

What Explains Neighborhood Sorting by Income and Race?

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Abstract: Why do high-income black households live in neighborhoods with characteristics similar to those of low-income white households? We find that neighborhood sorting by income and race cannot be explained by financial constraints: High-income, high-wealth black households live in similar-quality neighborhoods as low-income, low-wealth white households. Instead, we show that the racial composition of neighborhoods drives neighborhood sorting. Black households sorting into black neighborhoods explains the racial gap in neighborhood quality at all income levels. Absent high-quality black neighborhoods in their metro, black households sort into black neighborhoods rather than high-quality ones.

Keywords: Neighborhood, Income, Wealth, Race

JEL Classification Codes: H72, J15, J18, R11, R21

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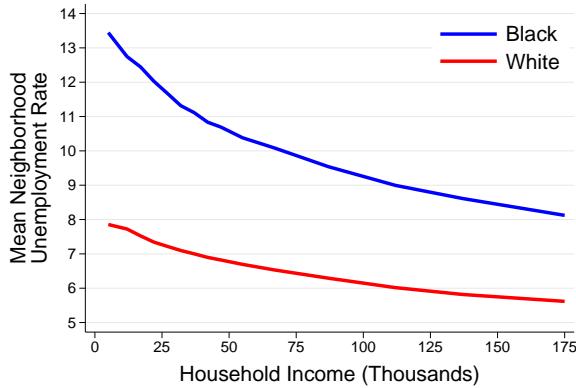
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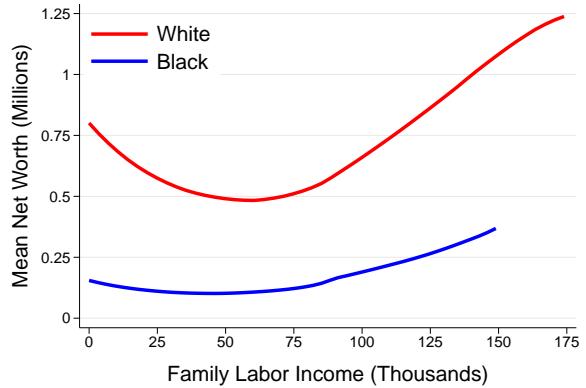
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1 Introduction

High-income black households live in neighborhoods of similar quality as low-income white households. This fact is true whether one measures quality in terms of a neighborhood's unemployment rate (Figure 1a), its rate of poverty, educational attainment, or single-headed households (Pattillo (2005), Logan (2011), Reardon et al. (2015), Intrator et al. (2016)), or an index of all of these factors like the one we use below. In the presence of neighborhood effects, this type of neighborhood sorting could help explain why black children have lower incomes than white children, even conditional on parents' income (Chetty et al. (2018), Mazumder (2012)).



(a) Income and Neighborhood Unemployment Rates



(b) Income and Wealth

Figure 1: Black-White Gaps in Neighborhood Unemployment Rates and Wealth, by Income
Note: The left panel displays 2012–2016 American Community Survey (ACS) data from the NHGIS. The right panel displays local regressions using data from the 2016 Survey of Consumer Finances.

If neighborhood sorting contributes to racial inequality, one question seems obvious: Why do black households with high incomes live in neighborhoods of lower quality than white households of comparable incomes? Financial constraints related to wealth and the price of housing are natural places to look for the answer. Figure 1b shows that black households at all levels of income hold substantially less wealth than white households (Barsky et al. (2002), Aliprantis et al. (2019)). Black households are also over-represented in urban areas where housing tends to be more expensive (Parker et al. (2018), Murray and Schuetz (2018)).

An alternative explanation is that neighborhood sorting by income and race is driven by the racial composition of neighborhoods, which we refer to as racial preferences. Relative to their white peers, black households may have stronger attachments to communities located in lower-quality neighborhoods (Eligon and Gebeloff (2016)) or experience higher levels of hostility from prospective neighbors (Anderson (2020), Harriot (2019), Jensen et al. (2018)) and institutions (Harris and Yelowitz (2018)) in higher-quality neighborhoods. If these types of race-specific factors for residing in a neighborhood are important, then indirect racial preferences over neighborhoods

could emerge even in the absence of direct preferences over neighborhood racial composition.¹

We show that financial constraints are not the reason black families live in lower-quality neighborhoods than white families with similar incomes. We create an index of neighborhood quality that combines labor market outcomes, educational attainment, poverty, and the share of single-headed households. Matching data from the 2015 Panel Study of Income Dynamics (PSID) with tract-level data from the 2012-2016 American Community Survey (ACS), we regress neighborhood quality on race, income, and wealth. We find that high-income, high-wealth black households live in similar-quality neighborhoods as low-income, low-wealth white households. Wealth has almost no predictive power for neighborhood quality within racial groups, but there is a 22 percentile point gap in quality between black and white households.² Moreover, high housing prices in high-quality neighborhoods do not explain black households living in lower-quality neighborhoods: Black and white households are distributed across metros with similar housing price-quality gradients.

We also extend the literature on racial preferences by showing that racial preferences are a central determinant of neighborhood quality. While segregation might be helpful or harmful for a group depending on the broader context (Cutler and Glaeser (1997), Cutler et al. (2008)), one of the main reasons for concern about racial segregation in the United States is that it can lead to racial gaps in neighborhood externalities, which can then generate racial inequality of opportunity. Previous studies have shown that racial preferences exist (Bayer et al. (2007), Bayer et al. (2004), Gabriel and Rosenthal (1989)) and can generate residential segregation (Sethi and Somanathan (2004), Bayer et al. (2014)). The implications of racial preferences for neighborhood quality are ambiguous, however, and depend on both the supply of neighborhoods and the marginal rate of substitution between racial composition and quality.

We show that black households trade large amounts of neighborhood quality in exchange for residing in a black neighborhood. The racial gap in neighborhood quality can be explained at all income levels by black households sorting into black neighborhoods. We demonstrate that this result is robust to alternative measures of neighborhood quality, including the homicide rate (Rich et al. (2018)) and estimates of intergenerational income mobility (Chetty et al. (2018)).

We conclude by showing that the black neighborhoods in a black household's choice set – their metro – explains their expected neighborhood quality. In metros without black neighborhoods, the neighborhood quality of black households increases in the supply of high-quality any-race neighborhoods. In metros with black neighborhoods, the neighborhood quality of black households is unresponsive to the supply of high-quality any-race neighborhoods, but is increasing in the supply of high-quality *black* neighborhoods. As well, the metro-level neighborhood quality gap declines

¹The racial preferences of white households also matter, as they could result in white flight upon the arrival of black households (Shertzer and Walsh (2019), Derenoncourt (2018), Ellen (2000), Card et al. (2008)) or the bidding up of the price of high-quality white neighborhoods (Cutler et al. (1999)). Our approach cannot distinguish racial preferences from discrimination in the housing market, which we discuss in the Conclusion.

²We show that this result is robust, not being driven by the sample period, our approaches to measuring neighborhood quality or wealth, the age of household head, the presence of children, housing tenure, differences in within wealth×race-bin distributions of wealth or home equity, or issues related to common support and functional form assumptions.

as the supply of high-quality black neighborhoods increases relative to the supply of high-quality white neighborhoods.

The racial preferences we document affect any policy or mechanism that operates through space in the US. Some obvious examples include housing vouchers (Bergman et al. (2019), Aliprantis et al. (2019)); the construction of public housing (Diamond and McQuade (2019), Davis et al. (2019)); zoning (Schuetz (2009), Kulka (2019)); school choice (Epple and Romano (2003), Ellison and Pathak (2016), Owens (2018)); location-based subsidies (Neumark (2018), LeGower and Walsh (2017)); and policing (Neal and Rick (2014), Chetty et al. (2018)). As well, the existence of racial frictions to mobility within cities suggests that frictions to mobility across larger regions could likewise be large (Zabek (2019)). Regional frictions to mobility would point in favor of place-making policies that can support local economies in the face of persistent spatial inequality (Schweitzer (2017), Austin et al. (2018)). The implication is that models of spatial equilibrium should include some form of racial preferences (Kuminoff et al. (2013)).

Racial preferences in residential choices are capable of perpetuating racial inequality in the US. At least since Wilson (1987), social scientists have been concerned with the ability of neighborhood effects to perpetuate racial inequality. Neighborhood effects can generate persistent inequality of opportunity even in a world where race only determines initial conditions of segregation and inequality (Aliprantis and Carroll (2018), Durlauf (1996), Benabou (1996)), and racial preferences can reinforce this mechanism by reducing mixing (Badel (2015)). Our results indicate that without investments to close the neighborhood quality gap, improvements in race relations so that racial preferences in residential location subside, or both, there will continue to be racial inequality of opportunity in the US.

2 Data

We use individual-level survey data from the Panel Study of Income Dynamics (PSID, ISR (2019)). The first part of our analysis features extensive use of the net worth variable provided in the PSID. The constructed net worth variable in the PSID, ER65408, is defined as the sum of total assets net of debt value plus the value of home equity. Total assets are the sum of the values of farm/businesses, checking and savings accounts, real estate holdings other than one's main home, stocks, vehicles, other assets like life insurance policies or rights in a trust, and annuities/IRAs. Debt value is the sum of debt toward farm/businesses, real estate debt for holdings other than one's main home, credit card debt, student loan debt, medical debt, legal debt, loans from relatives, and other debts. We measure income using the total family income variable, ER65349, that is the sum of all taxable income, transfer income, and Social Security income of the head, his/her spouse/partner, and other family members. We prefer this measure of income relative to a labor income variable due to the importance of transfers (Meyer et al. (2019), Meyer and Sullivan (2012)), and our results are qualitatively similar when measuring income using labor income.

We use tract-level data from the 5 percent sample from the 2012-2016 American Community

Survey (ACS) of the US Census, obtained from the National Historical Geographic Information System (NHGIS, Manson et al. (2017)). To measure the externality in a neighborhood we follow Aliprantis and Richter (2019) and define neighborhood quality in terms of a neighborhood’s poverty rate, employment to population ratio, unemployment rate, high school attainment rate, BA attainment rate, and the share of households with children under 18 that are single-headed. We measure these variables in terms of the percentiles of their national distributions, and then define neighborhood quality as the percentile of the first principal component of these variables. These neighborhood characteristics are strongly correlated with a neighborhood’s upward mobility as estimated in Chetty et al. (2018), and are chosen to capture the neighborhood externality mechanisms described in Wilson (1987) and Galster (2019). Appendix A discusses this measure of neighborhood quality in detail.

We use two data sets that include alternative measures of neighborhood quality. For tract-level homicide rates, we use data from the Washington Post Unsolved Homicide Database (Rich et al. (2018)). This database contains criminal homicides that occurred between 2007 and 2017 in the main county or counties of 55 of the largest American cities, and we are able to calculate tract-level homicide rates because the database contains the exact coordinates of each killing. For intergenerational mobility, we use publicly available estimates from the Opportunity Atlas (Chetty et al. (2018)). The tract-level estimates we use are the average child’s household income percentile when growing up in a household with median-income.

In several parts of the analysis we look at tract-level outcomes by household income quintiles. Although the tract-level NHGIS data only provide counts of households that have incomes within bins, we can obtain approximate counts of households in income quintiles by matching the NHGIS bins to the quintile cutoffs of the household income distribution in the individual-level 2012-2016 ACS data from the Integrated Public Use Microdata Series (IPUMS-USA, Ruggles et al. (2018)). The person-weighted household income quintiles in the IPUMS-USA 2012-2016 ACS data are $(-\infty, 29]$, $[29, 53]$, $[53, 83]$, $[83, 132]$, $[132, \infty)$, and we map these to the NHGIS bins as $[0, 30]$, $[30, 50]$, $[50, 75]$, $[75, 125]$, $[125, \infty)$.

Finally, we construct metro-level data from the 2012-2016 ACS sample of residents in the 53 largest metropolitan statistical areas (metros) in the US, each of which has a population of at least 1 million residents in the 2016 ACS. We define several variables to characterize the neighborhoods in each metro. We define a neighborhood as being “black” if at least 20 percent of its residents are black. While the precise cutoff used in this definition is arbitrary, we choose 20 percent because Ellen (2000) finds that 10 percent is an inflection point for the willingness of black residents to move into a neighborhood, and the Gautreaux program defined neighborhood eligibility in terms of a 30 percent cutoff (Polikoff (2006)). “White” neighborhoods are defined analogously.

We create a measure of the supply of high-quality neighborhoods that takes two issues into account: First, different sorting across metros has led to a distribution in the number of black neighborhoods per black residents. Second, some cities have higher-income residents than others. Thus, a metro might have many high-quality black neighborhoods per black resident, but few per

high-income black resident. Likewise, a metro might have few high-quality black neighborhoods per black resident, but many per high-income black resident. To account for these issues, we define a neighborhood as being high quality if it is above the median of the national distribution. We consider a resident of a metro as being high income if he/she is in a household with above-median household income. And finally, since [Census tracts](#) tend to have about 4,000 residents, we define:

$$\text{Supply of High-Quality Black Neighborhoods in a Metro} \equiv \frac{\# \text{ of High-Quality Black Neighborhoods}}{4,000 \text{ Black High-Income Residents}}.$$

The supply of high-quality white and any-race neighborhoods in a metro are defined analogously.

3 Financial Constraints Cannot Explain Neighborhood Sorting

3.1 Wealth Cannot Explain Sorting by Income and Race

After combining our index of neighborhood quality from the 2012-2016 ACS with data from the 2015 wave of the PSID, we estimate the regression

$$Q_i = \alpha + \alpha^B B_i + \beta_1 I_i + \beta_2 I_i^2 + \beta_1^B I_i \times B_i + \beta_2^B I_i^2 \times B_i + \gamma I_i \times NW_i + \delta_1 NW_i + \delta_2 NW_i^2 + \delta_1^B NW_i \times B_i + \delta_2^B NW_i^2 \times B_i + \varepsilon_i \quad (1)$$

where the unit i is families, Q_i is neighborhood quality as measured at the tract level, B_i is an indicator for the head of the family being black versus non-Hispanic white, I_i is total family income, and NW_i is family net worth. In an attempt to impose common support, the estimation sample is restricted to families with incomes between the 10th and 90th percentiles of the income distribution within each wealth quintile×race bin. The regression is estimated on the sample of all families in the 2015 PSID with a black or non-Hispanic white head, and weights are used to obtain all of our PSID estimates.

Table 2 displays estimated regression coefficients. The coefficient on having a black head of household is -22 , indicating that black families live in neighborhoods that are 22 percentile points worse than white families conditional on income and wealth. The coefficient on income indicates that as income increases by \$10,000, neighborhood quality increases by 2 percentile points on average. Income matters more than wealth, with the coefficient on family income more than an order of magnitude higher than the coefficient on family wealth. And finally, neighborhood quality is more strongly related to family income and wealth for blacks than for whites, although the difference for wealth is minor.

Figure 2 illustrates the regression results. High- and low-wealth families, or 4th and 1st quintile families, live in neighborhoods of similar quality after accounting for income and race. If income and wealth were driving neighborhood sorting, then the dashed lines representing low-wealth families would be on top of each other. Similarly, the solid lines representing high-wealth families would be on top of each other. Instead, the lines we see on top of each other are the red lines representing white families and the blue lines representing black families.

Table 1: Neighborhood Quality Regression Coefficients

α	39.9 (0.9)	I_i	2.0e-4 (2.4e-5)	I_i^2	-1.6e-10 (1.2e-10)
B_i	-21.8 (2.0)	$I_i \times B_i$	9.2e-5 (7.5e-5)	$I_i^2 \times B_i$	-8.7e-10 (5.9e-10)
		NW_i	1.2e-5 (1.4e-6)	NW_i^2	-8.1e-13 (1.2e-13)
$I_i \times NW_i$	-4.6e-11 (8.8e-12)	$NW_i \times B_i$	1.6e-6 (9.1e-6)	$NW_i^2 \times B_i$	-1.4e-12 (2.6e-12)
R^2	0.22	N	6,600-6,700		

Note: This table reports coefficients from a family-level OLS regression of neighborhood quality on an indicator for having a black head, a quadratic in income (interacted with black head), a quadratic in net worth (interacted with black household head), and an interaction of income and net worth. The sample is taken from the 2015 PSID and joined with tract-level data from the 2012-2016 ACS.

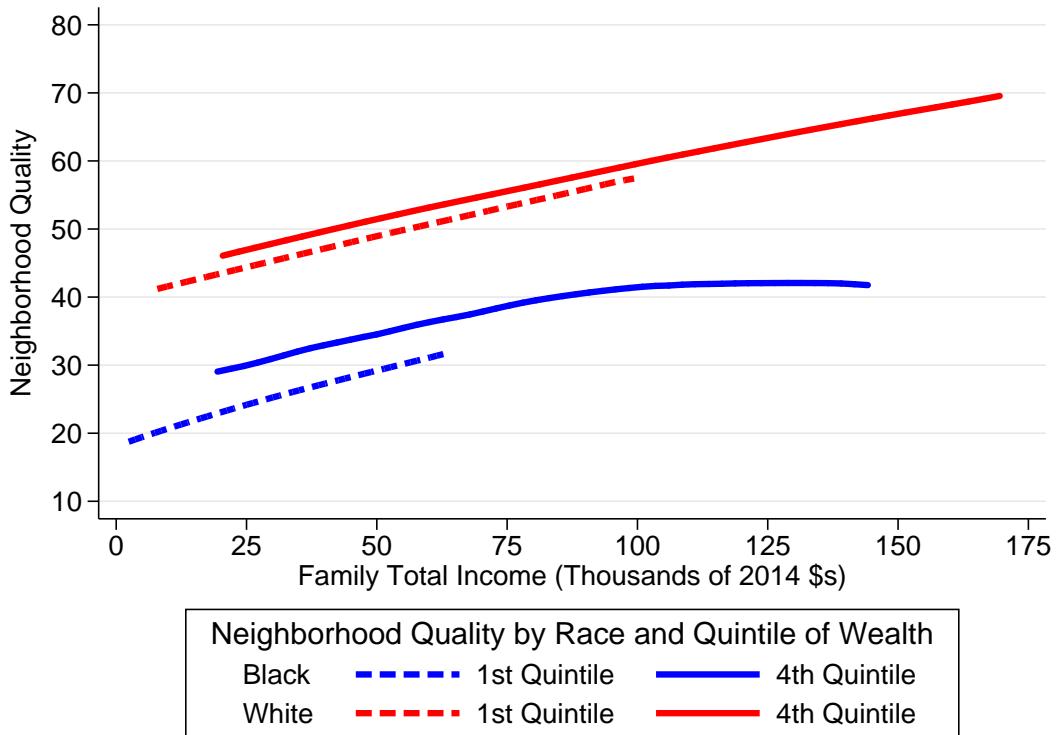


Figure 2: Neighborhood Quality by Income, Race, and Wealth

Note: This figure reports results from a family-level OLS regression of neighborhood quality on an indicator for having a black head, a quadratic in income (interacted with black head), a quadratic in net worth (interacted with black household head), and an interaction of income and wealth. The sample is taken from the 2015 PSID and joined with tract-level data from the 2012-2016 ACS.

It is worth noting that even within race, wealth appears unimportant at both low levels of income and high levels of income. As a stylized fact, we might characterize these estimation results as indicating that neighborhood quality is (mean) independent of wealth conditional on income and race. If credit constraints were a barrier to accessing high-quality neighborhoods, then one would expect a larger gap between high- and low-wealth groups at low levels of income.

We use the 1st and 4th quintiles of the overall wealth distribution to represent, respectively, low and high wealth for two reasons. First, there are simply not many African American households in the 5th quintile of the overall distribution of wealth. Second, the right tail of the wealth distribution is extremely long, and there are differences across race in the distribution within the 5th quintile. The mean wealth of white households in the 5th quintile of the overall distribution is \$1.97 million, compared to \$0.18 million for white households in the 4th quintile. In contrast, discrepancies across race within bins are not large enough to drive our results when focusing on the 1st and 4th quintiles.³ In the 4th quintile of wealth for our trimmed sample, mean white and black wealth is, respectively, \$180,000 versus \$155,000. In the 1st quintile of wealth, mean white and black wealth is, respectively, -\$51,000 and -\$36,000.

The result that wealth does not predict neighborhood quality after conditioning on income and race is robust. Appendix B shows that this result is not driven by the age of household heads or the absence of children in the families in our sample, assumptions about how to measure neighborhood quality, the functional form assumptions made about the relationship between quality and family characteristics, or heterogeneity across race in income or wealth volatility. We also look at issues related to measuring wealth. Appendix C repeats this analysis with the 1990 Census and 1989 PSID and finds very similar results.

3.2 The Price of Quality Cannot Explain Sorting by Income and Race

The price of housing represents another financial constraint that could be differentially affecting black and white households. Figure 3a illustrates the general relationship between price and neighborhood quality by plotting a random sample of 1,000 tracts from the 53 metros with at least 1 million residents in the 2012-2016 ACS.⁴ In most metros, the price of housing increases as a function of quality, but not steeply. In most metros it is also the case that while the price of housing is correlated with quality, this correlation is not so strong as to eliminate “affordable” high-quality neighborhoods. The metro-level average (population-weighted) R^2 of median three-bedroom rent and quality is 0.43.

Neighborhood choices are made at the metro level, though, and so the general picture in Figure 3a could mask heterogeneity in housing prices in the metros where black or white households are

³See Auerback and Gelman (2016) for an example of how different within-bin distributions can drive inferences. In our case, the concern would be that black families in the 4th quintile would be disproportionately near to the 3rd quintile of wealth while white families would be nearer to the 5th quintile. In such a scenario, comparing families within the 4th quintile would not be a comparison between families with similar levels of wealth.

⁴We abstract from the dimension of housing unit quality, which itself can generate important neighborhood effects (Ioannides and Zabel (2003), Brock and Durlauf (2001)).

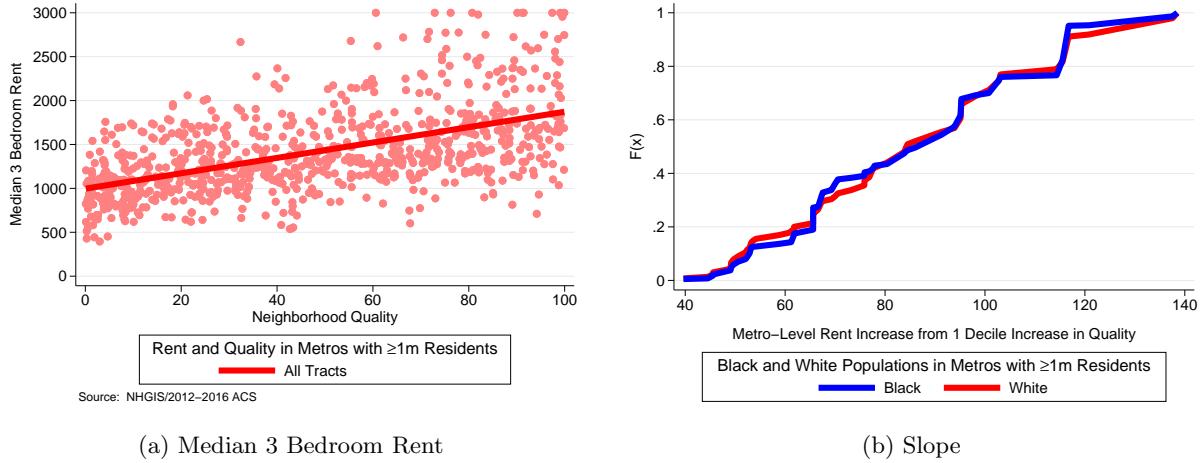


Figure 3: Neighborhood Quality and the Price of Housing

Note: The left panel illustrates the price of quality by plotting a random sample of 1,000 tracts from the 53 metros with at least 1 million residents in the 2012–2016 ACS. The right panel displays the CDF of the black population in those 53 metros over the metro-level slope of an OLS linear regression of price on quality.

more likely to reside. It could be the case that black households tend to live in more expensive metros than white households, and this price differential could help drive differences in neighborhood sorting by income and race. Figure 3b shows that this is not the case, as black and white households are distributed in metros with similar housing price–neighborhood quality elasticities. A related analysis is conducted in Appendix E and shows similar results when housing prices are measured using median house values. Appendix E also shows the data from several metros and shows that black and white households reside in cities where the strength of the correlation between price and quality is similar.

4 Racial Preferences Can Explain Neighborhood Sorting

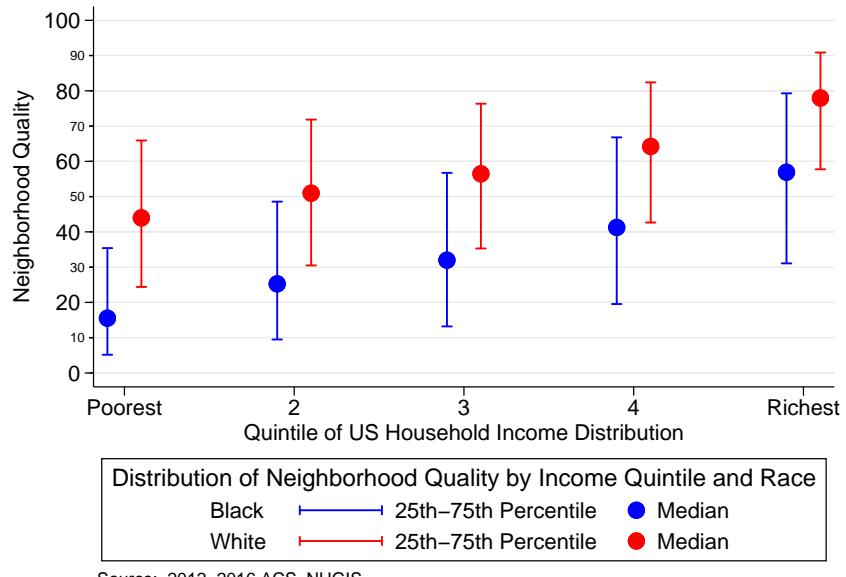
4.1 Neighborhood Racial Composition Explains Sorting by Income and Race

We have shown that wealth predicts little difference in neighborhood quality conditional on income and race, and that black and white households live in cities with similar housing prices. These facts point to an alternative to financial constraints as an explanation for why black and white households of similar incomes live in different quality neighborhoods.

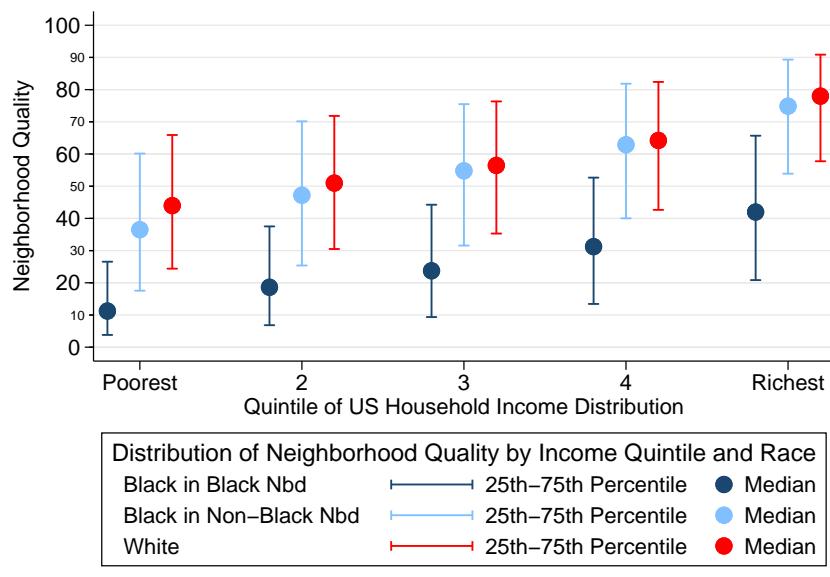
Racial preferences, or when the racial composition of neighborhoods affects location choices, are an alternative explanation for neighborhood sorting by income and race. We know from the literature that racial preferences exist (Bayer et al. (2007), Bayer et al. (2004), Gabriel and Rosenthal (1989)) and can generate residential segregation (Sethi and Somanathan (2004), Bayer et al. (2014)). The implications of racial preferences for racial gaps in neighborhood quality are not clear, though, as they depend on both the supply of neighborhoods and the marginal rate of substitution between racial composition and quality.

If racial preferences drive neighborhood sorting, we would expect to see that black households

would live in neighborhoods of similar quality to those of white households when not residing in black neighborhoods. The pattern predicted by racial preferences is the one we observe in the data. Figure 4b shows that at all income levels, the racial gap in neighborhood quality can be explained by black households sorting into black neighborhoods.



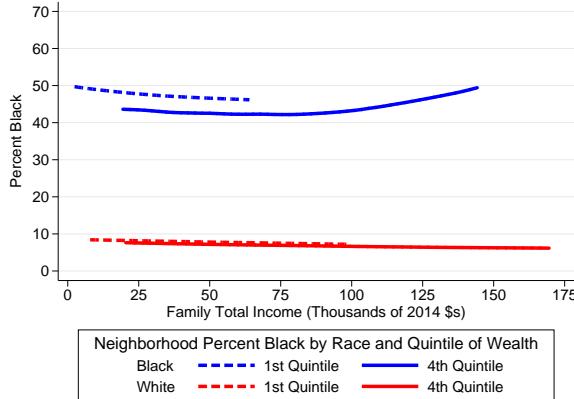
(a) Quality by Income and Race



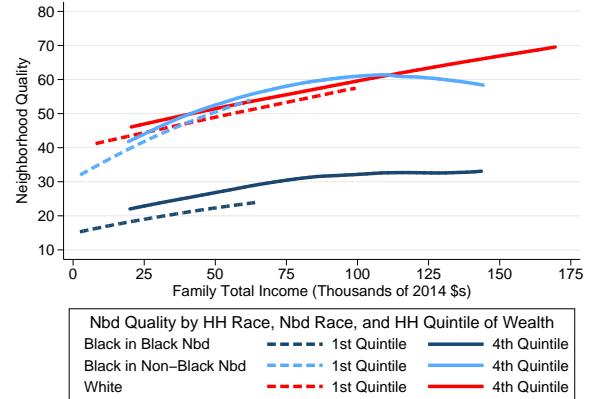
(b) Quality by Income, Race, and Racial Composition

Figure 4: Neighborhood Quality by Income, Race, and Neighborhood Racial Composition
 Note: The top panel shows the distribution of neighborhood quality conditional on household income quintile and race. The bottom panel shows the distribution of neighborhood quality conditional on household income quintile, race, and, for black households, whether they live in a Census tract that is at least 20 percent black. Both panels use tract-level data from the 2012–2016 ACS/NHGIS.

The neighborhood sorting patterns in Figure 4b are not driven by wealth. We estimate an analogue to Equation 1 where the dependent variable is the share of black residents rather than quality. Figure 5a shows the results: High-wealth black households sort into neighborhoods with the same high share of black residents as low-wealth black households. Similarly, low-wealth white households sort into neighborhoods with the same (lower) share of black residents as high-wealth white households. The share of black residents in one's neighborhood also appears independent of income; among wealth, income, and race, a household's race is the only variable predictive of the share of black residents in one's neighborhood, with the gap between black and white households being 42 percentage points. We also estimate a version of Equation 1 that conditions on whether a black household is residing in a black neighborhood. Figure 5b shows that conditional on income and wealth, black households residing in non-black neighborhoods sort into neighborhoods of quality comparable to their white counterparts, while black households residing in black neighborhoods sort into neighborhoods of significantly lower quality than those of their white counterparts.



(a) Neighborhood Racial Composition



(b) Neighborhood Quality

Figure 5: Neighborhood Sorting

Note: The left panel reports results from a family-level OLS regression of neighborhood racial composition on an indicator for having a black head, a quadratic in income (interacted with black head), a quadratic in net worth (interacted with black household head), and an interaction of income and wealth. The sample is taken from the 2015 PSID and joined with tract-level data from the 2012–2016 ACS. The right panel shows results from an identical regression in which the dependent variable is neighborhood quality and the sample of black families is split by whether they live in a Census tract that is at least 20 percent black.

Nor are the neighborhood sorting patterns in Figure 4b driven by our measure of neighborhood quality. Identical results obtain when measuring neighborhood quality in terms of a Census tract's homicide rate (Figure 6a) or intergenerational income coefficient (Figure 6b). These results indicate that our measure of neighborhood quality is generating meaningful results, given the importance of exposure to violence for outcomes (Aliprantis (2017), Sharkey and Friedson (2019)) and the importance of racial segregation for intergenerational income mobility (Andrews et al. (2017)).

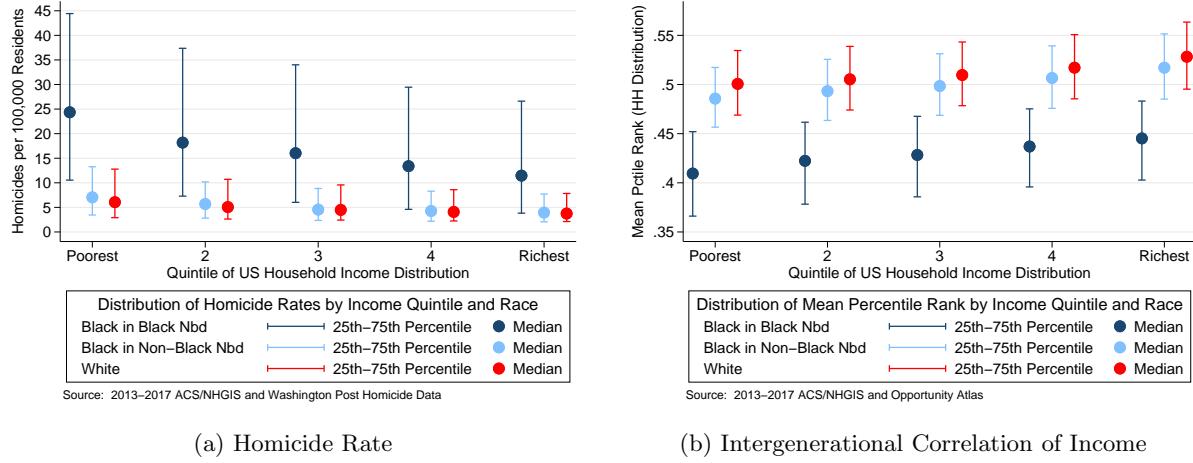


Figure 6: Alternative Measures of Neighborhood Quality

Note: Both panels show the distribution of neighborhood quality conditional on household income quintile, race, and, for black households, whether they live in a Census tract that is at least 20 percent black. The left panel measures neighborhood quality using the tract-level homicide rate calculated from the Washington Post Unsolved Homicide Database and the right panel measures neighborhood quality using the tract-level intergenerational income correlation for 50th income-percentile parents in the Opportunity Atlas.

4.2 Black Households’ Expected Neighborhood Quality Is Explained by the Black Neighborhoods in their Choice Set

We now examine the importance of black neighborhoods in a given metro for the expected neighborhood quality of black residents in that metro. We define a metro as having no black neighborhoods if it has less than one black neighborhood per 4,000 residents. Figure 7a shows that these metros contain a small share of the black population in our sample of 53 metros (9 percent). The metros without black neighborhoods in the 2012–2016 ACS are Austin, Las Vegas, Orlando, Phoenix, Portland, Riverside, Sacramento, Salt Lake City, San Antonio, San Diego, San Jose, Seattle, and Tucson.

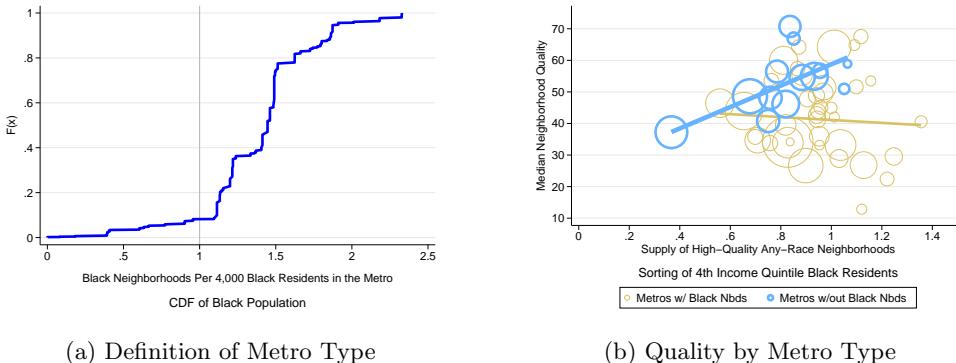


Figure 7: Metros With and Without Black Neighborhoods

Note: The left panel shows the distribution of black residents over the supply of black neighborhoods in their metro (per 4,000 black residents). Metros without black neighborhoods are defined as metros with less than 1 black neighborhood per 4,000 black residents. The right panel shows the mean neighborhood quality of 4th income quintile black households as a function of the supply of high quality any-race neighborhoods, separated by households living in metros with black neighborhoods versus households living in metros without black neighborhoods.

Figure 7b shows the neighborhood quality of high-income (4th quintile of the population distribution) black households in a metro as a function of the supply of high-quality any-race neighborhoods in the metro, conditional on the presence or lack thereof of black neighborhoods in the metro. The light blue metros show that when no black neighborhoods are in the choice set, black households' neighborhood quality increases as the supply of high-quality any-race neighborhoods increases. In contrast, the gold metros shows that when black neighborhoods are in the choice set, the neighborhood quality of black households does not change as the supply of high-quality any-race neighborhoods increases.

The relationship between rent and quality for black neighborhoods is not remarkably different from the relationship between rent and quality for other neighborhoods in the US (See Appendix E.). What is different about quality and black neighborhoods in the US is simply the scarcity of high-quality black neighborhoods (Bayer and McMillan (2005), Bayer et al. (2014)). Figure 8a shows that in Chicago, a metro with over 2,200 Census tracts and a black population of 1.6 million people, there are 11 black neighborhoods in the top quintile of quality. This translates into 0.028 top-quintile black neighborhoods per 4,000 black residents, compared with 0.29 top-quintile non-black neighborhoods per 4,000 non-black residents.⁵

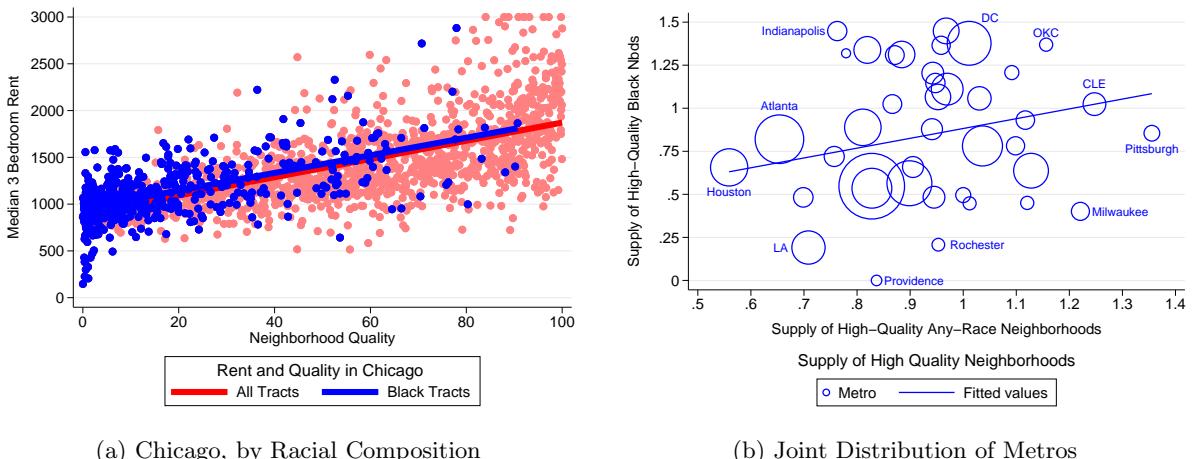


Figure 8: The Supply of High-Quality Neighborhoods
Note: The left panel shows the supply of neighborhoods in Chicago by quality and price, separated by whether those neighborhoods are at least 20 percent black. The right panel shows the joint distribution of metros' supply of high-quality black neighborhoods and high-quality any-race neighborhoods.

Figure 8b shows that across metros there is variation in the supply of high-quality black neighborhoods conditional on the supply of high-quality any-race neighborhoods. While there is a positive relationship between black and any-race supply, the R^2 of a regression of the supply of high-quality black neighborhoods on the supply of high-quality any-race neighborhoods is 0.13. To give an example of the type of variation this allows for, consider Washington, DC and Rochester, NY. Washington, DC and Rochester have similar supplies of high-quality any-race neighborhoods. How-

⁵Los Angeles is even more extreme than Chicago. LA has 2,929 Census tracts and 880,000 black residents, but only one top-quintile black neighborhood. This gives LA 0.005 top-quintile black neighborhoods per 4,000 black residents, compared with 0.14 top-quintile non-black neighborhoods per 4,000 non-black residents.

ever, Washington, DC has a very high supply of high-quality black neighborhoods, while Rochester has an extremely low supply of high-quality black neighborhoods. High-income black households in these metros face quite different neighborhood choice sets.

We use the orthogonal variation in the supply of high-quality neighborhoods shown in Figure 8b to test how the neighborhood sorting of black residents depends on the supply of high-quality neighborhoods. Recall that the gold bubbles in Figure 7b show that the neighborhood quality of high-income black households does not change as the supply of high quality any-race neighborhoods in their metro increases. The blue bubbles in Figure 9a show a different story when looking at the supply of high-quality black neighborhoods. These data show that there is a strong, positive correlation between the supply of high-quality black neighborhoods and the neighborhood quality of high-income black residents.

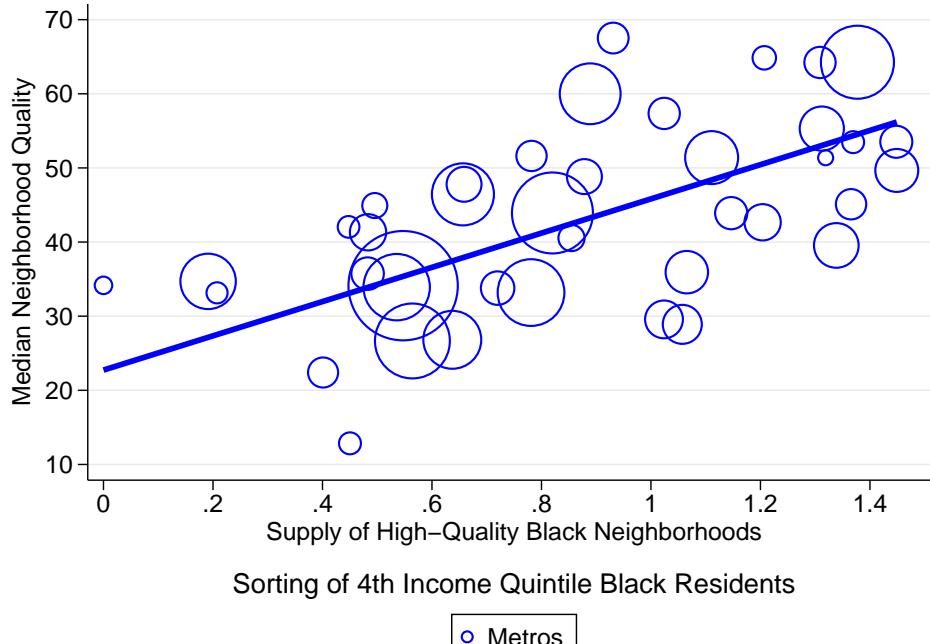
Table 2 quantifies the results from Figures 7b and 9a and expands the analysis to include each race×income quintile group. Looking at the first three rows of Table 2, we see that the pattern from the figures extends from black households in the 4th quintile of income to black households at all incomes: Neighborhood quality is not related to the supply of high-quality any-race neighborhoods. Looking at the last three rows of Table 2, we see that black households do respond to an increase in the supply of high-quality *black* neighborhoods by sorting into higher-quality neighborhoods.

Table 2: Regressions of Median Neighborhood Quality

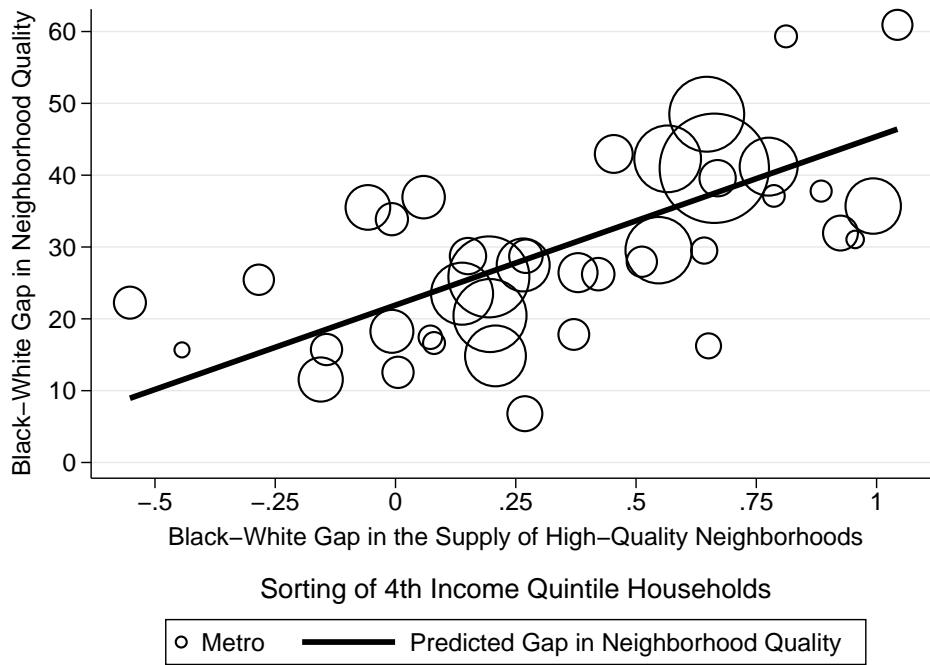
Coefficient on Supply of HQ Nbds	Median Neighborhood Quality									
	Black Households by HH Income Quintile					White Households by HH Income Quintile				
	1	2	3	4	5	1	2	3	4	5
Any-Race	-7	-10	-12	-5	2	14	14	10	11	7
p-value	0.49	0.36	0.31	0.71	0.84	0.14	0.09	0.15	0.08	0.18
R ²	0.01	0.02	0.03	0.00	0.00	0.06	0.07	0.05	0.08	0.05
Own-Race	14	17	20	23	22	27	23	16	14	6
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.23
R ²	0.25	0.31	0.35	0.43	0.38	0.25	0.23	0.18	0.16	0.04

Note: This table reports regression results where the dependent variable is the median neighborhood quality of a metro's black or white households, estimated separately by income quintile, and the independent variable is the metro's supply of high quality black, white, or any-race neighborhoods. The table uses data from the 2012-2016 ACS/NHGIS and the estimation sample only includes metros with black neighborhoods (having at least one black neighborhood per 4,000 black residents). The bold column reports the regression results from the gold line in Figure 7b and the blue line in Figure 9a. Income quintiles are defined in terms of the population distribution of household income in the US.

One could imagine that sorting into metros has resulted in differences in income across metros with different levels of neighborhood supply that correlate with racial composition. This issue appears both possible and unlikely given the results in Section 3.2. One way to deal with this issue is to use white households as a “control” group by looking at differences in the supply of



(a) Quality and Supply



(b) The Gap in Quality and the Gap in Supply

Figure 9: Sorting and the Supply of High-Quality Neighborhoods by Metro

Note: The top panel shows the median neighborhood quality of a metro's 4th income quintile black households as a function of the metro's supply of high quality black neighborhoods. The bottom panel shows a metro's gap in the median neighborhood quality of 4th income quintile black households relative to the metro's 4th income quintile white households as a function of the metro's gap in the supply of high quality black neighborhoods versus high quality white neighborhoods. Both panels use data from the 2012-2016 ACS/NHGIS and are estimated on the sample of metros with black neighborhoods (with at least one black neighborhood per 4,000 black residents).

high-quality neighborhoods. Using this approach, we define the black-white gap in the supply of high-quality neighborhoods as the supply of high-quality white neighborhoods in a metro minus the supply of high-quality black neighborhoods in the metro. We also define the metro-level black-white gap in neighborhood quality as the median neighborhood quality of white households in the 4th quintile of income minus the median neighborhood quality of black households in the 4th quintile of income. Figure 9b shows that the black-white gap in the supply of high-quality neighborhoods predicts the black-white gap neighborhood quality. In a regression of the gap in quality on the gap in supply the coefficient is 24, the relevant p-value is 0.000, and the R^2 is 0.47.

5 Conclusion

This paper documented new facts about neighborhood sorting in the US. It was previously known that black and white households of similar incomes live in neighborhoods of different quality. It was also previously known that racial preferences exist, or that the racial composition of neighborhoods affects location choices. What was not known before this paper was whether wealth or the price of neighborhood quality were omitted variables that could explain racial preferences, and whether racial preferences have major implications for neighborhood quality.⁶ We have shown that financial constraints related to wealth or the price of housing cannot explain neighborhood sorting by income and race, and that racial preferences are a central determinant of the neighborhood externalities experienced by African Americans.

We cannot rule out that racial discrimination in the housing market is a major contributor to our results. Nevertheless, we speculate that racial discrimination in the housing market, while present and non-trivial, is not large enough to generate the sorting patterns we observe. This speculation is partly informed by the literature (Bhutta and Hizmo (2019), Berkovec et al. (1998), Ross (2010)), partly informed by recent studies finding discrimination priced in terms of a 1 or 2 percent premium (Bayer et al. (2017), Early et al. (2019)), and partly informed by the existence of websites like [Zillow](#) and [realtor.com](#), which equalize access to information.⁷

We think the best explanation for our results is that living in predominantly white neighborhoods imposes large psychic costs on black households, and that these costs are large enough to outweigh any educational, labor market, or safety benefits one might experience due to living in a higher-quality neighborhood. If this mechanism does explain the sorting patterns observed in the data, then our results provide one way of quantifying how costly it is for black people to interact with white people.

⁶The nearest related results on wealth of which we are aware are in Woldoff and Ovadia (2009), Crowder et al. (2006), and Freeman (2000), and the nearest related results on stated-race preferences are in Ihlanfeldt and Scafidi (2002) and Vigdor (2003).

⁷For related evidence see Ihlanfeldt and Mayock (2009) and Hanson et al. (2016). We acknowledge the presence of differential information through steering (Christensen and Timmins (2018), Nowak and Smith (2018)) and other forms of discrimination (Munnell et al. (1996), Ladd (1998), Yinger (1998)), and also note that discrimination would seem to be a better explanation than a general notion of distance from one's social network for generating the sharp racial lines one observes in the data (For examples, see [The Racial Dot Map](#).)

This paper highlights that the spatial component of public policy should not be focused entirely on access, but should also be designed with attention to racial preferences. An important subject for future research will be providing evidence that allows us to move beyond speculation about the relative importance of the factors generating racial preferences. The success or failure of related policies will hinge on understanding precisely which factors matter the most in determining neighborhood choices. The preferred policy might be very different depending on whether neighborhood choices are driven more by discrimination in the housing market (Ross and Yinger (2002)), information (Bergman et al. (2019), Christensen and Timmins (2018)), family and social networks (Büchel et al. (2019), van der Klaauw et al. (2019)), racial hostility (Harriot (2019)), white flight (Shertzer and Walsh (2019), Derenoncourt (2018), Card et al. (2008)), amenities (Caetano and Maheshri (2019)), or preferences for same-race neighbors or communities (Bayer and Blair (2019)), and whether any of these mechanisms have changed over time (Blair (2019), Mallach (2019)).

References

- Aliprantis, D. (2017). Human capital in the inner city. *Empirical Economics* 53(3), 1125–1169.
- Aliprantis, D. and D. Carroll (2018). Neighborhood dynamics and the distribution of opportunity. *Quantitative Economics* 9(1), 247–303. DOI: 10.3982/QE785.
- Aliprantis, D., D. Carroll, and E. Young (2019). The dynamics of the racial wealth gap. *Mimeo., FRB Cleveland*.
- Aliprantis, D., H. Martin, and D. C. Phillips (2019). Landlords and access to opportunity. *FRB of Cleveland WP 19-02-R*. DOI: 10.26509/frbc-wp-201902r.
- Aliprantis, D. and F. G.-C. Richter (2019). Evidence of neighborhood effects from Moving to Opportunity: LATEs of neighborhood quality. *Review of Economics and Statistics*.
- Anderson, E. (2020). *Black in White Space*. University of Chicago Press.
- Andrews, R., M. Casey, B. L. Hardy, and T. D. Logan (2017). Location matters: Historical racial segregation and intergenerational mobility. *Economics Letters* 158, 67 – 72.
- Auerback, J. and A. Gelman (2016). Age-aggregation bias in mortality trends. *Proceedings of the National Academy of Sciences* 113(07), E816–E817. DOI: 10.1073/pnas.1523465113.
- Austin, B. A., E. L. Glaeser, and L. H. Summers (2018). Jobs for the Heartland: Place-based policies in 21st century America. *NBER WP 24548*. DOI: 10.3386/w24548.
- Badel, A. (2015). A racial inequality trap. *Mimeo., St. Louis Fed*.

- Barsky, R., J. Bound, K. K. Charles, and J. P. Lupton (2002). Accounting for the black-white wealth gap. *Journal of the American Statistical Association* 97(459), 663–673. DOI: 10.1198/016214502388618401.
- Bayer, P. and P. Blair (2019). The consequences of decentralized racial sorting. *Mimeo., Harvard University*.
- Bayer, P., M. Casey, F. Ferreira, and R. McMillan (2017). Racial and ethnic price differentials in the housing market. *Journal of Urban Economics* 102, 91 – 105. DOI: 10.1016/j.jue.2017.07.004.
- Bayer, P., H. Fang, and R. McMillan (2014). Separate when equal? Racial inequality and residential segregation. *Journal of Urban Economics* 82, 32 – 48. DOI: 10.1016/j.jue.2014.05.002.
- Bayer, P., F. Ferreira, and R. McMillan (2007). A unified framework for measuring preferences for schools and neighborhoods. *Journal of Political Economy* 115(4), 588–638.
- Bayer, P. and R. McMillan (2005). Racial sorting and neighborhood quality. *NBER WP* 11813. DOI: 10.3386/w11813.
- Bayer, P., R. McMillan, and K. S. Rueben (2004). What drives racial segregation? New evidence using Census microdata. *Journal of Urban Economics* 56(3), 514–535.
- Benabou, R. (1996). Heterogeneity, stratification, and growth: Macroeconomic implications of community structure and school finance. *The American Economic Review*, 584–609.
- Bergman, P., R. Chetty, S. DeLuca, N. Hendren, L. F. Katz, and C. Palmer (2019). Creating moves to opportunity: Experimental evidence on barriers to neighborhood choice. *NBER WP* 26164. DOI: 10.3386/w26164.
- Berkovec, J. A., G. B. Canner, S. A. Gabriel, and T. H. Hannan (1998). Discrimination, competition, and loan performance in FHA mortgage lending. *The Review of Economics and Statistics* 80(2), 241–250.
- Bhutta, N. and A. Hizmo (2019). Do minorities pay more for mortgages? *Mimeo., Federal Reserve Board*. DOI: 10.2139/ssrn.3352876.
- Blair, P. (2019). The effect of outside options on tipping points. *Mimeo., Harvard University*.
- Brock, W. A. and S. N. Durlauf (2001). Discrete choice with social interactions. *The Review of Economic Studies* 68(2), 235–260.
- Büchel, K., D. Puga, E. Viladecans-Marsal, and M. von Ehrlich (2019). Calling from the outside: The role of networks in residential mobility. *Mimeo., University of Bern*.
- Caetano, G. and V. Maheshri (2019). Gender segregation within neighborhoods. *Regional Science and Urban Economics* 77, 253 – 263.

- Card, D., A. Mas, and J. Rothstein (2008, 02). Tipping and the Dynamics of Segregation*. *The Quarterly Journal of Economics* 123(1), 177–218.
- Chetty, R., J. N. Friedman, N. Hendren, M. R. Jones, and S. R. Porter (2018). The Opportunity Atlas: Mapping the childhood roots of social mobility. *Mimeo., Opportunity Insights*. DOI: 10.3386/w25147.
- Chetty, R., N. Hendren, M. R. Jones, and S. R. Porter (2018). Race and economic opportunity in the United States: An intergenerational perspective. *NBER WP 24441*. DOI: 10.3386/w24441.
- Christensen, P. and C. Timmins (2018). Sorting or steering: Experimental evidence on the economic effects of housing discrimination. *NBER WP 24826*. DOI: 10.3386/w24826.
- Crowder, K., S. J. South, and E. Chavez (2006). Wealth, race, and inter-neighborhood migration. *American Sociological Review* 71(1), 72–94. DOI: 10.1177/000312240607100104.
- Cutler, D. M. and E. L. Glaeser (1997). Are ghettos good or bad? *The Quarterly Journal of Economics* 112(3), 827–872.
- Cutler, D. M., E. L. Glaeser, and J. L. Vigdor (1999). The rise and decline of the American ghetto. *Journal of Political Economy* 107(3), 455–506.
- Cutler, D. M., E. L. Glaeser, and J. L. Vigdor (2008). When are ghettos bad? Lessons from immigrant segregation in the United States. *Journal of Urban Economics* 63(3), 759–774.
- Davis, M., J. Gregory, and D. Hartley (2019). The equilibrium effects of low income housing policies on neighborhood composition. *Mimeo., Chicago Fed*.
- Derenoncourt, E. (2018). Can you move to opportunity? Evidence from the Great Migration. *Mimeo., Harvard University*.
- Diamond, R. and T. McQuade (2019). Who wants affordable housing in their backyard? An equilibrium analysis of low income property development. *Journal of Political Economy* 127(3), 1063–1117. DOI: 10.1086/701354.
- Durlauf, S. N. (1996). A theory of persistent income inequality. *Journal of Economic Growth* 1(1), 75–93.
- Early, D. W., P. E. Carrillo, and E. O. Olsen (2019, jan). Racial rent differences in U.S. housing markets: Evidence from the housing voucher program. *Journal of Regional Science* 59(4), 669–700. DOI: 10.1111/jors.12422.
- Eligon, J. and R. Gebeloff (2016, August 20). Affluent and black, and still trapped by segregation. *The New York Times Magazine*.
- Ellen, I. G. (2000). *Sharing America's Neighborhoods: The Prospects for Stable Racial Integration*. Cambridge, MA: Harvard University Press.

- Ellison, G. and P. A. Pathak (2016). The efficiency of race-neutral alternatives to race-based affirmative action: Evidence from Chicago's exam schools. *NBER WP 22589*. DOI: 10.3386/w22589.
- Epple, D. N. and R. Romano (2003). Neighborhood schools, choice, and the distribution of educational benefits. In C. M. Hoxby (Ed.), *The Economics of School Choice*, Chapter 7, pp. 227–286. University of Chicago Press. DOI: 10.1177/0895904890004002004.
- Freeman, L. (2000). Minority housing segregation: A test of three perspectives. *Journal of Urban Affairs* 22(1), 15–35. DOI: 10.1111/0735-2166.00037.
- Gabriel, S. A. and S. S. Rosenthal (1989). Household location and race: Estimates of a multinomial logit model. *The Review of Economics and Statistics* 71(2), 240–249.
- Galster, G. C. (2019). *Making Our Neighborhoods, Making Ourselves*. Chicago: University of Chicago Press. DOI: 10.7208/chicago/9780226599991.001.0001.
- Hanson, A., Z. Hawley, H. Martin, and B. Liu (2016). Discrimination in mortgage lending: Evidence from a correspondence experiment. *Journal of Urban Economics* 92, 48–65. DOI: 10.1016/j.jue.2015.12.004.
- Harriot, M. (2019, June 28). The racist Nextdoor. *The Root*.
- Harris, T. F. and A. Yelowitz (2018). Racial climate and homeownership. *Journal of Housing Economics* 40, 41 – 72. Special Issue on Race and the City.
- Ihlanfeldt, K. and T. Mayock (2009). Price discrimination in the housing market. *Journal of Urban Economics* 66(2), 125 – 140. DOI: 10.1016/j.jue.2009.05.004.
- Ihlanfeldt, K. R. and B. Scafidi (2002). Black self-segregation as a cause of housing segregation: Evidence from the multi-city study of urban inequality. *Journal of Urban Economics* 51(2), 366 – 390. DOI: 10.1006/juec.2001.2249.
- Intrator, J., J. Tannen, and D. S. Massey (2016). Segregation by race and income in the United States 1970-2010. *Social Science Research* 60, 45 – 60. DOI: 10.1016/j.ssresearch.2016.08.003.
- Ioannides, Y. M. and J. E. Zabel (2003). Neighbourhood effects and housing demand. *Journal of Applied Econometrics* 18(5), 563–584.
- ISR (2019). *Panel Study of Income Dynamics* (restricted use dataset ed.). Ann Arbor, MI: Produced and distributed by the Survey Research Center, Institute for Social Research, University of Michigan.
- Jensen, T., J. Lyon, and N. Nash (2018, October 22). To the next ‘BBQ Becky’: Don’t call 911. Call 1-844-WYT-FEAR. *The New York Times*. [Link](#).
- Kulka, A. (2019). Sorting into neighborhoods: The role of minimum lot sizes. *Mimeo., University of Wisconsin*.

- Kuminoff, N. V., V. K. Smith, and C. Timmins (2013). The new economics of equilibrium sorting and policy evaluation using housing markets. *Journal of Economic Literature* 51(4), 1007–62.
- Ladd, H. F. (1998, June). Evidence on discrimination in mortgage lending. *Journal of Economic Perspectives* 12(2), 41–62. DOI: 10.1257/jep.12.2.41.
- LeGower, M. and R. Walsh (2017). Promise scholarship programs as place-making policy: Evidence from school enrollment and housing prices. *Journal of Urban Economics* 101, 74–89. DOI: 10.1016/j.jue.2017.06.001.
- Logan, J. R. (2011). *Separate and Unequal: The Neighborhood Gap for Blacks, Hispanics and Asians in Metropolitan America*. Providence, RI: US 2010 Project/Russell Sage Foundation.
- Mallach, A. (2019). Walking away: Shifting spatial decisions by black homeowners and their implications for black urban middle neighborhoods in legacy cities. *Mimeo., Center for Community Progress*.
- Manson, S., J. Schroeder, D. V. Riper, and S. Ruggles (2017). *IPUMS National Historical Geographic Information System* (12.0 ed.). Minneapolis: University of Minnesota. [Database] <http://doi.org/10.18128/D050.V12.0>.
- Mazumder, B. (2012). Black-white differences in intergenerational mobility in the US. *Chicago Fed WP 2011-10R*.
- Meyer, B. D. and J. X. Sullivan (2012). Identifying the disadvantaged: Official poverty, consumption poverty, and the new supplemental poverty measure. *Journal of Economic Perspectives* 26(3), 111–136. 10.1257/jep.26.3.111.
- Meyer, B. D., D. Wu, V. R. Mooers, and C. Medalia (2019). The use and misuse of income data and extreme poverty in the United States. *NBER Working Paper 25907*. DOI: 10.3386/w25907.
- Munnell, A. H., G. M. B. Tootell, L. E. Browne, and J. McEneaney (1996). Mortgage lending in Boston: Interpreting HMDA data. *The American Economic Review* 86(1), 25–53.
- Murray, C. and J. Schuetz (2018, June 21). Housing in the US is too expensive, too cheap, and just right. It depends on where you live. *The Brookings Institution*.
- Neal, D. and A. Rick (2014). The prison boom & the lack of black progress after Smith & Welch. *Mimeo., University of Chicago*.
- Neumark, D. (2018). Rebuilding communities job subsidies. In J. Shambaugh and R. Nunn (Eds.), *Place-Based Policies for Shared Economic Growth*. The Hamilton Project/Brookings Institution.
- Nowak, A. and P. Smith (2018). Reexamining racial price differentials in housing markets. *Mimeo., West Virginia University*. DOI: 10.2139/ssrn.3258811.

- Owens, A. (2018). Income segregation between school districts and inequality in students' achievement. *Sociology of Education* 91(1), 1–27. DOI: 10.1177/0038040717741180.
- Parker, K., J. M. Horowitz, A. Brown, R. Fry, D. Cohn, and R. Igielnik (2018, May 22). Demographic and economic trends in urban, suburban and rural communities. In *What Unites and Divides Urban, Suburban and Rural Communities*. Pew Research Center.
- Pattillo, M. (2005). Black middle-class neighborhoods. *Annual Review of Sociology* 31, 305–329. DOI 10.1146/annurev.soc.29.010202.095956.
- Polikoff, A. (2006). *Waiting for Gautreaux*. Northwestern University Press.
- Reardon, S. F., L. Fox, and J. Townsend (2015). Neighborhood income composition by household race and income, 1990–2009. *The Annals of the American Academy of Political and Social Science* 660(1), 78–97. DOI: 10.1177/0002716215576104.
- Rich, S., T. Mellnik, K. Kelly, and W. Lowery (2018). *Washington Post Criminal Homicide Dataset*. Washington, DC: The Washington Post. [Database] <https://www.washingtonpost.com/graphics/2018/investigations/unsolved-homicide-database/>.
- Ross, S. L. (2010). Understanding racial segregation: What is known about the effect of housing discrimination. In H. Newburger, E. Birch, and S. Waether (Eds.), *Neighborhood and Life Changes: How Place Matters in Modern America*, pp. 288–301. University of Pennsylvania Press. DOI: 10.9783/9780812200089.288.
- Ross, S. L. and J. Yinger (2002). *The Color of Credit: Mortgage Discrimination, Research Methodology, and Fair-Lending Enforcement*. MIT Press.
- Ruggles, S., S. Flood, R. Goeken, J. Grover, E. Meyer, J. Pacas, and M. Sobek (2018). *IPUMS USA: Version 8.0 [dataset]*. Minneapolis, MN: IPUMS. DOI: 10.18128/D010.V8.0.
- Schuetz, J. (2009). No renters in my suburban backyard: Land use regulation and rental housing. *Journal of Policy Analysis and Management* 28(2), 296–320.
- Schweitzer, M. E. (2017). Manufacturing employment losses and the economic performance of the Industrial Heartland. *FRB of Cleveland Working Paper* 17-12. DOI: 10.26509/frbc-wp-201712.
- Sethi, R. and R. Somanathan (2004). Inequality and segregation. *Journal of Political Economy* 112(6), 1296–1321.
- Sharkey, P. and M. Friedson (2019). The impact of the homicide decline on life expectancy of African American males. *Demography*, 1–19. Forthcoming.
- Shertzer, A. and R. P. Walsh (2019). Racial sorting and the emergence of segregation in American cities. *The Review of Economics and Statistics* 101(3), 415–427. DOI: 10.1162/rest_a_00786.

van der Klaauw, W., G. Kosar, and T. Ransom (2019). Understanding migration aversion using elicited counterfactual choice probabilities. *New York Fed Staff Report* 883. DOI: 10.2139/ssrn.3368408.

Vigdor, J. L. (2003). Residential segregation and preference misalignment. *Journal of Urban Economics* 54(3), 587 – 609. DOI: 10.1016/S0094-1190(03)00085-8.

Wilson, W. J. (1987). *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. University of Chicago.

Woldoff, R. A. and S. Ovadia (2009). Not getting their money's worth: African-American disadvantages in converting income, wealth, and education into residential quality. *Urban Affairs Review* 45(1), 66–91. DOI: 10.1177/1078087408328947.

Yinger, J. (1998). Evidence on discrimination in consumer markets. *The Journal of Economic Perspectives* 12(2), 23–40. DOI: 10.1257/jep.12.2.23.

Zabek, M. (2019). Local ties in spatial equilibrium. *FEDS Working Paper No. 2019-080*.

Appendix to

“What Explains Neighborhood Sorting by Income and Race?”

Dionissi Aliprantis Daniel Carroll Eric Young

A Measuring Neighborhood Quality

There are reasons to exercise caution when focusing on a single dimension to characterize neighborhood quality (Chetty et al. (2018)). Important neighborhood characteristics are not perfectly collinear, and this can generate surprising implications for sorting patterns. An important example is that black low-poverty neighborhoods in Moving to Opportunity (MTO) cities looked like white high-poverty neighborhoods in terms of characteristics such as educational attainment, unemployment, and the share of single-headed households (Aliprantis and Kollner (2015)).

With this consideration in mind, we now consider our measure of neighborhood quality. To begin, we note that each of the variables we use in our measure of neighborhood quality is motivated by Wilson (1987)’s original discussion of the mechanisms driving neighborhood effects. These mechanisms include the concentration of poverty generating social isolation (Chapter 2); the importance of educational attainment in the face of secular changes in the labor market (Chapter 2); the importance of black males’ labor market outcomes such as employment and participation in terms of role models and household formation (Chapters 2 and 3); and the importance of single-headed households in driving child poverty (Chapter 3). A more recent discussion of related mechanisms can be found in Chapter 8 of Galster (2019).

Figure 1 and Table 1 show that if we were to summarize the neighborhood variables poverty rate, high school graduation rate, BA attainment rate, employment-to-population ratio, unemployment rate, and share of single-headed households, a principal components analysis would indicate that these variables can be summarized by a univariate index. In other words, it appears reasonable to focus on the first principal component of these variables alone, and to define this univariate index as neighborhood quality. Table 2 shows that the coefficients on the variables are relatively similar.

Table 1: Percent of Variance Explained

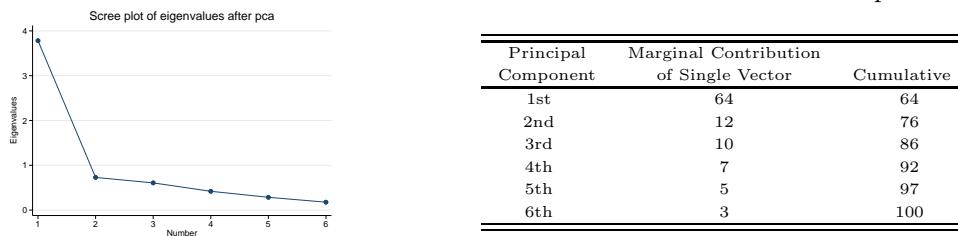


Figure 1: Scree Plot of Eigenvalues

Table 2: Coefficient for First Principal Component

Characteristic	Princ Comp	Characteristic	Princ Comp
Poverty Rate	0.45	Emp-to-Pop Ratio	0.35
HS Grad Rate	0.44	Unemp Rate	0.39
BA Attainment Rate	0.43	Share Single-Headed HHs	0.39

Note: See the text for further details.

It is important to be mindful that our measure of neighborhood quality will sometimes miss in its univariate summary of a multivariate world, as well as the fact that many criteria would define neighborhood quality in terms of additional neighborhood characteristics. Nevertheless, we find our univariate index to be a useful abstraction; it summarizes information in a way that allows us to conduct an analysis in terms of the types of neighborhood effects discussed in Wilson (1987).

Figure 2 uses the NHHGIS data to replicate the result from the literature that neighborhood quality is lower for blacks than whites at all levels of income (Pattillo (2005), Reardon et al. (2015)). Note that the gap is large enough so that high-income black households live in neighborhoods with characteristics similar to those of low-income white households. Whites in the first (poorest) quintile of household income live in neighborhoods of similar quality to those of blacks in the fourth quintile of household income.

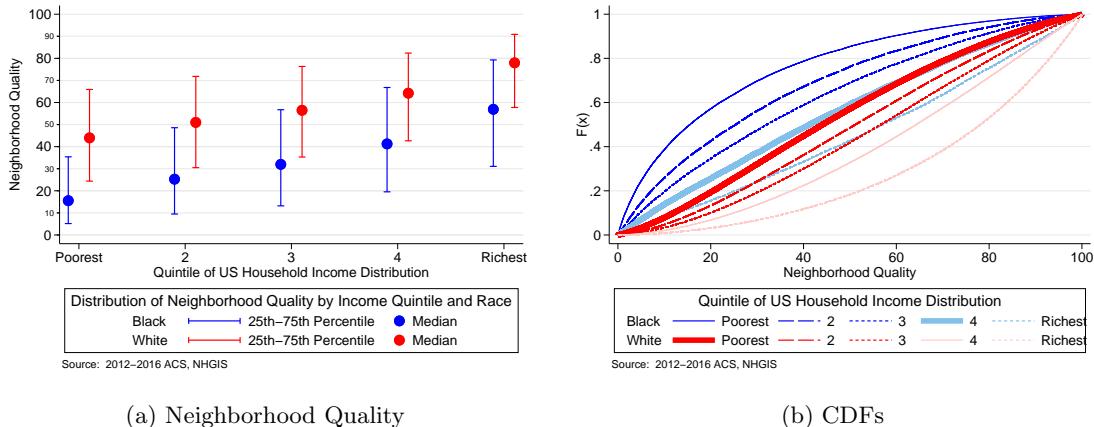
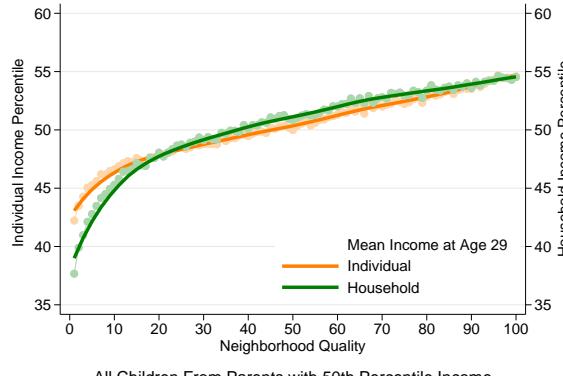


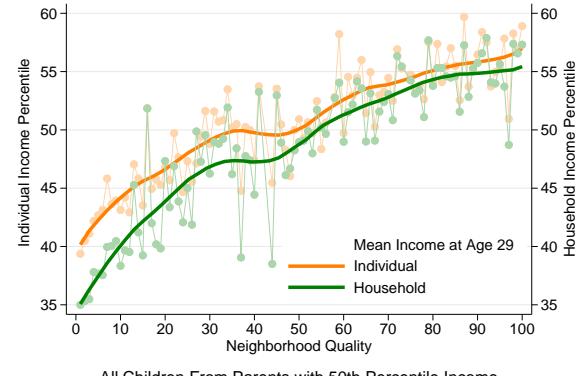
Figure 2: Household Income and Neighborhood Quality in the 2012-2016 ACS, by Race

Empirically, the components of our index are also the neighborhood characteristics found to be highly correlated with neighborhood opportunity as estimated in Chetty et al. (2018): the employment rate of the local residents, poverty rate, share of college graduates, and share of single-headed households. Here we compare neighborhood quality with a few measures of intergenerational outcomes from Chetty et al. (2018). Chetty et al. (2018) analyze data for children born between 1978 and 1983. In Census tracts with sufficient data, they provide publicly available estimates of mean outcomes for children of a specific race and gender given parents at several percentiles of the national household income distribution. These estimates represent the expectation of each outcome conditional on growing up from birth in a given tract, where each tract-level regression weights children by the fraction of their childhood (up to age 23) spent in that tract.

Figure 3 shows mean income estimates pooled across race/ethnicity and gender for children whose parents had incomes at the 50th percentile of the US distribution. Figure 4 shows mean income estimates for black boys whose parents had incomes at the 25th percentile of the US distribution. We see that the intergenerational income level in a neighborhood is positively correlated with neighborhood quality, although the relationship is different by subgroups and is noisier as the sample size for estimation declines.

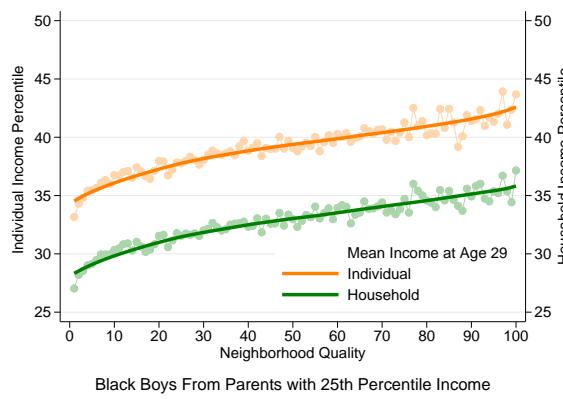


(a) United States

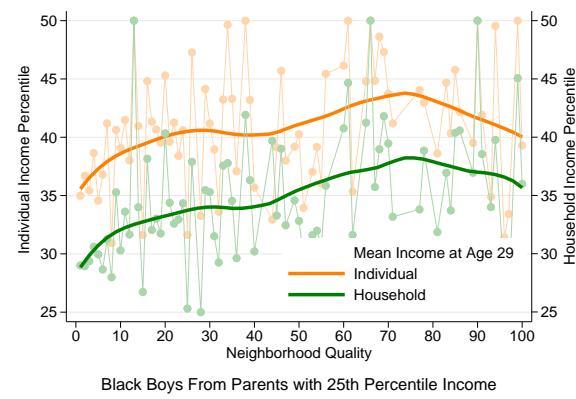


(b) Cleveland, OH

Figure 3: All Children with 50th Percentile Parents



(a) United States



(b) Cleveland, OH

Figure 4: Black Boys with 25th Percentile Parents

B Robustness: The 2015 Wave of the PSID

It might come as a surprise to find that wealth only weakly predicts neighborhood quality after conditioning on race and income. There are several reasons we might see such a result that are not related to the explanation that neighborhood sorting is driven by race and income.

For this reason we now consider the robustness of our result that sorting into neighborhood quality is not driven by wealth once income and race are taken into account. We first present evidence on whether our result is driven by family composition of our sample, assumptions about how to measure neighborhood quality, or the functional form assumptions made about the relationship between quality and family characteristics. We also look at issues related to measuring wealth.

B.1 Family Composition

One possibility is that black households in the 4th quintile of wealth are older, less likely to have children than their white counterparts, or less likely to be homeowners. We test this possibility by estimating versions of Equation 1 on our estimation sample that also include a quadratic in the age of the head of the household, a dummy for the presence of children 18 or younger, a dummy for homeownership, and each of these controls. These estimates are shown in Table 3, with there being two main findings. The first is that the coefficient on having a black head of household is stable, and the second is that the R^2 does not increase after including the additional controls. Both of these findings indicate that the main results in the text are not driven by compositional issues across race. The last column in Table 3 shows evidence from a similar regression investigating whether the higher income volatility of black families documented in the PSID in Darity et al. (2019) is driving our results. We find that the coefficient on having a black head of household is stable when measuring income and wealth as the average of 2011, 2013, and 2015 income and net worth.

Table 3: Neighborhood Quality Regressions

Black Head of Household	-21.8 (2.0)	-21.2 (2.0)	-21.0 (2.0)	-22.7 (2.1)	-21.5 (2.1)	-21.2 (4.7)
Child \leq 18 in Household		X			X	
Quadratic in Age of Head			X			X
Rent/Own Dummy				X	X	
'11+'13+'15 Avg I, NW						X
R^2	0.22	0.22	0.23	0.23	0.23	0.17

We run a similar set of regressions where the dependent variable is the percentage of black residents in the household's neighborhoods, where again we progressively add a quadratic in the age of the head of the household, a dummy for the presence of children 18 or younger, a dummy for homeownership, and each of these controls. These estimates are shown in Table 4, with there again being two main findings. The first is that the coefficient on having a black head of household

is stable, and the second is that the R^2 does not increase after adding more controls. Both of these findings indicate that the main results in the text are not driven by compositional issues across race.

Table 4: Racial Composition Regressions

Black Head of Household	41.5 (1.3)	41.5 (1.3)	41.2 (1.3)	41.1 (1.4)	41.0 (1.4)
Child \leq 18 in Household		X			X
Quadratic in Age of Head			X		X
Rent/Own Dummy				X	X
R^2	0.46	0.46	0.46	0.46	0.46

B.2 Measuring Neighborhood Quality

We also investigate whether one variable in our neighborhood quality index is by itself driving our results. Table 5 shows the coefficient on the black indicator when Equation 1 is estimated with Q_i measured as each individual component of our index.

No single variable drives our results on the relationship between neighborhood quality, race, income, and wealth. Most of the neighborhood characteristics yield results similar to the penalty of 22 percentile points in neighborhood quality for having a black family head. The coefficient on the black indicator is -20 percentile points or more for the poverty rate, unemployment, and the share of single-headed household; -16 percentile points for the employment-to-population ratio and the share of high school graduates; and smallest in magnitude for the BA attainment rate at -12 percentile points. These results are not surprising given the relatively even coefficients across characteristics under our definition of quality (Table 1 in Appendix A), and the relatively higher value given to the educational attainment of neighbors is consistent with the recent hedonic results in Bishop and Murphy (2019).

Table 5: Neighborhood Characteristic Regressions

Coefficient on Black Household Head for Percentile of	Coefficient	s.e.
Poverty Rate	-19.5	(2.1)
Share of Single-Headed HHs	-25.6	(2.1)
Unemployment Rate	-23.0	(2.2)
Employment-to-Population Ratio	-15.8	(2.3)
HS Attainment Rate	-16.0	(2.1)
BA Attainment Rate	-11.9	(2.2)

B.3 Functional Form Assumptions

Another possibility is that black families with high wealth actually do sort into higher-quality neighborhoods than those without wealth, but that this relationship is blurred by the limited number of high-income and high-wealth black families we observe in the data. As highlighted in Barsky et al. (2002), this could mean that our results are being driven by functional form assumptions over the parts of the income and wealth distribution where there is not common support between black and white households.

Figure 5 presents evidence on this issue by showing means within \$10,000 income bins by race and wealth quintile. Figure 5b shows the area of concern for having a limited sample size, high-income and high-wealth black families. Each \$10,000 income bin with a dot shown has at least 15 families to prevent indirect data disclosure. When the cell size is decreased to 10 families, which is not shown here, we see that the variance of neighborhood quality for high-income, high-wealth black families is higher than it is for their white counterparts. However, the relationship characterized by the curve in Figure 5b accurately characterizes the mean relationship. Most importantly, there remains a clear gap between means across black- and white-headed families that are high income and high wealth.

Related analyses using the propensity score to relax functional form assumptions imposed by OLS regression (Imbens (2015)), both to impose common support (Heckman et al. (1998)) and to conduct nearest neighbor matching, produce similar results.

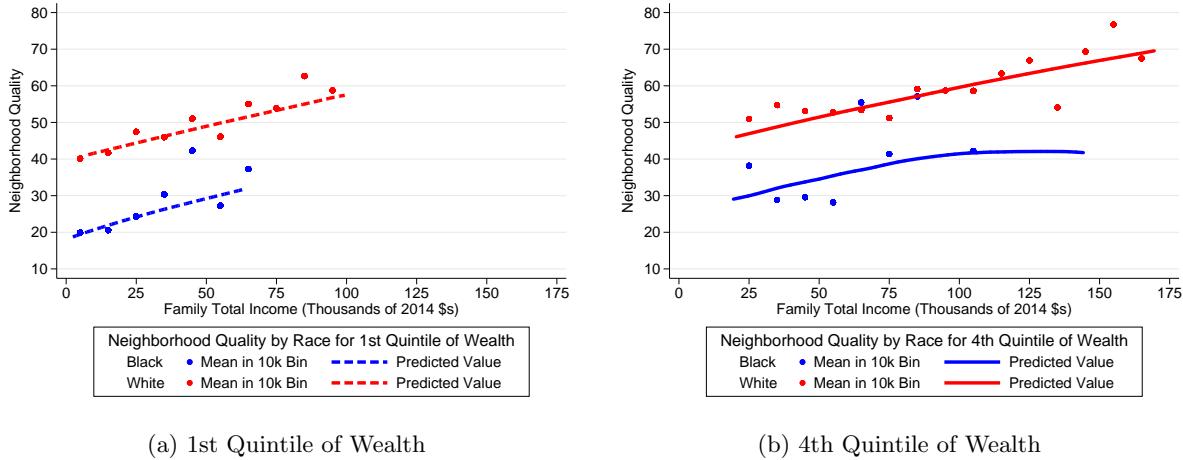


Figure 5: Neighborhood Quality by Income and Race, 2015 PSID

B.4 Measuring Wealth

Turning to the issue of measuring wealth, net worth might be less informative for a family's credit constraints than either total assets or liquid wealth. Two households with identical net worth but different levels of total assets, and therefore debt, might have different access to credit, just based on past access. Similarly, two households with identical net worth but different levels

of liquid wealth have different needs for credit. We measure total assets as net worth plus total debt, and we measure liquid wealth as the sum of two asset classes; checking/savings accounts and stocks. We do not show the results here, but the qualitative results are almost identical regardless of whether we measure wealth as net worth, total assets, or liquid wealth.

It could also be the case that families within quintiles of wealth are too heterogeneous to be compared, especially across race. Figure 6a shows the distribution of wealth across race in the 4th quintile of wealth, which we use as our high-wealth category. The means for black and white families are, respectively, \$155,000 and \$180,000.

One might also suspect that high-wealth households of different races make different investments in home equity, and that this is somehow driving neighborhood sorting patterns. Figure 6 shows that the distribution of home equity is very similar for black- and white-headed families in the 4th wealth quintile. Homeownership rates are very high among the 4th wealth quintile, and the rates are (statistically) identical by race.

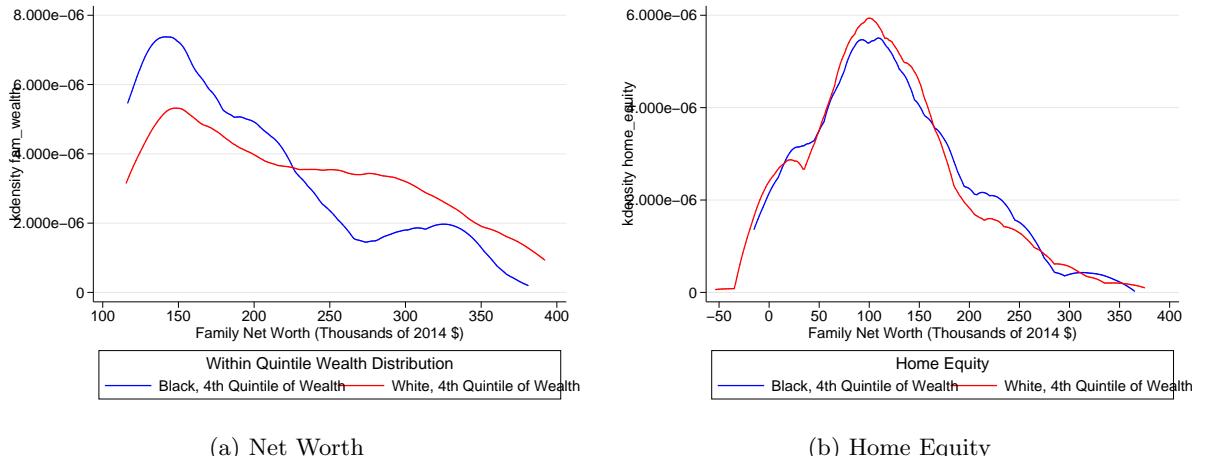


Figure 6: Net Worth and Home Equity by Income and Race, 2015 PSID

C Robustness: The 1989 Wave of the PSID

In order to test whether our result reflects a new trend in sorting due to the Great Recession, we replicate the previous analysis using the 1990 decennial Census together with the 1989 wave of the PSID. We find almost identical results to those using the 2012-2016 ACS and 2015 wave of the PSID: In the 1989 wave of the PSID wealth had little role in sorting into neighborhood quality once race and income are accounted for.

Table 6 shows results from estimating Equation 1 using the 1990 decennial Census and the 1989 wave of the PSID, where the estimation sample is all families in the 1989 PSID with a black or non-Hispanic white head. To impose common support, the sample is restricted to families with incomes between the 10th and 90th percentiles of the within-wealth-quintile black income distribution. The coefficient on black head of household is -25 , which indicates that black families live in neighborhoods that are, on average, 25 percentile points worse than those of white families. Figure 7 displays these results graphically.

Table 6: Neighborhood Quality Regression, 1989 PSID

All Households			
Constant	39.9 (0.9)	Black Head of Household	-25.1 (2.1)
Family Income	$5.1\text{e-}4$ ($6.1\text{e-}5$)	Black \times Family Income	$-1.6\text{e-}4$ ($1.5\text{e-}4$)
Family Income ²	$-1.5\text{e-}9$ ($6.8\text{e-}10$)	Black \times Family Income ²	$2.2\text{e-}9$ ($2.4\text{e-}9$)
Family Wealth	$3.7\text{e-}5$ ($5.2\text{e-}6$)	Black \times Family Wealth	$3.3\text{e-}5$ ($1.9\text{e-}5$)
Family Wealth ²	$-5.8\text{e-}12$ ($9.8\text{e-}13$)	Black \times Family Wealth ²	$-5.3\text{e-}12$ ($4.0\text{e-}12$)
		Family Income \times Family Wealth	$-2.7\text{e-}10$ ($6.9\text{e-}11$)
R^2	0.29	N	4,400-4,500

Tables 7 and 8 again investigate whether differences in family composition or homeownership can explain the main results in the 1989 PSID. We again find that the coefficient on black head of household is stable and that explanatory power does not increase when adding these covariates.

Table 9 shows the coefficient on the black indicator when Equation 1 is estimated with Q_i measured as each individual component of our index. Again for the 1989 wave, just as we saw in the 2015 wave of the PSID, no single variable drives our results on the relationship between neighborhood quality, race, income, and wealth. Most of the neighborhood characteristics yield results similar to the penalty of 25 percentile points in neighborhood quality for having a black family head.

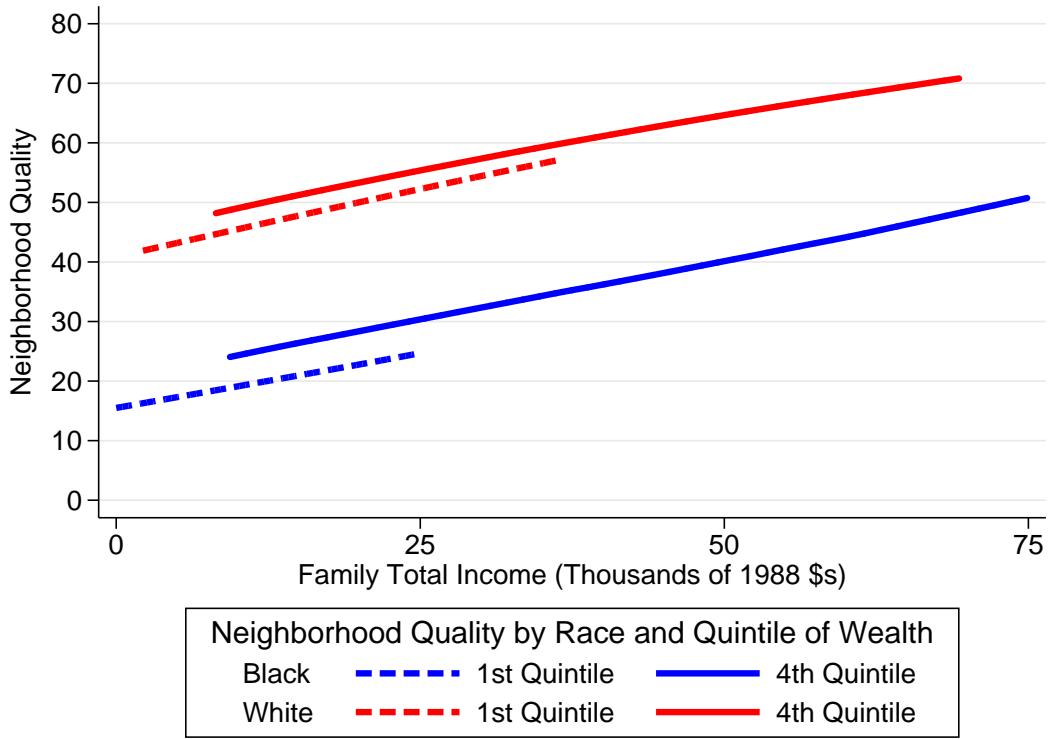


Figure 7: Neighborhood Quality by Income, Race, and Wealth, 1989 PSID

Table 7: Neighborhood Quality Regressions, 1989 PSID

Black Head of Household	-25.1 (2.1)	-22.5 (2.1)	-26.0 (2.1)	-24.9 (2.2)	-23.0 (2.2)
Child \leq 18 in Household		X			X
Quadratic in Age of Head			X		X
Rent/Own Dummy				X	X
R^2	0.29	0.29	0.29	0.29	0.31

Table 8: Racial Composition Regressions, 1989 PSID

Black Head of Household	56.5 (1.3)	56.7 (1.4)	56.8 (1.4)	56.4 (1.4)	57.0 (1.4)
Child \leq 18 in Household		X			X
Quadratic in Age of Head			X		X
Rent/Own Dummy				X	X
R^2	0.61	0.61	0.61	0.61	0.61

Table 9: Neighborhood Characteristic Regressions,
1989 PSID

Coefficient on Black Household Head for Percentile of	Coefficient	s.e.
Poverty Rate	-24.4	(2.1)
Share of Single-Headed HHs	-25.4	(2.1)
Unemployment Rate	-27.8	(2.1)
Employment-to-Population Ratio	-22.7	(2.2)
HS Attainment Rate	-22.5	(2.1)
BA Attainment Rate	-16.4	(2.2)

Turning to the possibility that the relationship between race, income, wealth, and neighborhood quality is blurred by the limited number of high-income and high-wealth black families we observe in the data, Figure 8 shows means within \$10,000 income bins by race and wealth quintile. Figure 8b shows the area of concern for having a limited sample size, high-income and high-wealth black families. Each \$10,000 income bin with a dot shown has at least 15 families to prevent indirect data disclosure. When the cell size is decreased to 10 families, which is not shown here, we see that the variance of neighborhood quality for high-income, high-wealth black families is higher than it is for their white counterparts. However, the relationship characterized by the curve in Figure 8b accurately characterizes the mean relationship.

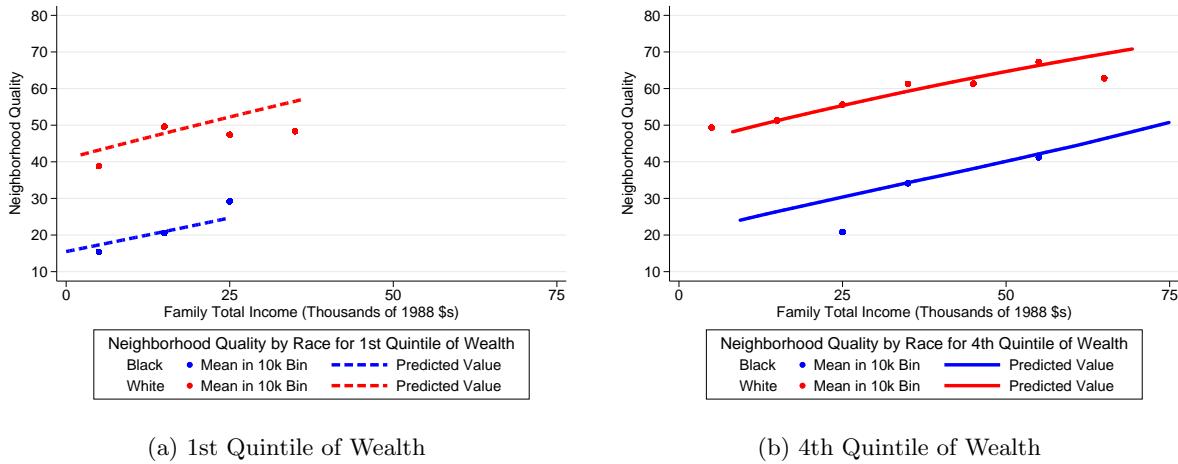


Figure 8: Neighborhood Quality by Race, Income, and Wealth, 1989 PSID

Figure 9a shows again that within wealth quintile differences in wealth across race are unlikely to drive our results. Homeownership rates are very high among the 4th wealth quintile and (statistically) identical across race. Figure 9b shows that in the 1989 wave of the PSID, just as in the 2015 wave, home equity was very similar across race in the 4th quintile of wealth.

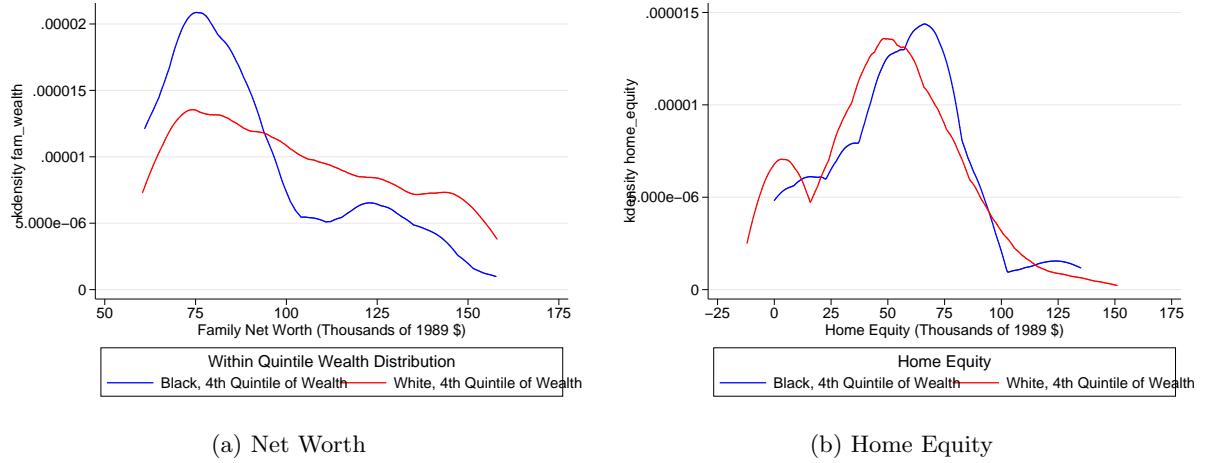


Figure 9: Net Worth and Home Equity by Race, Income, and Wealth, 1989 PSID

D Additional Evidence on Racial Preferences

D.1 The National Longitudinal Survey of Youth 1997 (NLSY97)

We present further evidence that conditional on income and wealth, blacks and whites have different locational preferences. We look first at data from the National Longitudinal Survey of Youth 1997 (NLSY97), a nationally representative longitudinal survey of individuals born between 1980 and 1984. Figure 10a shows that at age 25 in the NLSY97, black respondents were more likely than their white counterparts to live within five miles of their mothers. Figure 10b shows that this fact is not driven by financial constraints, as it remains true conditional on both income and wealth.

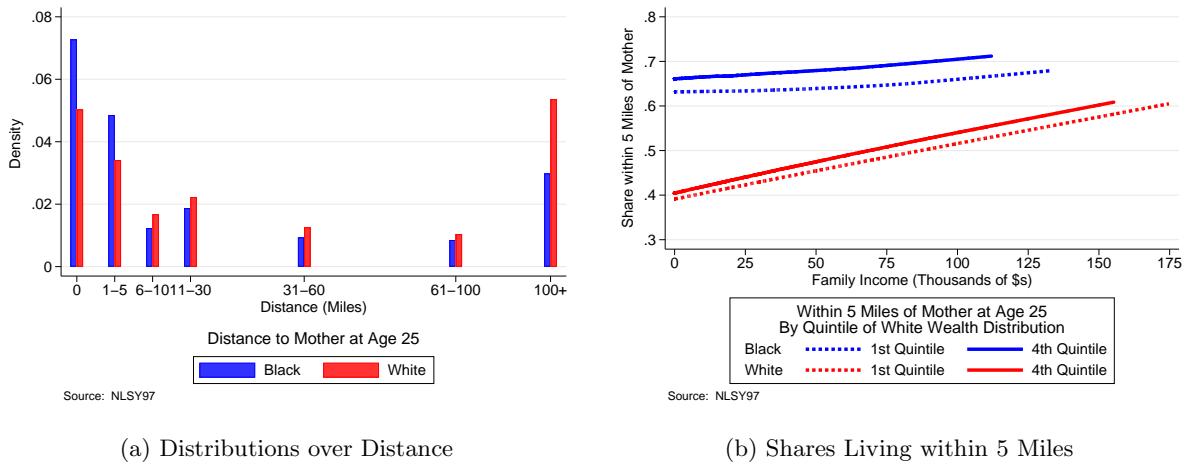


Figure 10: Distance to Mother at Age 25, NLSY97

D.2 2012-2016 American Community Survey (ACS)

We next look at anonymized individual-level data from the 2012-2016 wave of the ACS drawn from IPUMS-USA. Figure 11 shows that black individuals “pay” for the locational preference, including that of being near their mothers, by spending more time traveling to work, even conditional on income. This result provides suggestive evidence that high-income households’ neighborhood sorting is not driven by access to employment (Ellen et al. (2013)). The estimates in Figure 11 are precise, even for high-income African Americans, since the IPUMS ACS sample has more than 15 million individuals.

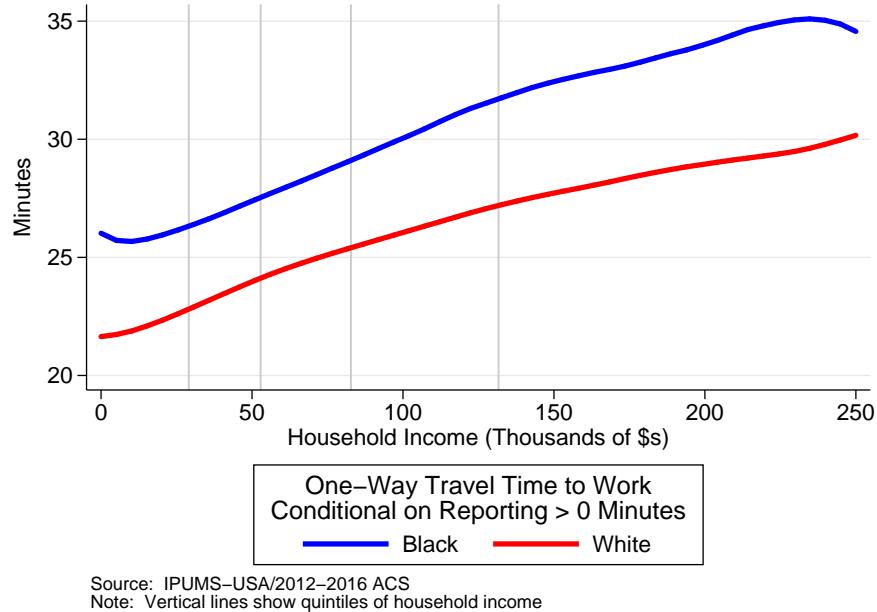


Figure 11: One-Way Travel Time to Work, 2012-2016 ACS

Digging into the cross section of travel to work times in Figure 11, Figure 12a shows the empirical CDFs of travel to work times for black and white households within \$2,500 of the income separating 3rd and 4th quintile households, \$78,000. To more clearly show where differences in black and white distributions occur, Figure 12b shows differences between the white and black CDFs in \$5,000 bins centered at each of the incomes separating quintiles. This figure shows, for a given income, a value on the y -axis indicating the additional share of black households with a longer travel time than the time on the x -axis.

The qualitative patterns in Figure 12b are similar across income levels. The big increases around 5 and 10 minutes, combined with the drop-off at 30 minutes, indicate that many more African Americans than white Americans have travel times of 30 minutes rather than 5 or 10 minutes. We might interpret the drop-offs at 45 and 60 minutes similarly; many more African Americans have commutes of 45 or 60 minutes rather than 30 minutes.

The levels in Figure 12b, however, are clearly differences across income levels. The largest differences in travel time are seen for the highest income households. The highest income households are also clear exceptions between 30-60 minutes, with larger differences in CDFs than for any other income level. There is also variation in differences between 0-30 minutes that is not monotonic in income. Figure 13 shows more detail on precisely how differences in travel time are increasing in income.

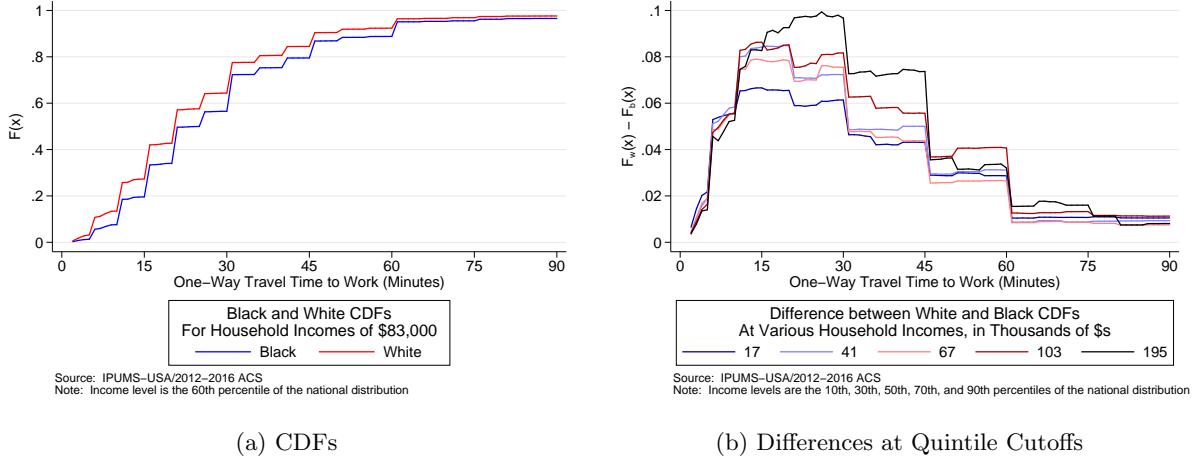


Figure 12: Census Data

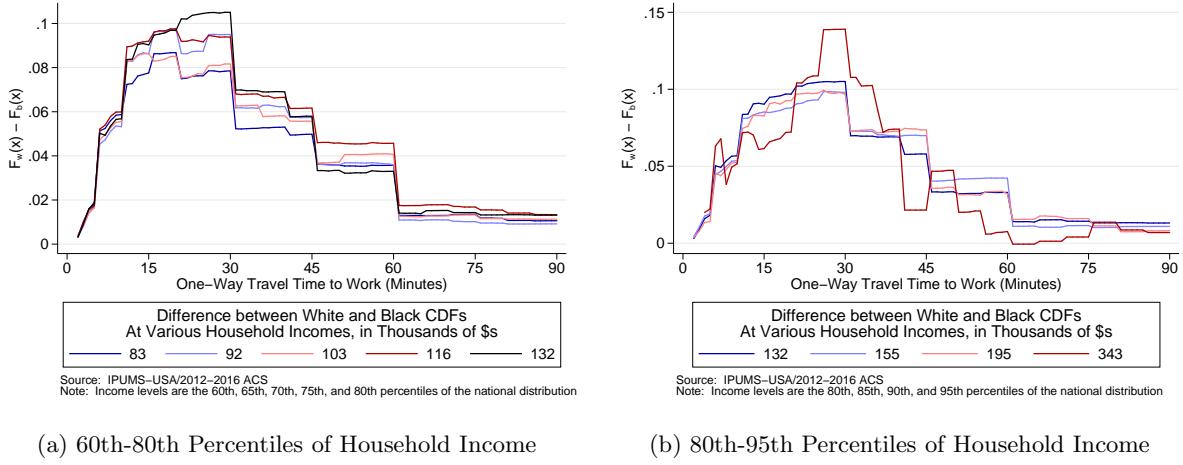
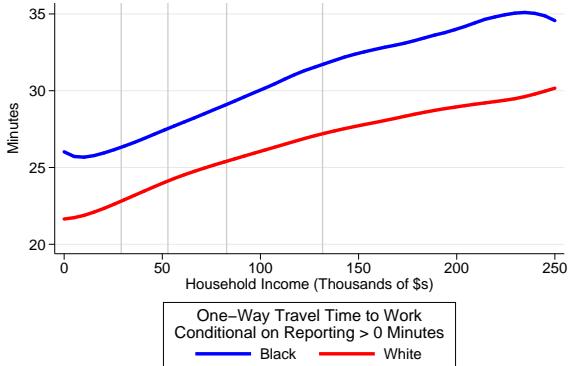


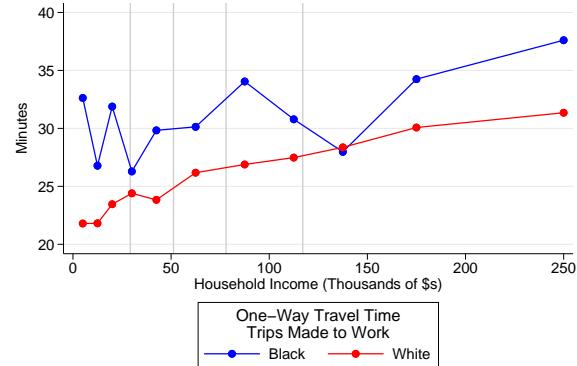
Figure 13: Census Data

D.3 2017 National Household Travel Survey (NHTS)

Finally, we look at data from the 2017 National Household Travel Survey (NHTS). The evidence from the NHTS is noisier than either the NLSY97 or the IPUMS 2012-2016 ACS, and this is one reason for the difficulty of using these data to test for the relationship between neighborhood sorting and social isolation (Wang et al. (2018)) or consumption segregation (Davis et al. (2019)). We first compare results from the 2017 NHTS with the IPUMS Census data in Figure 14, and find that the NHTS is noisier but qualitatively similar. Figures 15a - 16b show that black and white respondents in the NHTS tend to spend similar amounts of time on trips made for doing household chores, picking up meals, buying goods or services, and picking someone up. This is especially true within the first 4 quintiles of income. One notable exception is that black respondents in the fifth quintile of income tend to spend much more time on trips picking someone up.

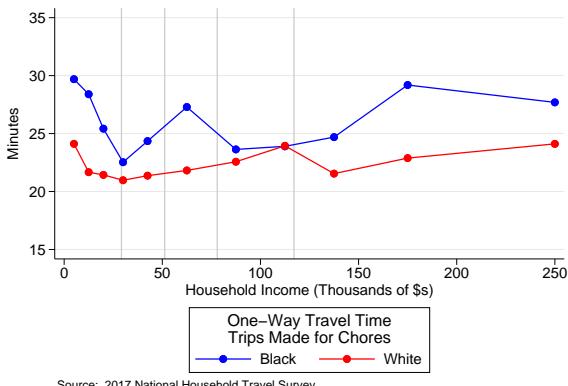


(a) IPUMS/ACS 2012-2016

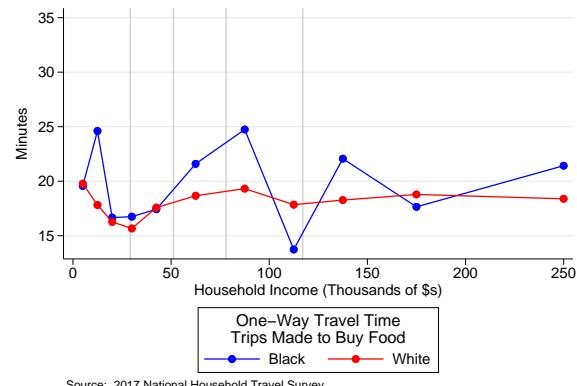


(b) NHTS

Figure 14: Travel Times to Work

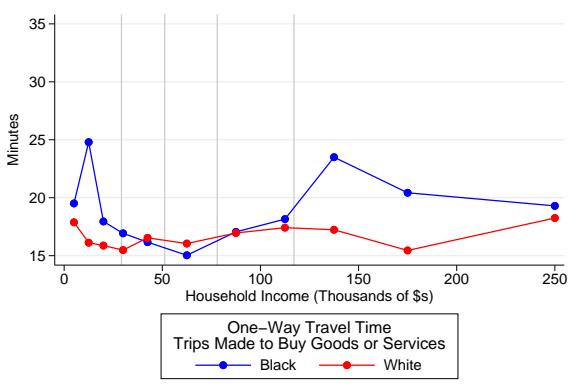


(a) Trips Made for Chores

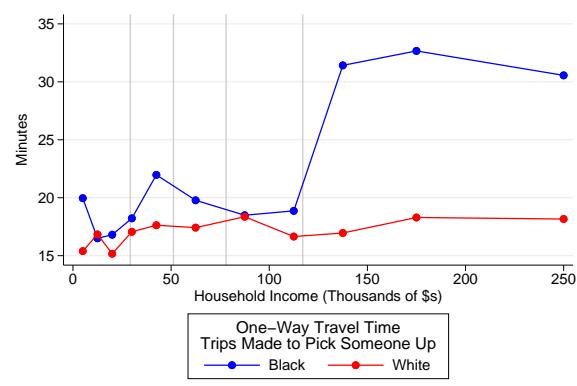


(b) Trips Made to Buy Food

Figure 15: Travel Times in the 2017 NHTS



(a) Trips Made to Buy Goods or Services



(b) Trips Made to Pick Someone Up

Figure 16: Travel Times in the 2017 NHTS

E Neighborhood Quality and the Price of Housing

Figures 17 and 18 confirm the result noted in Section 3: Black and white households are distributed across metros where the relationship between neighborhood-level housing prices and quality is similar. This result does not depend on whether we measure price using the median three-bedroom rent in a neighborhood or using the median house value in the neighborhood. Moreover, if we run a metro-level regression of neighborhood housing price on neighborhood quality, we find that this result is true both for the slope of the regression coefficients (Figures 17b and 18b) and for the R^2 of the regression (Figures 17c and 18c).

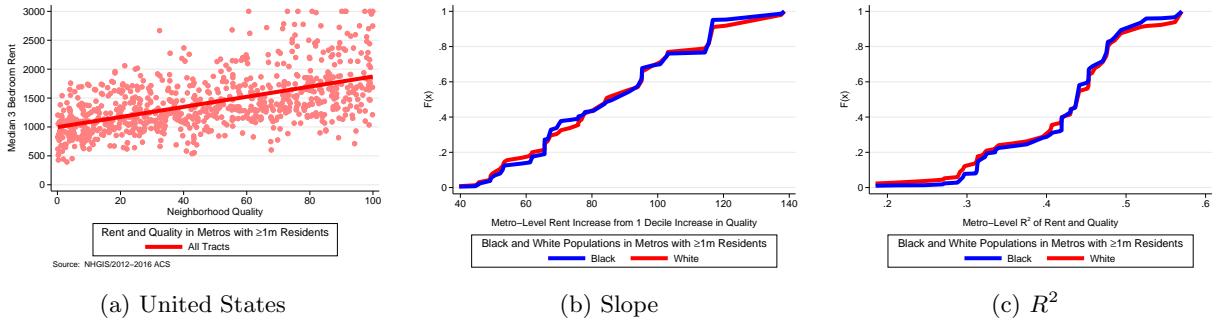


Figure 17: Neighborhood Quality and Median 3-Bedroom Rent

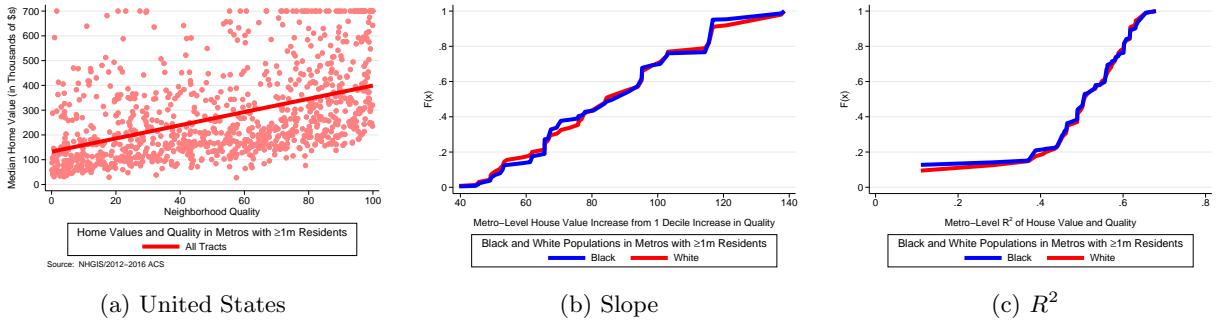


Figure 18: Neighborhood Quality and Median House Value

Figures 17a and 18a display a random sample of 1,000 tracts from the 53 MSAs with populations of at least 1 million in the 2012-2016 ACS. Because the subject of our interest here is understanding the variation across metros in the relationship between price and quality, Figures 19-22 plot the data on housing prices and neighborhood quality for several metros.

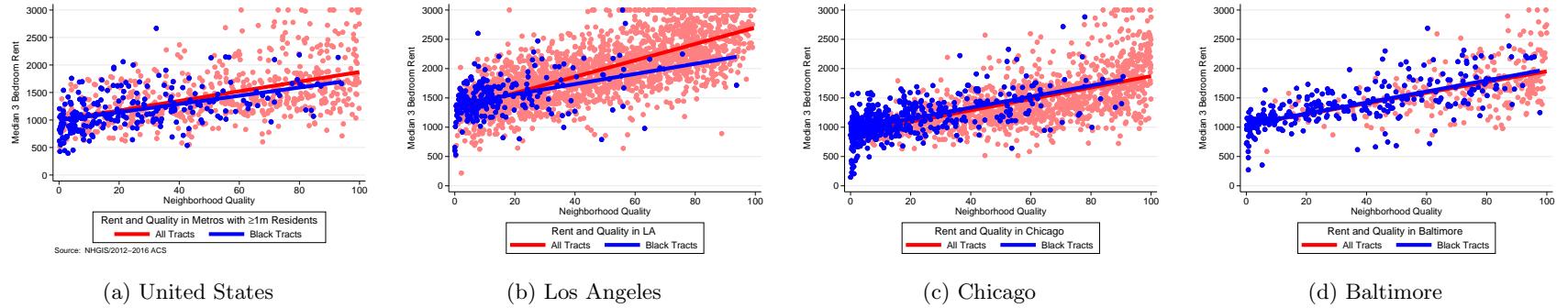


Figure 19: Median 3 Bedroom Rent

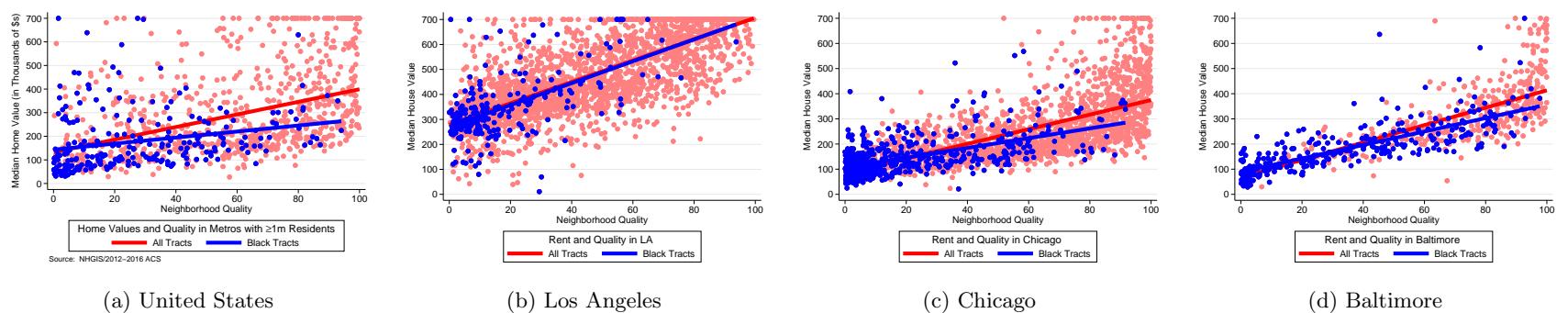


Figure 20: Median House Value

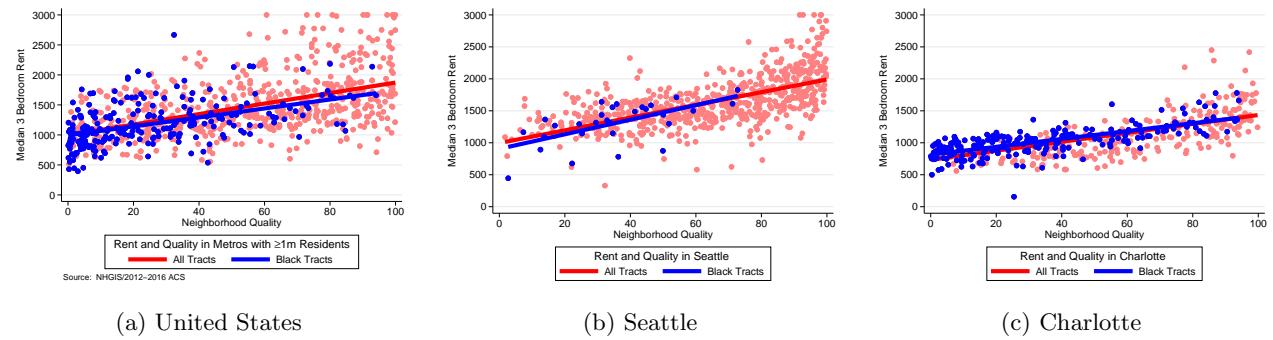


Figure 21: Median 3 Bedroom Rent

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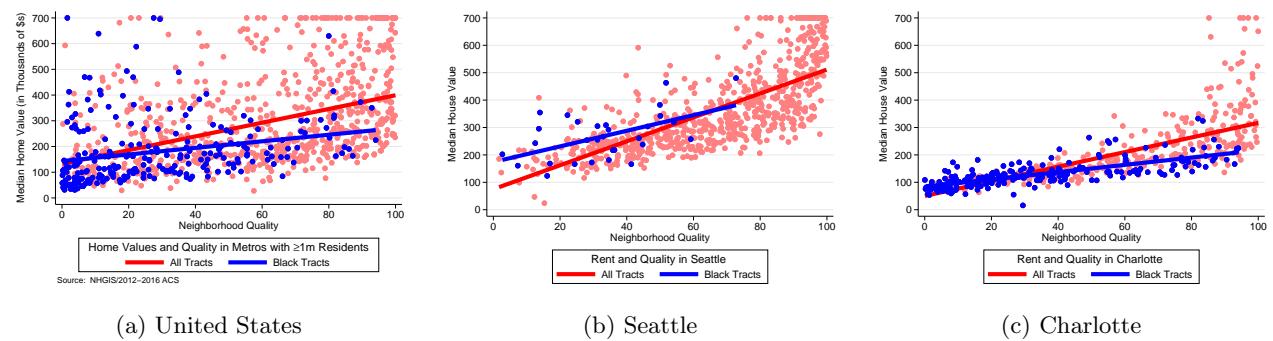
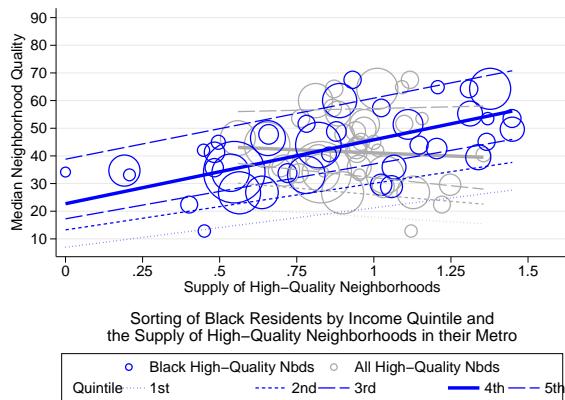
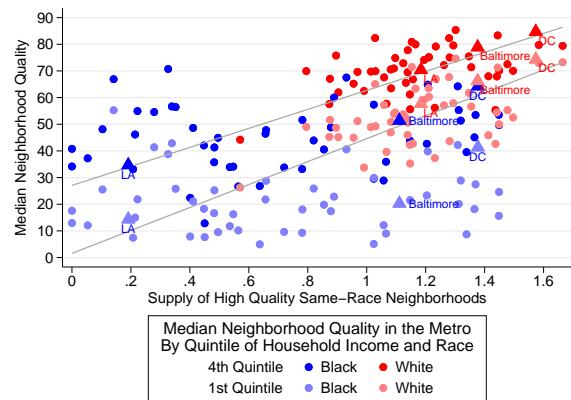


Figure 22: Median House Value

F Additional Figures



(a) Sorting by Supply, All Income Quintiles



(b) Sorting by Supply, Black and White

Figure 23: Sorting by the Supply of High Quality Neighborhoods

Appendix References

- Aliprantis, D. and D. Kollner (2015). Neighborhood poverty and quality in the Moving to Opportunity experiment. *Federal Reserve Bank of Cleveland Economic Commentary*.
- Barsky, R., J. Bound, K. K. Charles, and J. P. Lupton (2002). Accounting for the black-white wealth gap. *Journal of the American Statistical Association* 97(459), 663–673. DOI: 10.1198/016214502388618401.
- Bishop, K. and A. Murphy (2019). Incorporating dynamic behavior into the hedonic model. *Mimeo.*, *Arizona State University*.
- Chetty, R., J. N. Friedman, N. Hendren, M. R. Jones, and S. R. Porter (2018). The Opportunity Atlas: Mapping the childhood roots of social mobility. *Mimeo.*, *Opportunity Insights*. DOI: 10.3386/w25147.
- Chetty, R., N. Hendren, M. R. Jones, and S. R. Porter (2018). Race and economic opportunity in the United States: An intergenerational perspective. *NBER WP 24441*. DOI: 10.3386/w24441.
- Darity, William A., J., D. Hamilton, B. Hardy, and J. Morduch (2019). Reinforcing inequalities: Income volatility and its overlap with wealth, income, race, and ethnicity. *Mimeo.*, *American University*.
- Davis, D. R., J. I. Dingel, J. Monras, and E. Morales (2019). How segregated is urban consumption? *Journal of Political Economy*. Forthcoming.
- Ellen, I. G., K. M. Horn, and K. M. O'Regan (2013). Why do higher-income households choose low-income neighbourhoods? Pioneering or thrift? *Urban Studies* 50(12), 2478–2495.
- Galster, G. C. (2019). *Making Our Neighborhoods, Making Ourselves*. Chicago: University of Chicago Press. DOI: 10.7208/chicago/9780226599991.001.0001.
- Heckman, J., H. Ichimura, J. Smith, and P. Todd (1998). Characterizing selection bias using experimental data. *Econometrica* 66(5), 1017–1098.
- Imbens, G. W. (2015). Matching methods in practice: Three examples. *Journal of Human Resources* 50(2), 373–419.
- Pattillo, M. (2005). Black middle-class neighborhoods. *Annual Review of Sociology* 31, 305–329. DOI 10.1146/annurev.soc.29.010202.095956.
- Reardon, S. F., L. Fox, and J. Townsend (2015). Neighborhood income composition by household race and income, 1990–2009. *The Annals of the American Academy of Political and Social Science* 660(1), 78–97. DOI: 10.1177/0002716215576104.

Wang, Q., N. E. Phillips, M. L. Small, and R. J. Sampson (2018). Urban mobility and neighborhood isolation in America's 50 largest cities. *Proceedings of the National Academy of Sciences* 115(30), 7735–7740.

Wilson, W. J. (1987). *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. University of Chicago.