining temporal changes in racial inequality are estimated.

Brazil and the US are among the six largest countries in the world by population and area and the three largest in the Western Hemisphere (see below). Both have substantial populations of African descent oriented towards the tropics, but whereas mainland North America was the destination of 3.8 percent of all African slaves shipped during the trans-Atlantic trade, 44.2 percent were destined for Brazil (Trans-Atlantic Slave Trade Database). In 1850, however, the Black population of the US was tenfold the cumulative number of slaves it had imported, while that of Brazil had yet to surpass the number of slaves it had until then received. In that year, 88 percent of Black Americans were enslaved, versus 51 percent of Black Brazilians.

Comparative Black-white real incomes are presented for the US since 1950 and Brazil after 1960 using census and household survey microdata. These series are extended back to the 1870s and 1880s, respectively, by appending the estimates of Robert Margo (2016) and Bucciferro (2017). Incomes in Brazil have converged towards those of the US, but in both countries the racial gaps remain wide. As of 2020, average Black income in the US was 62 percent of average white income, against 59 percent in Brazil; in 1960, the corresponding ratios were 54 and 49 percent. In 1940, the estimated income of African-Americans was 38 percent of whites', compared to 41 percent for Afro-Brazilians twenty years earlier; in 1900, the relative income was 32 percent in the US, versus 35 percent in Brazil as of 1886.

The temporal patterns of changes in relative earnings by race across the two countries are almost perfectly inverse: the 1960s and 1970s showed strong comparative increases for the Black population in the US, versus declines in the 1980s, growth in the 1990s, and decreases in the 2000s and 2010s; and the mirror-opposite for Brazil. The overall increases in relative incomes are modest against sustained gains in literacy (the Black rate was 6 percent of the white in 1860, and rising to 86 percent in 1930 for the US; and 8 percent in 1900, rising to 85 percent in 2000 for Brazil), and educational attainment (in 1940, the Black cohort completed *ninth* grade at 38 percent of the white rate in the US, versus 16 percent relative completion of *fifth* grade in Brazil; in 2010, 94 percent and 86 percent).

The Black-white income gaps are decomposed along age and sex, literacy or school enrollment, educational attainment, and region. For Brazil, these variables can explain 82 percent of the income gap in 1960, yet only 64 percent in 2020; and for the US, they account for 59 percent of the gap in 1960, and just 48 percent in 2020. In the US, an average 7.0 percent of the decadal change in the income ratio can be explained by school enrollment or education level, had the conforming levels for white people remained constant; in effect, only 1.2 percent of the difference can be explained by these forces given simultaneous changes among both groups. The statistics for Brazil are 15.9 percent and 4.5 percent, respectively. Demography and migration, with some exceptions, were not as powerful drivers of changes in relative incomes.

This article complements work on historical racial inequality in the United States, including that by Peter Lindert and Jeffrey Williamson (2016) and Margo (2016). It also considers the impact of foreign (e.g. Leah Boustan and Ran Abramitzky 2017; Abramitzky,

Boustan, and Katherine Eriksson 2014) and domestic migration (e.g. Boustan 2009; William Collins 1997; Ellora Derenoncourt 2022), and educational attainment (e.g. David Card and Jesse Rothstein 2007; June O'Neill and Dave O'Neill 2005), on relative earnings. The approach builds on other empirical studies of race in Brazil, including those by Jean-Louis Arcand and Béatrice D'Hombres (2004), Omar Arias, Gustavo Yamada, and Luis Tejerina (2004), and Filipe Campante, Anna Crespo, and Phillippe Leite (2004). The comparative gains made by Afro-descendants in the New World, beset by increasingly disparate treatment, warrant some measured optimism as regards the future.

## Historical Antecedents of Black-White Income Inequality

There are several parallels between Brazil and the United States, in terms of their place in the world and within the hemisphere. The US is the third-largest country in the world by area (9.8 million sq. km) and has the fourth-largest population (321 million, est. July 2015); Brazil is the fifth-largest country in area (8.5 million sq. km) and has the sixth-largest population (204 million, est. July 2015) (CIA World Factbook). The two countries, both federal republics, are respectively situated in North and South America and, with reference to the equator, have symmetric geographical distributions of race: most African Americans (57.2 percent) reside in the south, and most Afro-Brazilians (53.2 percent) reside in the north.[7]

Though similar in these regards, the countries differ in terms of their historical reliance on the trans-Atlantic slave trade, and their respective population shares of African ancestry. The US, while the major terminus for slaves in Mainland North America, had a notably lower total volume of embarkations from Africa as compared to the Caribbean or Brazil, as well as Spanish America save for the 1700s.[8] Only 3.8 percent of all African slaves were destined for Mainland North America (472 thousand souls)—the second-lowest volume in the New World to the Danish West Indies, which accounted for 1.0 percent of the trade (130,000), and close to the Dutch Americas with 4.1 percent of embarkations (514,000). The greater volume of slaves sent to the Spanish and Portuguese Americas is partially explained by their earlier settlement and the later duration of the south-Atlantic trade.[9]

Comparison of the cumulative inflows of slaves and migrants to the United States and Brazil with their extant populations allows some raw inferences about historical racial inequality. The spreads between the series shown in Figures 1 and 2 are suggestive of the relative population growth rates of Black and white people (panels A and B) over time—a rough proxy for gross standards-of-living. The early estimates must be interpreted with caution; hence, the series as illustrated are three-decade moving averages to avoid implying undue precision.

The underlying data for the US are decennial census figures from 1790 to 2010, along with Census Bureau estimates for periods back to 1620, broken-down by "white", "Black", and "Native American" or "other"; likewise, the data for Brazil are national census figures from 1872 to 2010, in addition to regional census estimates from 1775 to 1850, and the author's estimates for periods back to 1545, grouped by "*pardo*", "*preto*", "*branco*", and "*indígena*" or "other". For detailed source information, please see Appendix I.

[7] These figures are based on respective 2000 census micro-samples from the University of Minnesota, IPUMS for the US (5 percent) and Brazil (10 percent). They refer to the combined share of Black individuals living in the "south Atlantic", "east south central", and "west south central" regions of the US, and the "north" and "northeast" regions of Brazil.

[8] Trans-Atlantic Slave Trade Database. Mainland North America effectively designates the original 13 US states, previously British colonies; some slaves were also shipped to the Gulf coast or other neighboring locations. The estimated volume of African slave embarkations for the New World, spanning 1501 to 1866, varies greatly by major destination region.

[9] The north Atlantic trade was ended in 1807, whereas the south Atlantic trade continued until 1850 (Leslie Bethell 1970).

As of 1790, the US population—as recorded by the first census—was about 80 percent white and 20 percent Black; as of 2010, the American Community Survey indicates that 83.5 percent was white and 10.7 percent Black.[10] In Brazil, on the other hand, circa 1775 around 30 percent of the population was white versus roughly 60 percent which was Black; in 2010, the population was about half Black (50.1 percent) and half white (47.5 percent).[11] The Black population has always been a minority in the United States, and more so today as compared to the eighteenth or nineteenth centuries, although in Brazil circa 1775 it was, and is again as of 2010, a majority.

Once more consider the estimated number of slaves embarked for Mainland North America (472,000), and in addition for Brazil (5,533,000), over the course of the trans-Atlantic trade.[12] The ratio of the Black population of the United States in 1870 after Abolition (4,880,000) to the total number of slaves sent there is *over ten-to-one*; the corresponding ratio for Brazil, as of the first national census in 1872 (with a Black population of 5,760,000), is just *over one-to-one*. The implication is a fundamentally different mortality regime within Brazil as opposed to the United States, partly a result of the generally lower overall standard of living, possibly harsher working conditions, greater access to slaves, and corresponding disincentives for the formation of families and childrearing.

It does not appear that the cumulative number of slaves imported into what is now the US up until each year (Figure 1A) is altogether different from the Black population of that year between roughly 1650 and 1750; afterwards, however, natural growth of the population accelerated and—following on the cessation of the trans-Atlantic trade—continued to be strong. For the white population (Figure 1B), perhaps excepting the first few decades of settlement when life was harshest, natural growth was sustained in the long-run.

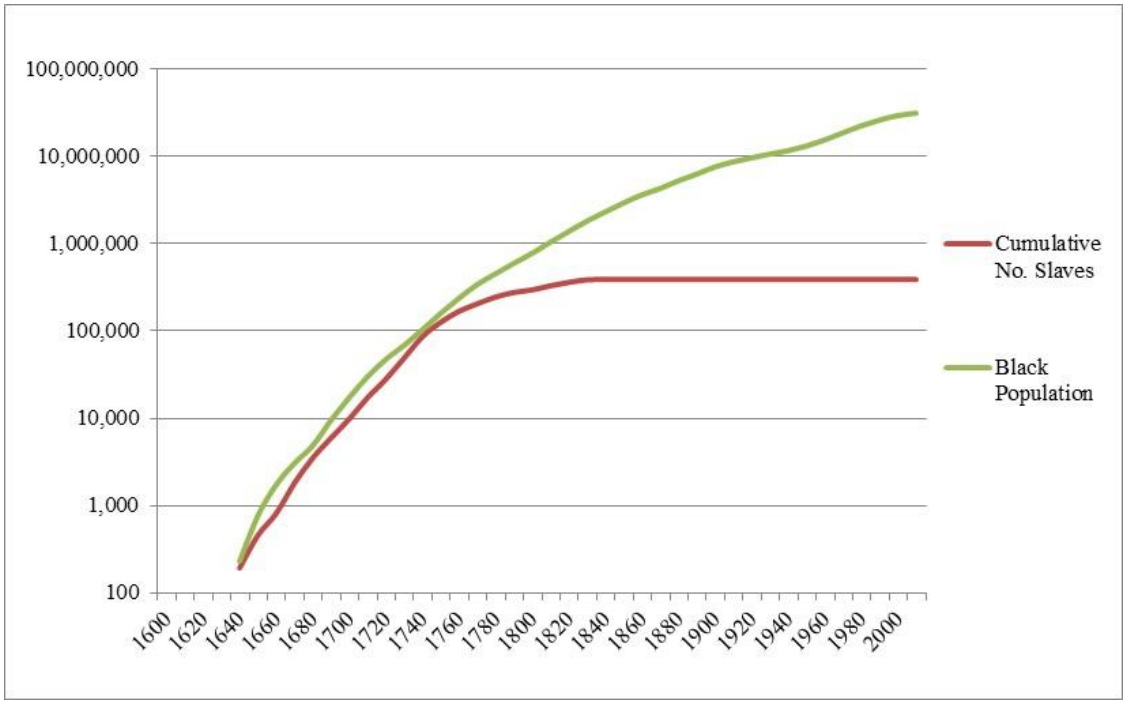
Consider the corresponding set of figures for Brazil, from colony to present. In Figure 2A, there is a centuries-long inversion (from about 1600 to 1860) where the cumulative number of slaves imported well exceeds the populace of African descent. A scenario in which the two series might be equal is if there were full population replacement (two children per woman average), but this was evidently not the case—a good deal from it. After 1872, when no more slaves would enter the country, the Afro-Brazilian population nonetheless exhibits robust natural growth. The relatively high mortality of African slaves in South America and the Caribbean versus British North America has been established elsewhere (see David Eltis and David Richardson 2010, for instance); the data as illustrated here nonetheless demonstrate how magnified such mortality differentials, if sustained, could become in terms of the sheer scale of human life that might have been.

There also appears to be a more-moderate inversion for the white population (Figure 2B) during the eighteenth century. Data for this period are nonetheless “precarious and scarce”, to cite Celso Furtado (2006, 118), so while these estimates confirm that this was a particularly difficult time for people of all races to survive, they might also to some extent undercount the population.

[10] Note that in US censuses after 2000, individuals are allowed to self-identify as belonging to multiple racial categories. This work considers the “single race” classification, which captures approximately 97 percent of respondents.

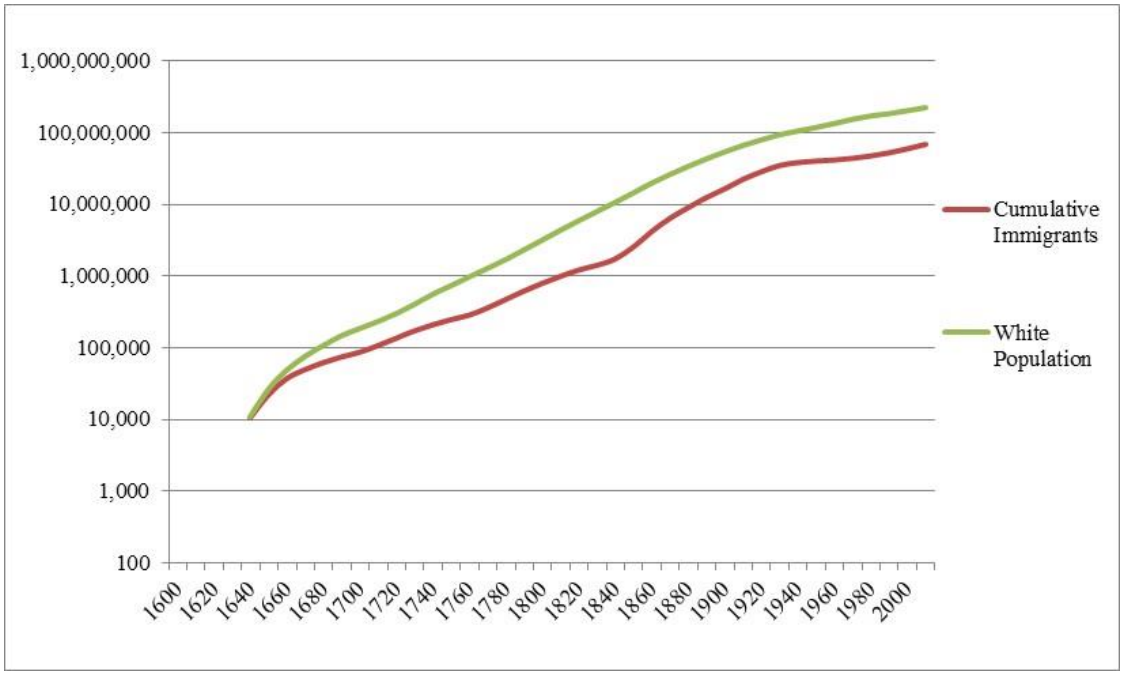
[11] The Black and white population shares of Brazil in 1772-1782 are based on the statistics compiled from regional censuses by Dauril Alden (1963), combined with the supplemental estimates of Bucciferro (2013). These may differ from other sources, which typically underestimate the size of the Indigenous population and thus overestimate the proportion of the population which was Black, brown (or “mulatto”), or white.

[12] Of the 12.5 million slaves estimated to have embarked from Africa, 10.7 million (or 85.5 percent) actually disembarked.



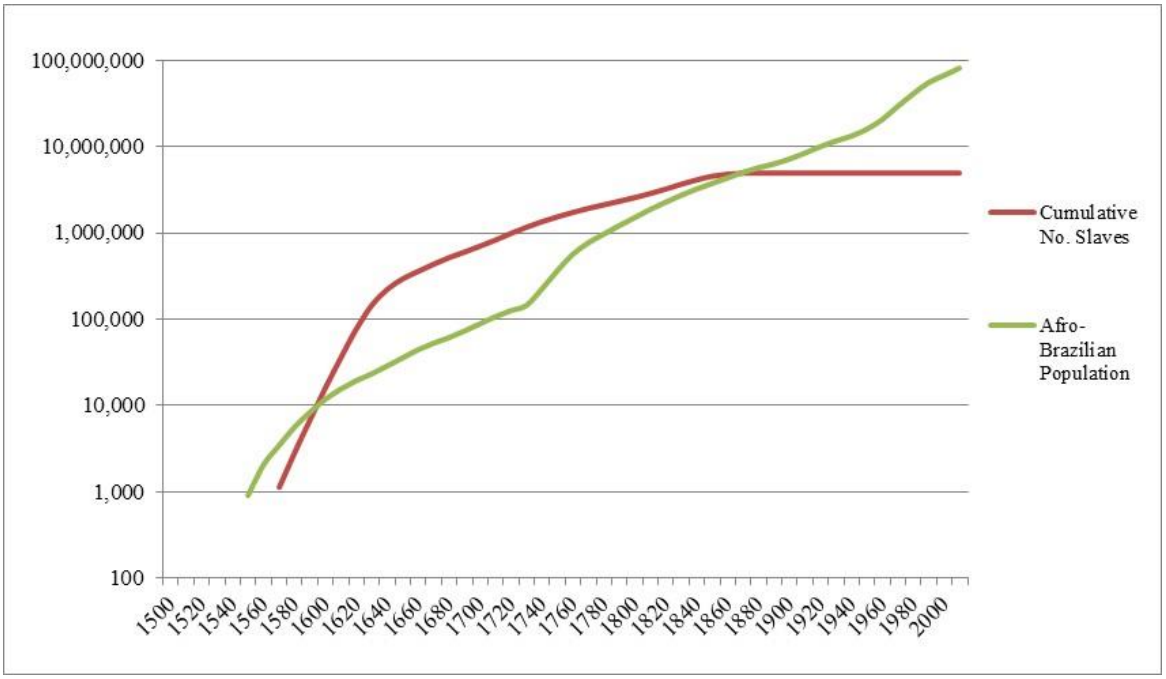

Sources: See Appendix I.

**Figure 1A**
Slaves Disembarked and African-American Population, US (1610-2010)



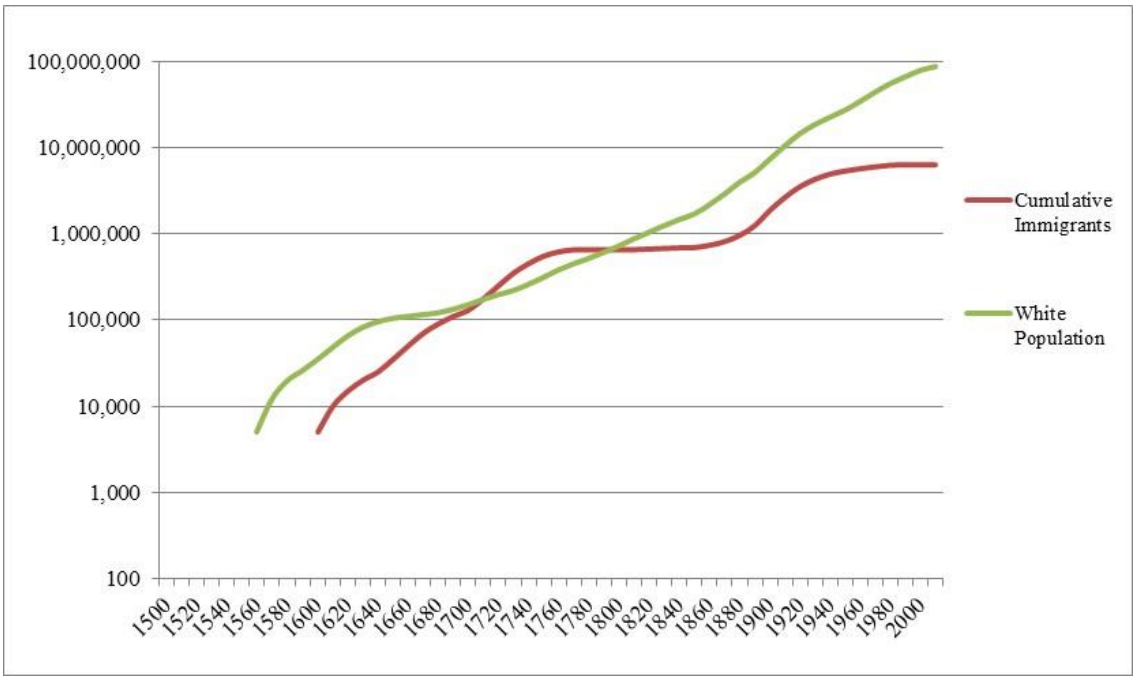

Sources: See Appendix I.

**Figure 1B**
Total Immigrants and White Population, US (1610-2010)




Sources: See Appendix I.

**Figure 2A**
Slaves Disembarked and Afro-Brazilian Population, Brazil (1510-2010)




Sources: See Appendix I.

**Figure 2B**
Total Immigrants and White Population, Brazil (1510-2010)

Brazil had greater African influence and numbers of foreign-born slaves as compared to the United States, although towards the end of 'the peculiar institution' a similar fraction of the overall population was enslaved (12.6 percent in the US in 1860, and 15.2 percent in Brazil in 1872). Table 1 reveals a profound difference between these countries, however: on the eve of Abolition, 89.0 percent of Blacks in the US were slaves, according to the census, versus 9.7 percent in Brazil, a circumstance which apparently contradicts the positive implications of the higher natural rates of increase realized by persons of African descent in the US.

**Table 1**
Population by Race and Servile Status

| United States | | | | Brazil | | | |
|---|---|---|---|---|---|---|---|
| Year | % Pop. Black | % Pop. Slave | % Black Pop. Enslaved | Year | % Pop. Black | % Pop. Slave | % Black Pop. Enslaved |
| - | | | | 1887 | 47.0 | 5.0 | 9.7 |
| 1860 | 14.1 | 12.6 | 89.0 | 1872 | 58.0 | 15.2 | 26.3 |
| 1850 | 15.7 | 13.8 | 88.1 | 1850 | 62.8 | 25.5 | 50.5 |
| 1840 | 16.8 | 14.6 | 86.6 | - | | | |
| 1830 | 18.1 | 15.6 | 86.3 | 1825 | 61.0 | 33.2 | 56.1 |
| 1820 | 18.4 | 16.0 | 86.8 | - | | | |
| 1810 | 19.0 | 16.5 | 86.5 | - | | | |
| 1800 | 18.9 | 16.8 | 89.2 | 1798 | 65.3 | .. | .. |
| 1790 | 19.3 | 17.8 | 92.1 | - | | | |
| - | | | | 1772/80 | 70.5 | .. | .. |

Sources:
US: Campbell Gibson and Kay Jung (2002).
Brazil: National population by race: 1772/80 from Alden (1963); 1798, Alden (1984); ca. 1825/1850, state censuses in Herbert Klein and Francisco Luna (2010); 1872/90, national censuses (see Appendix I). National slave population: Stein (1957) and Conrad (1972), in Carlos Alfredo Hasenbalg (1978).

In effect, to be Black in the area that would become the United States was almost always to be a slave. According to Donald Wright (1993, 126): "On the eve of the Revolution there may have been thirty thousand free African Americans—not 5 percent of the Black population of the colonies". The very concept of race, and social segmentation according to race, was bolstered by the American policy, without precedent in England, that the children of white men born to slave women would take on the legal status of the mother (Héctor Díaz Polanco 1997). The consistently high captivity rates of African Americans stand in sharp contrast to those of Afro-Brazilians, who had large and growing free populations during the eighteenth and, in Minas Gerais, even seventeenth centuries.

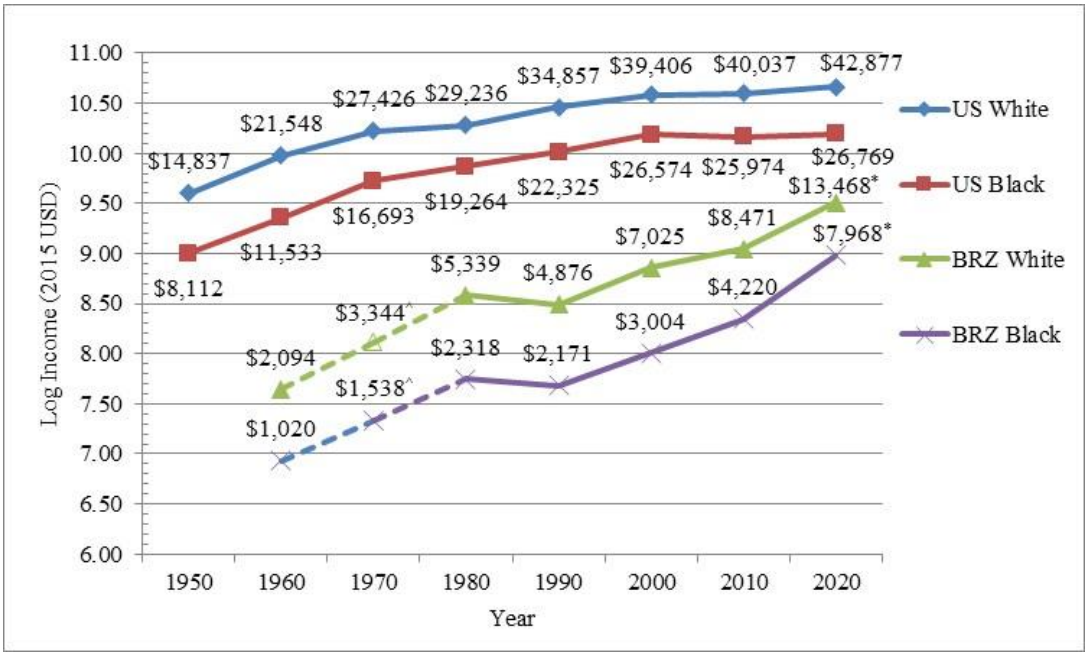
The extent of slavery in the past has been shown to have a forceful impact on the present, including lower rates of economic growth for those countries with a greater reliance on the slave trade (for example, see Nathan Nunn 2008). To better understand racial stratification today, however, it is necessary to expand beyond discussion of the legacy of slavery. The next section examines evidence for the "statistical era" leading up to the present day, beginning with the institution of the national census in the US in 1790 and in Brazil in 1872.

## Racial Inequality in the Modern Era

The approach adopted here is deliberately broad: Where does American (Brazilian) society stand with reference to the racial frontier, in terms of life-expectancy, sex or gender, and

education? Moreover, how do these characteristics map to prevailing earnings disparities? The era of national comprehensive censuses from which it is possible to infer relative earnings begins in the late nineteenth century. Systematic census accounts of earnings or incomes only begin in 1950 and 1960, respectively, for the US and Brazil.[13]

Figure 3 presents these countries' average real incomes by race using standardized microsamples. The specific metric considered is the total self-reported personal income from all sources.[14] A log scale is used, such that the changing vertical distances between the Black and white income series represent actual variations in inequality; the value of income is plotted above each point (as well as a linear interpolation for Brazil 1970 as reference). In terms of both absolute income and income relative to white persons, the economic status of African Americans is higher than that of Afro-Brazilians; of course, Brazil is at an earlier stage of its development and incomes are clearly converging with those in the US.



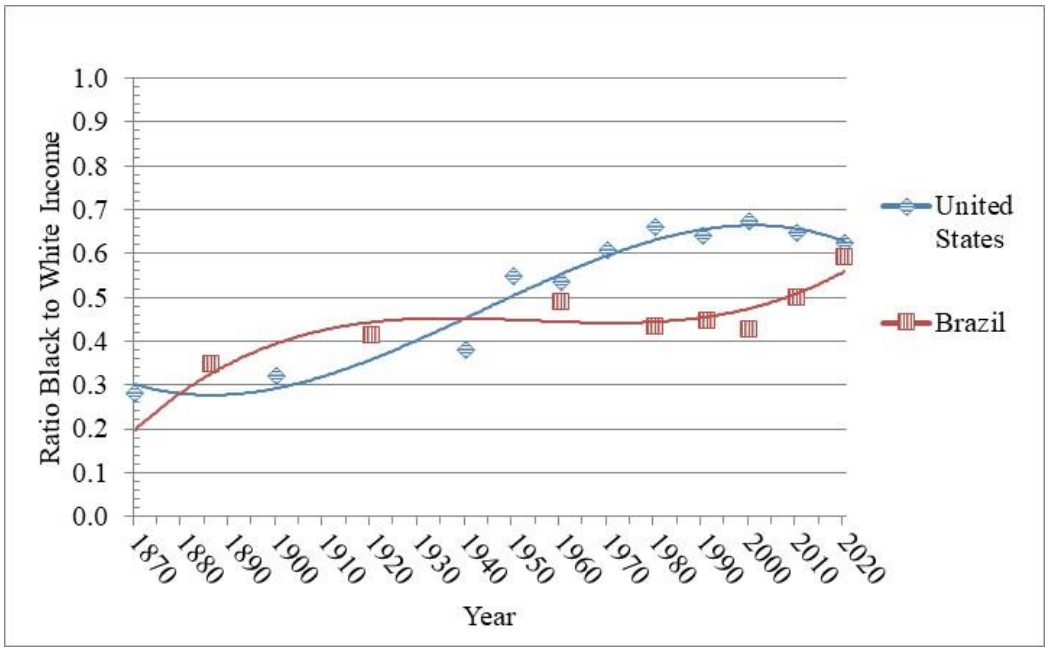

Sources: US Census Bureau microdata for 1950-2000 censuses and 2010/2020 five-year ACS from the Minnesota Population Center, IPUMS (Steven Ruggles et al. 2016 and 2022). Incomes in 2015 CPI-adjusted dollars (https://fred.stlouisfed.org/). IBGE microdata for 1960-2010 censuses from IPUMS (Minnesota Population Center 2016) and 2020 household survey microdata from IBGE (2022). Incomes expressed in "current-price" real 2015 dollars based on Penn World Tables v.10.0 PPP exchange rates (Robert C. Feenstra, Robert Inklaar, and Marcel P. Timmer 2015), adjusting for intervening currency revaluations. ^Race was not considered in the 1970 census; the dotted line displays a constant growth rate. *Income statistics for 2020 exclude individuals under age 14.

**Figure 3**
Real Incomes by Race, United States and Brazil

[13] Several approaches have been employed to estimate incomes for much earlier periods, including work by Lindert and Williamson (2016) for the US, as well as Leandro Prados de la Escosura (2009) for Latin America.

[14] The IPUMS source documents describe the variable *inctot* as "each respondent's total pre-tax personal income or losses from all sources for the previous year". The words "earnings" and "incomes" are sometimes interchanged—granted, they are not the same things—which the reader may excuse because most individuals in the sample have no unearned income net of transfers (like rent or dividends); those that do may underreport them to census-takers.

Racial inequality is nonetheless persistent. The respective ratios of Black-to-white income are shown in Figure 4, along with estimates of racial earnings inequality for earlier periods from Margo (2016), who revises the estimates of Robert Higgs (1977, 1989), and Bucciferro (2017), based on slave maintenance costs and occupational wage distributions.

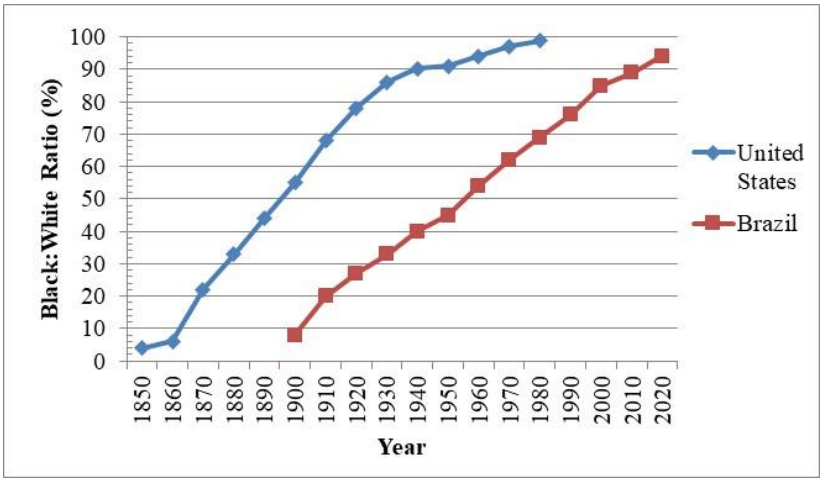



Sources: All figures from 1950 to 2020 are from decennial census or household survey microdata in Minnesota Population Center, IPUMS, with the exception of 2020 PNADc microdata for Brazil (IBGE 2022). Data for US in 1870, 1900, and 1940 are Margo's (2016) revisions of Higgs' (1977, 1989) original estimates; figures for Brazil in 1886 and 1920 are from Bucciferro (2017).
Note: A third-order polynomial trendline is plotted for each series.

**Figure 4**
Black-White Income Ratios in US and Brazil, 1870-2020

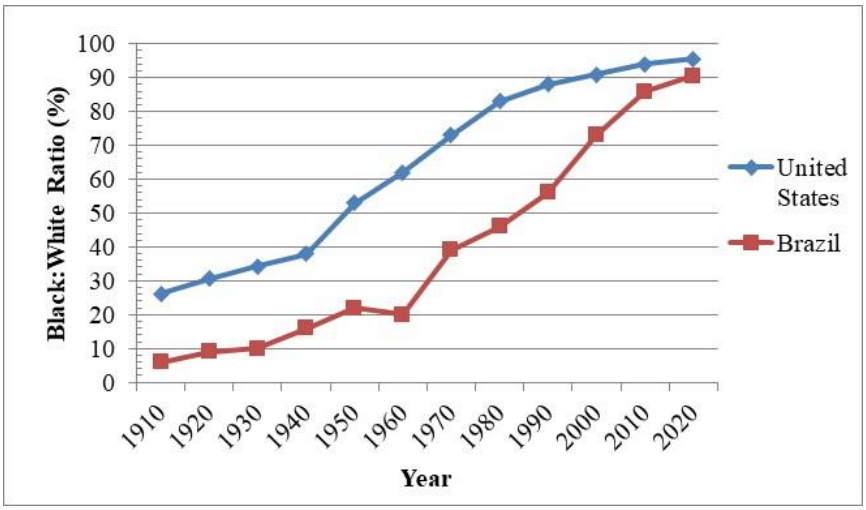
Relative Black incomes in Brazil were likely higher than in the US during the late 1800s and early 1900s. They were then surpassed by those of the US and, since 1960, there has been an inverse pattern across the two countries: When Black relative incomes in the US were rising during the 1960s Civil Rights Movement, those in Brazil were falling as the country entered a military dictatorship that would last two decades. During the 1980s, the re-emergence of civil society accompanied modest gains for Afro-Brazilians as compared to the declines experienced in the US during the era of deregulation. Upward movements in relative Black incomes resumed for the US in the 1990s, then stalled with the Great Recession of the 2000s and the economy's slow recovery during the 2010s; to the contrary, after falling in the 1990s, the Black-white income ratio in Brazil surged during the 2000s as new social welfare programs took effect—evidence suggests that in the 2010s the trend continued.

The balancing of incomes by race is moderate against the successes realized towards more-equal literacy and education rates, as illustrated in Figures 5 and 6. The trends in relative literacy for the United States and Brazil show a similar pattern of sustained long-run gains, albeit with an initial forty-year lag (to reach 10 percent relative literacy) expanding to a seventy-year lag (to reach 80 percent) that in recent decades has narrowed. Black literacy in the US was 6 percent of the level of whites in 1860, but rose to 86 percent in 1930; in Brazil, it was 8 percent of the white level in 1900, and increased to 85 percent as of 2000. These changes




Sources:
US: 1850 to 1930, Minnesota Population Center, IPUMS (Ruggles et al. 2016); linear trend shown for 1890. For 1940 to 1980, National Center for Education Statistics (1992); 1950 observation is the 1947/1952 average.
Brazil: 1940 and 1950, IBGE (1950 and 1956); 1960 to 2010, IBGE census microdata from IPUMS International (Minnesota Population Center 2016); and 2020, PNADc household survey data (IBGE 2022). Figures for 1900 to 1930 correspond to the 70-79 to 40-49 cohort illiteracy rates, respectively, in 1950, and may be subject to survival bias.

**Figure 5**
Relative Black/White Literacy, US and Brazil




Sources:
US: 1940 to 2020, Minnesota Population Center, IPUMS (Ruggles et al. 2022). Figures for 1910, 1920, and 1930 correspond to the 66-70, 56-60, and 46-50 age cohorts in 1940.
Brazil: 1940 and 1950, IBGE (1950 and 1956); 1960 to 2010, IBGE census microdata from IPUMS International (Minnesota Population Center 2016); and 2020, PNADc (IBGE 2022). Figures for 1910, 1920, and 1930 correspond to the 56-60, 46-50, and 36-40 age cohorts in 1960 (Aldo Musacchio, André M. Fritscher, and Martina Viarengo 2014).
Note: The US series is the percentage of respondents who have completed *ninth* grade or above, but the Brazil series corresponds to those who have finished at least *fifth* grade.

**Figure 6**
Relative Black/White Education, US and Brazil

were paralleled by similar improvements in the population shares which had completed basic education.

There is convergence across races in terms of educational attainment within both Brazil and the US, and in this respect the countries have become more similar. The general level of education is much higher in the United States across all races, notwithstanding that the data correspond to *ninth* grade for the US and only *fifth* grade for Brazil. In 1940, for instance, African-American educational attainment was at 38 percent of the white rate, compared to 16 percent relative completion for Afro-Brazilians; in 2010, these figures were 94 percent and 86 percent of white attainment for the US and Brazil, respectively.

The stubborn income differences documented here (granted, a lagging indicator of development) starkly contrast with rapid improvements in basic skills (or reductions in infant mortality, not shown) over the course of the twentieth century. The next section explores the interconnections between human capital, geography, and income by means of a formal model.

## Income Decomposition

How much of an impact did these improvements in education-level have on relative racial incomes? Over the past century, there were so many simultaneous, often contradictory, changes in key socio-economic measures that it is difficult to credit any single factor. Accordingly, the relative importance of each variable is disentangled econometrically, using the single-equation form of Blinder-Oaxaca decomposition from Hugo Ñopo (2008), as shown in Equation (1), employing the census and household survey microdata (see sources in note to Figure 3).

(1) $$y_i = \beta_0 + \boldsymbol{\beta}_1 \mathbf{x}_i + \beta_2 D_i + \boldsymbol{\beta}_3 \mathbf{x}_i D_i + v_i$$

The annual income of individual *i* ($y_i$) is regressed on a vector of observable characteristics ($\boldsymbol{x}_i$) including age, sex, literacy or school enrollment, educational attainment, and region (N, NE, SE, and S for Brazil; NE, MW, S, and W for the US), a dummy variable indicating the individual's single-race classification ($D_i = 0$ for white and $D_i = 1$ for Black or mixed-race), and the dummy interacted with a control vector ($\boldsymbol{x}_i D_i$), where $\beta_0$ and $\beta_2$ are intercepts, $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_3$ coefficient vectors, and $v_i$ a random error. The intercept of the income equation for the white cohort is $\beta_0$, and for the Black $\beta_0 + \beta_2$. The return to observable features is captured by $\boldsymbol{\beta}_1$, whereas $\boldsymbol{\beta}_3$ captures the differential return for Black individuals of those same characteristics. The expected white and Black incomes, and the white-Black income gap and ratio of Black-to-white income are respectively shown in Equations (2) and (3).

(2) $$E[y \mid D = 0] = \beta_0 + \boldsymbol{\beta}_1 \bar{\mathbf{x}}_W$$

$$E[y \mid D = 1] = (\beta_0 + \beta_2) + (\boldsymbol{\beta}_1 + \boldsymbol{\beta}_3)\, \bar{\mathbf{x}}_B$$

(3) $$E[y \mid D = 0] - E[y \mid D = 1] = \boldsymbol{\beta}_1 (\bar{\mathbf{x}}_W - \bar{\mathbf{x}}_B) - (\beta_2 + \boldsymbol{\beta}_3 \bar{\mathbf{x}}_B)$$

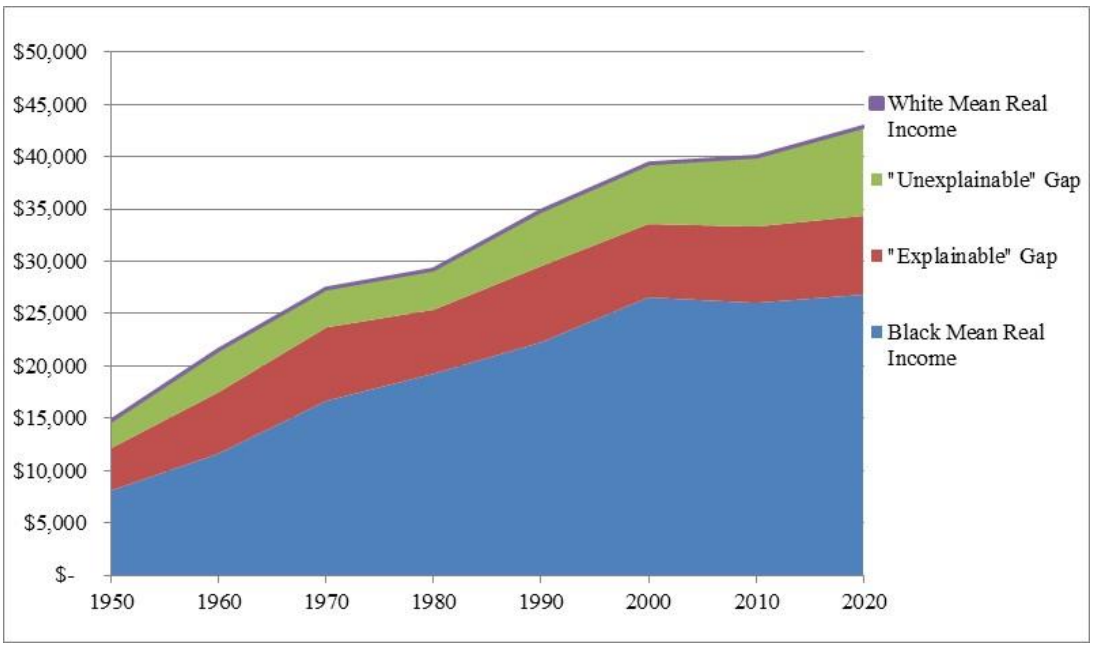
$$\frac{E[y \mid D = 1]}{E[y \mid D = 0]} = \frac{(\beta_0 + \beta_2) + (\boldsymbol{\beta}_1 + \boldsymbol{\beta}_3)\, \bar{\mathbf{x}}_B}{\beta_0 + \boldsymbol{\beta}_1 \bar{\mathbf{x}}_W}$$

Tables 2 and 3 present, for the US and Brazil respectively, the average real incomes by race and the differences between them, by decade, in the first cell; the income ratios and their decade-over-decade changes in the second cell; the percentages of the income gap which

may be considered ‘explainable’ or ‘unexplainable’, that is, attributable to the characteristics themselves as opposed to their returns, in the third cell; and finally, the last cell contains the number of observations by race and sample coverage. The full estimation results, including all coefficients and standard errors, are presented in Appendices II and III.

In the US, white people earned from 1.48 to 1.87 times more than Black people (or Black income was from 54 percent to 67 percent of white) over these seven decades. Relative Black earnings fell during the 1950s, increased notably during the 1960s and 1970s, decreased over the 1980s, rose in the 1990s, and returned to decline in the 2000s and 2010s. Together, observable factors like demography, education, and region accounted for 59 percent of the Black-white income gap in 1950, but this declined to 48 percent in 2020; that is, 52 percent of the gap in 2020 was made up of the differential return to those characteristics for Black individuals plus the penalty associated with simply being Black, versus just 41 percent in 1950.

Figure 7 illustrates the information from Table 2 for the United States, showing how the makeup of the racial wage gap has evolved over time. It is important to note that the present analysis includes anyone with non-negative income, regardless of age; the corresponding average incomes are therefore below those typically reported by other sources. The intention in doing so is to provide a universal assessment of relative economic well-being, including disparities in age-specific labor force participation rates. While the average person is clearly better-off today than in the past, racial income inequality remains structurally intact.




Sources: US Census Bureau microdata for 1950-2000 censuses and 2010/2020 five-year ACS from the Minnesota Population Center, IPUMS (accessed January 2016 and May 2022).
Note: Incomes in 2015 CPI-adjusted dollars.

**Figure 7**
Composition of Black-White Income Gap, US (1950-2020)

In Brazil, white persons earned from 1.69 to 2.34 times more than Black persons (or Black earnings were 43 percent to 59 percent of white) over these six decades, as shown by Table 3. Relative Black earnings declined between 1960 and 1980, increased and then fell over the 1980s and 1990s, respectively, and significantly rose from 2000 to 2010 and, again,

**Table 2**
Black-White Income Gaps and Their Composition, United States (1950-2020)

| | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| White Income ($\bar{y}_W$) | 14,837 | 21,548 | 27,426 | 29,236 | 34,857 | 39,406 | 40,037 | 42,877 |
| Black Income ($\bar{y}_B$) | 8,112 | 11,533 | 16,693 | 19,264 | 22,325 | 26,574 | 25,974 | 26,769 |
| Income Gap ($\bar{y}_W$ - $\bar{y}_B$) | 6,725 | 10,016 | 10,733 | 9,972 | 12,531 | 12,831 | 14,063 | 16,108 |
| W:B Income Ratio ($\bar{y}_W$ / $\bar{y}_B$) | 1.83 | 1.87 | 1.64 | 1.52 | 1.56 | 1.48 | 1.54 | 1.60 |
| B:W Income Ratio ($\bar{y}_B$ / $\bar{y}_W$) | 0.55 | 0.54 | 0.61 | 0.66 | 0.64 | 0.67 | 0.65 | 0.62 |
| Change B:W Income ($\%\Delta(\bar{y}_B / \bar{y}_W)$) | .. | -2.1% | 13.7% | 8.3% | -2.8% | 5.3% | -3.8% | -3.8% |
| % "explainable" ($\boldsymbol{\beta}_1\{E[\mathbf{x}\|D=1]-E[\mathbf{x}\|D=0]\}$) | 59.4 | 58.7 | 65.7 | 61.2 | 58.1 | 55.0 | 52.4 | 47.5 |
| % "unexplainable" ($\beta_2 + (\boldsymbol{\beta}_3\{E[\mathbf{x}\|D=1]\})$) | 40.6 | 41.3 | 34.3 | 38.8 | 41.9 | 45.0 | 47.6 | 52.5 |
| No. White (1000s) | 308 | 1,132 | 1,319 | 7,604 | 8,320 | 9,312 | 10,283 | 10,182 |
| No. Black (1000s) | 32 | 121 | 150 | 942 | 920 | 1,193 | 1,240 | 1,336 |
| Sample Size (1000s) | 341 | 1,253 | 1,469 | 8,547 | 9,241 | 10,505 | 11,523 | 11,518 |
| % Population | 0.18% | 0.7% | 0.7% | 3.8% | 3.7% | 3.7% | 3.8% | 3.7% |

Sources: US Census Bureau microdata for 1950-2000 censuses and 2010/2020 five-year American Community Surveys from the Minnesota Population Center, IPUMS (accessed January 2016 and May 2022).
Note: Annual incomes in 2015 CPI-adjusted dollars (https://research.stlouisfed.org/). Arithmetic based on the values as shown in the table may yield slightly different results due to rounding.

from 2010 to 2020. The share of the income gap captured by 'explainable' factors was constant at about 81 percent from 1960 to 1991, but declined to 74 percent in 2000, and 64 percent in 2020. The earnings reported by the 2020 household survey omit individuals under age 14 and are therefore rather high as compared to the other years presented.[15] Like for the US, geography, demography, and education explain relatively less than they used to—something else must consequently explain why Afro-Brazilians, or African-Americans, still earn an average forty percent less than whites.

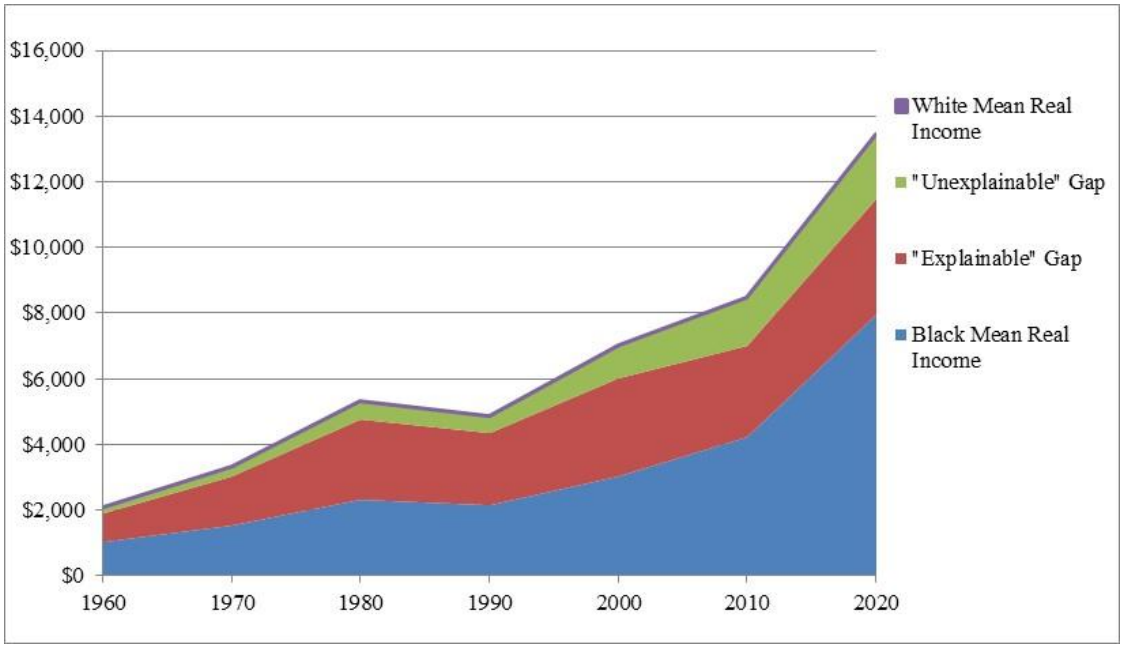
**Table 3**
Black-White Income Gaps and Their Composition: Brazil (1960-2020)

| | 1960 | 1980 | 1991 | 2000 | 2010 | 2020† |
|---|---|---|---|---|---|---|
| White Income ($\bar{y}_W$) | 2,094 | 5,339 | 4,876 | 7,025 | 8,471 | 13,468 |
| Black Income ($\bar{y}_B$) | 1,020 | 2,318 | 2,171 | 3,004 | 4,220 | 7,968 |
| Income Gap ($\bar{y}_W$ - $\bar{y}_B$) | 1,074 | 3,021 | 2,705 | 4,021 | 4,251 | 5,500 |
| W:B Income Ratio ($\bar{y}_W$ / $\bar{y}_B$) | 2.05 | 2.30 | 2.25 | 2.34 | 2.01 | 1.69 |
| B:W Income Ratio ($\bar{y}_B$ / $\bar{y}_W$) | 0.49 | 0.43 | 0.45 | 0.43 | 0.50 | 0.59 |
| Change B:W Income (**%Δ**($\bar{y}_B$ / $\bar{y}_W$)) | .. | -10.9% | 2.6% | -4.0% | 16.5% | 18.8% |
| % "explainable" ($\boldsymbol{\beta}_1${$E[\mathbf{x}\|D=1]-E[\mathbf{x}\|D=0]$}) | 81.7 | 81.5 | 81.3 | 74.3 | 65.5 | 63.8 |
| % "unexplainable" ($\beta_2 + (\boldsymbol{\beta}_3${$E[\mathbf{x}\|D=1]$})) | 18.3 | 18.5 | 18.7 | 25.7 | 34.5 | 36.2 |
| No. White (1000s) | 1,300 | 2,420 | 3,336 | 4,340 | 3,877 | 252 |
| No. Black (1000s) | 740 | 1,860 | 3,034 | 3,633 | 4,180 | 336 |
| Sample Size (1000s) | 2,040 | 4,280 | 6,370 | 7,973 | 8,057 | 588 |
| % Population | 2.9% | 3.5% | 4.3% | 4.7% | 4.2% | 0.35% |

Sources/Note: See below.

Figure 8 shows the respective illustration of the wage-gap components for Brazil. The key difference between this figure and the one for the US is the larger size of the 'explainable' racial income gap. This reflects the extent to which the quantity (not to say quality) of schooling and education lags for persons of African descent. In order to gauge the relative influence of changes in each variable on the Black-to-white predicted income ratio, two counterfactual measures are considered: the separate effect of the between-period change in that variable for the Black population holding expected white income constant, and the change allowing both expected Black and white incomes to vary.

[15] The 2020 census for Brazil was delayed a year due to the global pandemic, then another year (apparently because of fiscal issues); to the author's knowledge, the census was administered in 2022 and results are still pending.




Sources: IBGE census microdata for 1960-2010 from IPUMS International (Minnesota Population Center 2016); 2020 household survey microdata from PNADc (IBGE 2022).
Note: Incomes expressed in real 2015 US dollars based on PPP exchange rates from Penn World Tables v.10.0 (Feenstra, Inklaar, and Timmer 2015), adjusted for five currency revaluations. †Figures for 2020 exclude individuals age 14 or under.

**Figure 8**
Composition of Black-White Income Gap, Brazil (1960-2020)

In the aggregate, the two corresponding differences are represented by Equation (4). To isolate the individual impact of changes in the $j^{th}$ element of the control vector $\boldsymbol{x}$, all other variables ($j \neq k$) are to be held constant, for Black and white persons respectively.

(4)
$$\Delta\left(\frac{E[y \mid D=1]}{E[y \mid D=0]}\right)\Big|_{\Delta E[y|D=0]=0} = \frac{(\boldsymbol{\beta}_1 + \boldsymbol{\beta}_3)\,\Delta\,\bar{\mathbf{x}}_B}{\beta_0 + \boldsymbol{\beta}_1\,\bar{\mathbf{x}}_W}$$

$$\Delta\left(\frac{E[y \mid D=1]}{E[y \mid D=0]}\right) = \frac{(\beta_0 + \beta_2) + (\boldsymbol{\beta}_1 + \boldsymbol{\beta}_3)\,\bar{\mathbf{x}}_{B,t}}{\beta_0 + \boldsymbol{\beta}_1\,\bar{\mathbf{x}}_{W,t}} - \frac{(\beta_0 + \beta_2) + (\boldsymbol{\beta}_1 + \boldsymbol{\beta}_3)\,\bar{\mathbf{x}}_{B,t-1}}{\beta_0 + \boldsymbol{\beta}_1\,\bar{\mathbf{x}}_{W,t-1}}$$

The counterfactual changes in the relative Black-white incomes caused by each variable (expressed as a percentage of the previous decade's fitted income ratio) are presented in Tables 4 and 5, for the US and Brazil, respectively.

The figures in Panel A of each of the tables represent the percentage change in the Black-white income ratio which would have resulted from the shifting characteristics of Black persons along each dimension holding constant those of white persons; in the respective Panels B, they indicate the percentage change in relative incomes resulting from the differences in that variable experienced concurrently by people of both races.[16] If the

[16] Because the denominator is constant in the former calculations, the vertical summation of the figures within each cell of the Panels A of the tables gives the cumulative percentage change in the Black-white income ratio which would have been caused only from the relative changes of the Black-

percentage change associated with a given variable in Panel A is positive, for instance, but the corresponding change in Panel B is negative, then, despite an absolute gain for the Black cohort, there was a setback in relative terms because any such gain was outpaced by that of the white cohort.

**Table 4**

Counterfactual Effect of Each Variable on the Black-White Income Ratio: US

| Panel A: Individual Effect (%) on B:W Income (Calculated Holding Expected White Income Constant {$\Delta(x\text{-}bar)_W=0$}) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 |
| Age | 3.1 | 1.1 | -0.6 | -0.3 | 3.6 | 0.5 | 2.5 | 1.9 |
| Sex | -2.0 | -0.5 | -0.7 | -0.4 | -0.4 | 0.3 | 0.1 | 0.4 |
| In-School | 14.9 | -1.2 | -5.1 | -0.1 | 1.0 | -0.6 | -0.2 | 0.8 |
| Education | 17.0 | 8.6 | 13.2 | 21.5 | 18.5 | 6.3 | 9.1 | 8.6 |
| Region | 8.2 | 3.3 | 2.0 | 0.0 | -0.6 | 0.1 | 0.0 | 0.2 |
| Total | 41.3 | 11.3 | 8.8 | 20.7 | 22.2 | 6.6 | 11.4 | 12.0 |
| Panel B: Pairwise Effect (%) on B:W Income (Calculated Based on Inter-Period Change in One Variable at a Time for Both White and Black Populations) | | | | | | | | |
| Variable | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 |
| Age | -0.1 | 0.4 | -0.2 | -0.7 | 1.6 | 0.0 | 1.3 | 1.0 |
| Sex | 1.0 | -0.6 | 0.2 | -0.5 | -0.4 | -0.1 | 0.2 | 0.1 |
| In-School | 1.0 | 0.0 | -1.5 | -1.3 | 0.2 | -0.3 | -0.3 | 0.3 |
| Education | -2.8 | 2.7 | 3.2 | 7.8 | 6.4 | 3.6 | 0.3 | -0.2 |
| Region | 7.9 | 3.4 | 2.2 | 0.1 | -0.6 | 0.2 | 0.1 | 0.3 |
| Total | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

**Table 5**

Counterfactual Effect of Each Variable on the Black-White Income Ratio: Brazil

| Panel A: Individual Effect (%) on B:W Income (Calculated Holding Expected White Income Constant {$\Delta(x\text{-}bar)_W=0$}) | | | | | | |
|---|---|---|---|---|---|---|
| Variable | 1960 | 1980 | 1991 | 2000 | 2010 | 2020 |
| Age | .. | 4.4 | 2.0 | 9.0 | 13.2 | 20.4 |
| Sex | .. | 1.4 | 0.4 | 0.4 | -0.2 | 7.1 |
| Literacy | 4.2 | -11.9 | -9.3 | -6.3 | 0.2 | -6.8 |
| Education | -11.0 | 52.0 | 40.1 | 47.1 | 34.9 | 58.0 |
| Region | 3.0 | -0.2 | 0.9 | 1.1 | 1.2 | 3.7 |
| Total | -3.8 | 45.8 | 34.2 | 51.3 | 49.2 | 82.4 |
| Panel B: Pairwise Effect (%) on B:W Income (Calculated Based on Inter-Period Change in One Variable at a Time for Both White and Black Populations) | | | | | | |
| Variable | 1960 | 1980 | 1991 | 2000 | 2010 | 2020 |
| Age | .. | -6.1 | -3.1 | 2.0 | -0.3 | 4.4 |
| Sex | .. | 3.8 | 1.4 | 0.4 | -0.7 | 0.2 |
| Literacy | 16.7 | 20.4 | -3.0 | -1.5 | 0.7 | -0.7 |
| Education | 39.9 | -20.6 | 4.9 | 11.5 | -1.7 | -12.0 |
| Region | 2.1 | -1.0 | 1.5 | 1.7 | 1.8 | 2.4 |
| Total | n/a | n/a | n/a | n/a | n/a | n/a |

against the preceding white-level. One may not similarly aggregate figures in the Panels B of the tables: the sum does not equal the total expected change.

For both countries, growth in the average age is generally associated with higher incomes (Panels A): as people live longer, their earnings increase because they are able to accumulate more human capital (see descriptive statistics in Appendices IV and V). When compared against simultaneous changes in white characteristics (bottom of table), the net effect is sometimes negative because life-expectancy increased faster and had a higher return for whites. The effect of sex is most-often negative for the US because the Black female population, with typically lower wages, grew faster than the Black male; for Brazil, changes are generally positive in both cases since the percent of the Black population which was male increased at a faster rate, to such an extent that the net change in income was greater than for the white population.

School enrollment, or literacy for Brazil, mainly has opposite signs from educational completion, but their joint effect is positive. Someone with a high level of education is less likely to currently be in school or to not have surpassed basic literacy, thus the negative coefficient controlling for education reflects the independent effect of being in-school (and not working) or being literate (and not having further instruction). Broadly speaking, education has the greatest impact in both countries on relative incomes: Changes in school attendance and education would have increased the US Black-to-white income ratio by an average of 7.0 percent per decade, all-else-equal; versus the contemporaneous advance of whites, these relative gains raised the income ratio by 1.2 percent on-average. In Brazil, the improvement in literacy and schooling-level would have increased Black relative incomes by 15.9 percent per decade but, against the parallel progress of the white cohort, they rose an average of 4.5 percent.

Regional migration also had a positive influence on relative incomes: it was responsible for an average 1.65 percent of the total change in the Black-to-white income ratio in the US across decades, and positive 1.61 percent for Brazil. (Given concurrent white migration, it contributed similar averages of 1.68 percent in the US and 1.41 percent in Brazil.) In absolute terms, education was the most important overall factor affecting Black incomes over the decades in both countries, followed by either age or region. In relative terms, while education was still the largest single factor behind changes in the Black-white income ratio for Brazil, region was slightly more important for the US due to the outsized impact of the mid-century Great Migration.

## Conclusion

Slavery has been eliminated as a formal institution in Brazil and the United States for well over a century, although there are almost daily reminders that racial inequality persists. The historical pattern of slavery is outlined here, and how millions of African slaves and migrants, mostly European but also Asian, and not-to-forget Indigenous and all other peoples, influenced New World demographic growth. Black incomes (as well as literacy or school enrollment and educational completion) are shown to have converged with white—from roughly a third of the white level in Brazil and the US circa 1900, to one-half and two-thirds, respectively, in 2010. The latest statistics, corresponding to the time of the health crisis, suggest that the Black-white income ratios stand at a common six-tenths.

To gauge the impact of these factors and changes in the age-sex distribution and regional migration on relative earnings, Blinder-Oaxaca decomposition is conducted to find that until 1980, education, age and sex, and region explained about 80 percent of the Black-white income gap for Brazil, but this declined to roughly 65 percent in 2020. For the US, these variables could explain about 60 percent of the Black-white income gap in 1980, but roughly 50 percent in 2020. The income “penalty” associated with being Black, all other characteristics being the same, is lower in Brazil than in the US; in both cases, however, the residual capturing discrimination and other omitted variables has grown over time (see Glenn Loury 1998).

The timing of these changes across the two countries is opposed, and sometimes contradicts the broader historiography. The Great Migration of the Black population from the US South to the North from the 1930s to the 1950s is well-established; the respective North-South migration in Brazil happened earlier and does not show up as strongly in the analysis. It is also accepted that US Civil Rights legislation—or the expansion of the federal minimum wage, as found by Derenoncourt and Claire Montialoux (2021)—provided for a levelling of racial inequality from the 1960s to 1970s; in Brazil at the time, a dictatorship repressed civil society and chose not even to inquire about race in the 1970 census. During the past two decades, on the other hand, the reduction of the racial income gap in Brazil has been impressive, which some have attributed to the expansion of social welfare programs; the question remains why the US performance in this regard has been so weak, and the global pandemic is not a sufficient explanation.

While there was notable progress for Black Americans in many dimensions, gains among white Americans brought greater returns and counteracted further closing of the income gap. This is consistent with the finding of Patrick Bayer and Kerwin Kofi Charles (2018) that Black men with higher levels of education have fared well since 1940, while those with below-average skills have fallen behind. The ratios of Black-to-white earnings in the US and Brazil are now near or at their all-time highs of 0.67 and 0.59, yet they are not all so different from what they were in 1980 for the US (0.66) or in 1960 (0.49) for Brazil. This is especially alarming given the possibility that Black incarceration (e.g. Becky Pettit 2012) and school quality (e.g. O'Neill and O'Neill 2005) overstate the modest gains documented here. Overall, education was the primary factor driving improvements in proportional earnings by race, but substantial leaps were required for those of African descent to overcome the higher payoffs which accrued to those of European descent—something only possible because of their poor starting conditions.

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## Appendix I: Sources of Population Data

### United States

The cumulative number of slaves disembarked in each period is based on annual estimates from the Trans-Atlantic Slave Trade Database. The total number of slaves who embarked for the US per this source is 472,383.

The cumulative number of immigrants entering the US from 1820 to 2000 is based on decadal averages from the US Department of Immigration and Naturalization (2004); for 2000 to 2010, from the US Department of Homeland Security (2016); for 1700 through 1820, figures are the estimates of Henry A. Gemery (1984). The estimates for the period from 1620 to 1700 are based on arrivals at the Virginia (Jamestown) and Massachusetts (Plymouth) colonies, as well as New Amsterdam (New York), and late-century Irish migration to the frontier (see Carl L. Bankston III and Danielle A. Hidalgo 2006, and Nathaniel Philbrick 2006).

Total population figures, and their breakdown by race, from 1790 to 1990 are from Gibson and Jung (2002). Figures for 2000 and 2010 are, respectively, based on the five-percent US Census and American Community Survey microsamples, University of Minnesota, Minnesota Population Center, IPUMS-USA (Ruggles et al. 2016). The data for the period from 1620 to 1780 are in US Bureau of the Census (1975), Series Z1-19, “Estimated Population of American Colonies: 1610 to 1780.”

### Brazil

The cumulative number of slaves disembarked in each period is based on annual estimates from the Trans-Atlantic Slave Trade Database. The total estimate of slaves who embarked for Brazil according to this source is 5,533,117. The database indicates that no slaves disembarked during the early sixteenth century (although small numbers certainly did).

The number of immigrants who arrived in Brazil is from the IBGE [Brazilian Institute of Geography and Statistics] (2007); please note that for figures prior to 1820 and after 1975, only Portuguese immigrants are included (see Table 1: 66 and Appendix 4: 225-30).

The total population figures, and breakdown by race, before 1850 are from Bucciferro (2013); for the early nineteenth century, these are based on regional censuses and omit the state of Ceará. For 1872 to 2010, data are from IBGE (http://seriesestatisticas.ibge.gov.br/): *Recenseamento do Brasil em 1872* [Census of Brazil in 1872], Rio de Janeiro, Directoria Geral de Estatística (187?); *População Recenseada em 31 de Dezembro de 1890* [Population Censused as of December 31, 1890], Rio de Janeiro, Directoria Geral de Estatística (1898); IBGE (1950 and 1956); *Censo Demográfico de 1960* [Demographic Census of 1960], Rio de Janeiro: IBGE (1967-68); IBGE (1994, 2004, and 2006); and, *Sinopse do Censo Demográfico 2010* [Synopsis of the 2010 Demographic Census], Rio de Janeiro, IBGE (2011).

**Appendix II**

Blinder-Oaxaca Decomposition Results: US (Dependent Variable: Annual Individual Income)†

| Control | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| Age | 4 | 14 | 27 | 70 | 135 | 177 | 147 | 167 |
| | (0.2) | (0.2) | (0.3) | (0.2) | (0.4) | (0.7) | (0.8) | (1.1) |
| Sex | -1,875 | -3,308 | -4,926 | -8,848 | -14,270 | -18,846 | -22,430 | -25,852 |
| | (5.4) | (5.1) | (8.0) | (6.5) | (13.7) | (23.2) | (28.3) | (37.8) |
| School Enr. | -1,312 | -1,945 | -3,053 | -5,087 | -8,191 | -10,922 | -16,853 | -20,562 |
| | (10.2) | (9.4) | (12.9) | (10.4) | (22.2) | (38.3) | (48.4) | (67.5) |
| Education | 183 | 393 | 683 | 1,393 | 3,501 | 5,470 | 7,443 | 9,421 |
| | (1.1) | (1.0) | (1.6) | (1.3) | (2.8) | (4.7) | (5.8) | (8.0) |
| Northeast | 184 | 408 | 631 | -146 | 2,228 | 2,352 | 2,770 | 3,773 |
| | (10) | (10) | (16) | (12) | (26) | (44) | (54) | (72) |
| Midwest | 138 | 267 | 436 | 126 | 39 | -108 | -2,355 | -2,870 |
| | (10) | (10) | (15) | (12) | (25) | (42) | (51) | (68) |
| South | -53 | -22 | 91 | -391 | 661 | 517 | -315 | -977 |
| | (11) | (11) | (16) | (13) | (26) | (43) | (51) | (68) |
| West | 198 | 379 | 419 | 140 | 1,673 | 1,892 | 1,617 | 2,504 |
| | (12) | (11) | (16) | (13) | (26) | (43) | (52) | (70) |
| Race | -638 | -904 | -1,257 | -3,346 | -4,985 | -5,365 | -9,173 | -6,808 |
| | (38) | (39) | (60) | (47) | (109) | (172) | (217) | (281) |
| Race*Age | -2 | -6 | -11 | -7 | 10 | 18 | 60 | 70 |
| | (0.6) | (0.6) | (0.8) | (0.6) | (1.4) | (2.2) | (2.7) | (3.3) |
| Race*Sex | 1,009 | 1,890 | 2,900 | 5,438 | 9,403 | 13,198 | 16,809 | 20,259 |
| | (18) | (17) | (25) | (20) | (44) | (69) | (87) | (112) |
| Race*Sch | 602 | 909 | 1,111 | 1,849 | 3,762 | 5,326 | 9,796 | 11,081 |
| | (32) | (29) | (38) | (29) | (64) | (102) | (130) | (175) |
| Race*Edu | -87.3 | -195.1 | -230.4 | -322.2 | -903.9 | -1,486 | -1,895 | -2,931 |
| | (4.4) | (3.9) | (5.6) | (4.1) | (9.7) | (15.4) | (18.9) | (24.4) |
| Race*NE | 155 | 273 | 401 | 929 | 1,496 | 918.1 | 688.6 | 455 |
| | (32) | (30) | (45) | (36) | (79) | (127) | (161) | (205) |
| Race*MW | 222 | 339 | 515 | 1,121 | 1,861 | 2,617 | 2,487 | 2,307 |
| | (32) | (29) | (45) | (35) | (79) | (128) | (161) | (206) |
| Race*S | 38 | 37 | 92 | 483 | 913 | 1,119 | 1,700 | 2,107 |
| | (27) | (26) | (41) | (32) | (68) | (110) | (138) | (178) |
| Race*W | 245 | 323 | 407 | 896 | 1,914 | 2,148 | 2,403 | 2,397 |
| | (48) | (41) | (57) | (43) | (91) | (145) | (181) | (228) |
| Constant | 1,530 | 1,954 | 2,458 | 3,848 | -2,253 | -5,518 | -8,446 | -15,358 |
| | (13) | (13) | (21) | (16) | (35) | (58) | (74) | (100) |
| N (1000s) | 341 | 1,253 | 1,469 | 8,547 | 9,241 | 10,505 | 11,523 | 11,518 |
| $R^2$ | 0.342 | 0.355 | 0.339 | 0.319 | 0.257 | 0.197 | 0.205 | 0.179 |

† OLS regression results with standard errors in parentheses.

Sources: US Census 1950-2000 and 2010/2020 five-year ACS microdata from the Minnesota Population Center, IPUMS (Ruggles et al. 2016 and 2022).

Note: North and Race*North dropped from the estimates for all periods; Sex: 0 Male, 1 Female; Race: 0 White, 1 Black.

**Appendix III**

Blinder-Oaxaca Decomposition Results: Brazil (Dependent Variable: Annual Individual Income)†

| Control | 1960 | 1980 | 1991 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| Age | 111 | 284 | 2,434 | 16 | 30 | 64 |
| | (0.3) | (0.8) | (5.4) | (0.0) | (0.1) | (0.5) |
| Sex | -4,567 | -9,954 | -82,279 | -400 | -643 | -1,196 |
| | (9.4) | (27.1) | (186.7) | (1.4) | (2.9) | (13.9) |
| Literacy | -3,575 | -8,522 | -110,832 | -455 | -186 | -1,685 |
| | (21.1) | (55.2) | (407.4) | (3.2) | (6.7) | (57.9) |
| Education Level | 3.1 | 8.2 | 90.5 | 0.5 | 0.6 | 1.4 |
| | (0.01) | (0.02) | (0.12) | (0.00) | (0.00) | (0.01) |
| North | .. | -543 | -4,860 | -76 | -191 | -477 |
| | .. | (121) | (691) | (5) | (10) | (36) |
| Northeast | -1,039 | -1,348 | -21,552 | -163 | -376 | -963 |
| | (25) | (69) | (457) | (3) | (7) | (28) |
| Southeast | -78 | -57 | -3,092 | -50 | -97 | -264 |
| | (23) | (61) | (405) | (3) | (6) | (25) |
| South | -728 | -2,079 | -21,863 | -124 | -165 | -336 |
| | (24) | (64) | (425) | (3) | (6) | (25) |
| Race | 940 | 4,943 | 44,897 | 422 | 755 | 1,487 |
| | (39) | (105) | (712) | (6) | (12) | (76) |
| Race*Age | -66 | -173 | -1,187 | -8 | -12 | -27 |
| | (0.5) | (1.2) | (8.1) | (0.1) | (0.1) | (0.7) |
| Race*Sex | 2,304 | 5,660 | 45,313 | 243 | 350 | 527 |
| | (16) | (41) | (270) | (2) | (4) | (19) |
| Race*Literacy | 4,019 | 7,220 | 81,824 | 378 | 204 | 1,033 |
| | (35) | (81) | (554) | (4) | (8) | (66) |
| Race*Education | -2.7 | -5.9 | -58.3 | -0.3 | -0.4 | -0.6 |
| | (0.02) | (0.03) | (0.20) | (0.00) | (0.00) | (0.01) |
| Race*North | .. | 332 | -587 | 21 | 38 | 7 |
| | .. | (145) | (838) | (6) | (12) | (42) |
| Race*Northeast | 288 | 362 | 5,216 | 59 | 124 | 199 |
| | (36) | (93) | (601) | (4) | (9) | (34) |
| Race*Southeast | -135 | 159 | -1,049 | 17 | 9 | -79 |
| | (36) | (89) | (567) | (4) | (8) | (32) |
| Race*South | 647 | 1,244 | 8,635 | 66 | 90 | 210 |
| | (44) | (108) | (690) | (5) | (10) | (37) |
| Constant | 366 | -4,548 | -55,073 | -634 | -1,241 | -2,352 |
| | (26) | (75) | (530) | (4) | (9) | (65) |
| N (1000s) | 2,040 | 4,280 | 6,370 | 7,973 | 8,057 | 588 |
| $R^2$ | 0.248 | 0.120 | 0.157 | 0.077 | 0.057 | 0.157 |

† OLS regression results with standard errors in parentheses.

Sources: IBGE census microdata 1960-2010 from IPUMS (Minnesota Population Center 2016); household survey microdata for 2020 from the *Pesquisa Nacional por Amostra de Domicílios Contínua* (IBGE 2022).

Note: North, Race*North dropped from the 1960 estimates, and omitting Center-West, Race*Center-West in later periods; Sex: 0 Male, 1 Female; Race: 0 White, 1 Black.

**Appendix IV**

Descriptive Statistics: Sub-Sample Reporting Income, United States

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| *Age (Years)* | | | | | | | | | |
| White | 31.1 | 40.7 | 41.9 | 41.3 | 41.7 | 44.1 | 44.9 | 47.4 | 49.7 |
| Black | 26.9 | 37.5 | 39.1 | 38.2 | 37.9 | 40.4 | 40.9 | 43.4 | 45.5 |
| *Sex (0=Male; 1=Female)* | | | | | | | | | |
| White | 0.497 | 0.515 | 0.514 | 0.521 | 0.521 | 0.521 | 0.515 | 0.517 | 0.512 |
| Black | 0.512 | 0.525 | 0.530 | 0.538 | 0.544 | 0.552 | 0.544 | 0.542 | 0.521 |
| *In-School (0=No; 1=Yes)* | | | | | | | | | |
| White | 0.21 | 0.10 | 0.11 | 0.16 | 0.14 | 0.13 | 0.13 | 0.13 | 0.12 |
| Black | 0.22 | 0.11 | 0.12 | 0.18 | 0.19 | 0.16 | 0.18 | 0.19 | 0.17 |
| *Education Completion (0=No Schooling; 11=5+ Years College)* | | | | | | | | | |
| White | 3.0 | 4.2 | 4.5 | 5.1 | 5.9 | 6.4 | 6.6 | 6.9 | 7.3 |
| Black | 1.7 | 2.7 | 3.3 | 4.0 | 5.0 | 5.7 | 6.0 | 6.3 | 6.7 |
| *Northeast (%)* | | | | | | | | | |
| White | 0.29 | 0.29 | 0.27 | 0.25 | 0.23 | 0.22 | 0.20 | 0.19 | 0.18 |
| Black | 0.10 | 0.15 | 0.17 | 0.19 | 0.19 | 0.16 | 0.17 | 0.16 | 0.17 |
| *Midwest (%)* | | | | | | | | | |
| White | 0.33 | 0.31 | 0.30 | 0.29 | 0.27 | 0.25 | 0.25 | 0.24 | 0.24 |
| Black | 0.11 | 0.16 | 0.18 | 0.20 | 0.20 | 0.16 | 0.16 | 0.16 | 0.16 |
| *South (%)* | | | | | | | | | |
| White | 0.18 | 0.18 | 0.18 | 0.20 | 0.21 | 0.22 | 0.23 | 0.24 | 0.25 |
| Black | 0.59 | 0.49 | 0.44 | 0.40 | 0.40 | 0.44 | 0.45 | 0.46 | 0.44 |
| *West (%)* | | | | | | | | | |
| White | 0.11 | 0.14 | 0.16 | 0.18 | 0.19 | 0.20 | 0.22 | 0.22 | 0.22 |
| Black | 0.01 | 0.04 | 0.06 | 0.08 | 0.09 | 0.09 | 0.09 | 0.10 | 0.10 |
| *Other (%)* | | | | | | | | | |
| White | 0.09 | 0.09 | 0.09 | 0.09 | 0.10 | 0.10 | 0.11 | 0.11 | 0.11 |
| Black | 0.19 | 0.16 | 0.15 | 0.13 | 0.13 | 0.14 | 0.13 | 0.13 | 0.13 |

**Appendix V**

Descriptive Statistics: Sub-Sample Reporting Income, Brazil

| | 1950 | 1960 | 1980 | 1991 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|
| *Age (Years)* | | | | | | | |
| White | .. | 30.5 | 32.3 | 33.6 | 35.0 | 38.1 | 41.6 |
| Black | .. | 29.6 | 30.5 | 30.9 | 32.3 | 34.9 | 40.0 |
| *Sex (0=Male; 1=Female)* | | | | | | | |
| White | .. | 0.504 | 0.515 | 0.522 | 0.522 | 0.517 | 0.432 |
| Black | .. | 0.507 | 0.499 | 0.496 | 0.493 | 0.495 | 0.396 |
| *Literacy (0=No; 1=Yes)* | | | | | | | |
| White | 0.53 | 0.70 | 0.84 | 0.88 | 0.91 | 0.93 | 0.98 |
| Black | 0.26 | 0.41 | 0.62 | 0.71 | 0.81 | 0.85 | 0.95 |
| *Education Completion (0=No Schooling; 5000=Doctorate or Equivalent)* | | | | | | | |
| White | 2,175 | 1,491 | 2,001 | 2,219 | 2,435 | 2,833 | 3,669 |
| Black | 1,290 | 831 | 1,376 | 1,694 | 2,052 | 2,498 | 3,226 |
| *North (%)* | | | | | | | |
| White | .. | .. | 0.02 | 0.03 | 0.04 | 0.04 | 0.06 |
| Black | .. | .. | 0.08 | 0.10 | 0.11 | 0.11 | 0.18 |
| *Northeast (%)* | | | | | | | |
| White | 0.27 | 0.21 | 0.14 | 0.15 | 0.17 | 0.17 | 0.15 |
| Black | 0.62 | 0.54 | 0.47 | 0.45 | 0.42 | 0.40 | 0.34 |
| *Southeast (%)* | | | | | | | |
| White | 0.47 | 0.51 | 0.54 | 0.51 | 0.48 | 0.44 | 0.34 |
| Black | 0.30 | 0.34 | 0.33 | 0.32 | 0.34 | 0.33 | 0.27 |
| *South (%)* | | | | | | | |
| White | 0.23 | 0.23 | 0.25 | 0.26 | 0.25 | 0.29 | 0.36 |
| Black | 0.04 | 0.05 | 0.06 | 0.06 | 0.05 | 0.07 | 0.07 |
| *Center-West (%)* | | | | | | | |
| White | 0.03 | 0.04 | 0.05 | 0.06 | 0.06 | 0.06 | 0.10 |
| Black | 0.04 | 0.06 | 0.07 | 0.07 | 0.08 | 0.08 | 0.13 |