

Racial disparity, d , over years $t = \{1880, 1890, 1904, 1910, 1923, 1940, 1950\}$ in Great Migration states i can be decomposed into the quotient of the weighted sum of nonwhite, B , and white, W , incarceration rates, I ,

$$d_t = \frac{\sum_i \pi_{it}^B I_{it}^B}{\sum_i \pi_{it}^W I_{it}^W}, \quad (1)$$

where the weights, π , are simply the proportion of the population in state i in year t by race. We can assess the relative importance of changes in the population versus shifts in the incarceration rate by alternately fixing the weights, $d_t(\pi_{1880})$, and the rates, $d_t(I_{1880})$, at their 1880 levels. Fixing the weights tells us what racial disparity would have been if the white and nonwhite populations had not transitioned between states after 1880 but the incarceration rates of both groups had continued to increase. Fixing the rates tells us what racial disparity would have been if the incarceration rates of whites and nonwhites did not change after 1880 but the population had still moved between states.

Holding the weights at their 1880 level shows that population shifts contributed considerably to the increase in racial disparity in Great Migration states between 1880 and 1950. Rather than 5:1, racial disparity would have been 4.2:1 in 1950 if the white and nonwhite populations had stayed distributed about states as they were in 1880. This represents a 29% reduction in the increase in disparity between 1880 and 1950. Population shifts alone, however, provide only a partial account of the rise in racial disparity. Setting instead the white and nonwhite incarceration rates at their 1880 level reduces racial disparity to 3.3:1, cutting the increase by 64%.

Equation (1) can be further decomposed to examine the contribution to disparity of changes in only the white and nonwhite incarceration rates of the North. It can be rewritten:

$$d_t = \frac{\sum_i \pi_{it}^{BN} I_{it}^{BN} + \sum_i \pi_{it}^{BS} I_{it}^{BS}}{\sum_i \pi_{it}^{WN} I_{it}^{WN} + \sum_i \pi_{it}^{WS} I_{it}^{WS}}, \quad (2)$$

for northern, N , and southern, S , states. Fixing the white and nonwhite incarceration rates of just northern states at their 1880 level, $d_t(I_{1880}^N)$, reduces the aggregate increase in racial disparity between 1880 and 1950 by 41%. Since the rise in northern incarceration rates accounts for nearly 50% more of the growth in disparity than compositional shifts in the population, providing a more complete account of the link between migration and racial disparity requires explaining how increasing rates of northward migration might have led the region's nonwhite incarceration rate to increase.