

Introduction

Throughout the United States' history, various tactics and methods have been employed in order to perpetuate and preserve white privilege and power over black and brown populations. One of the most persistent ways the racial wealth gap has been maintained in the U.S. has been through differences in home ownership between black and white people. We want to understand the extent of role the U.S. federal government had in expanding this discrepancy.

Following the Great Depression, the U.S. government instituted the Home Owners' Loan Corporation (HOLC) and the Federal Housing Administration (FHA) to counter the depression's effects on the housing markets. The HOLC Drafted a series of maps to help inform their work that categorized neighborhoods in metropolitan areas in the US according to mortgage risk (D: worst to A: best). Our geocoded addresses and maps can be seen in Figure 5. These maps were then used by banks to assess the risk of giving individuals from these neighborhoods loans.

The leading academic hypothesis is that black neighborhoods were categorized as hazardous not by any objective economic measure of risk, but rather by racial discrimination, directly implicating the US government in the perpetuation of housing and wealth inequality between black and white people. A recent paper by Fishback et al. (2020), however, has challenged this hypothesis linking 1940 census to 9 HOLC maps of northern US cities. The paper argues the side that black neighborhoods were endogenously worse-off than white neighborhoods as a result of racial discrimination, but that further discrimination was not a significant determinant of redlined borders.

The results of this study are intended to investigate this claim in southern cities, which would not be statistically similar to the northern cities examined in the Fishback paper.

Objectives

1. Develop a process for and geocode addresses in North Carolina cities, namely Durham, NC
2. Use econometric techniques to understand the role race played in the creation of the HOLC maps by investigating the characteristics of redlined neighborhoods in Durham, NC

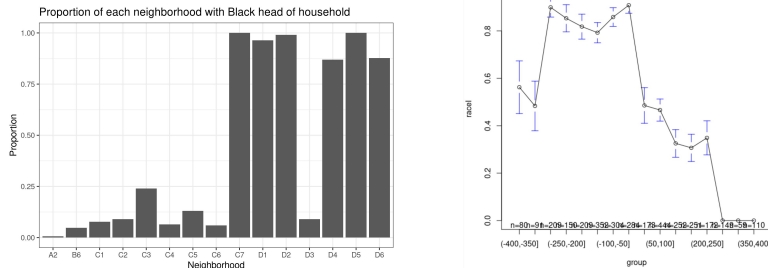


Figure 2: Proportion of Black Heads of Household by distance from border

Methods

Data Construction

- Construct census-parseable addresses from full-count 1940 census data.
- Use a crosswalk of 1940 to 2010 addresses in Durham, NC to convert 1940 address to current geocodable addresses.
- Use the census geocoder to retrieve latitude and longitude data for each household
- Intersect households with digitized HOLC maps to find HOLC grade of each home

Empirical Specification

$$raceI_i = \beta_1 lgi_i + \beta_2 mindist_i + \beta_3 lgi_i * mindist_i + \gamma \bar{Z}_i + \mu_i + \epsilon_i$$

$$\ln\left(\frac{P(lgi_i=1|X)}{P(lgi_i=0|X)}\right) = \beta_0 + \beta_1 raceI_i + \gamma \bar{Z}_i + \mu_i + \epsilon_i$$

We run two main regressions in our empirical estimation. *RaceI* is an indicator variable for if a household is black. *Lgi* is an indicator if a household is on the lower-grade side of a boundary. *Mindist* is the distance a household is from a border. *Z* is a vector of controls including age, education, labor force participation, home ownership, and income. These are the economic variables that *should* be the ones determining border drawing if there was no further discrimination based on race. Finally, μ is a specific-border fixed effect, and ϵ is error.

The first regression is a regression by discontinuity design. The idea is to examine homes close to the C-D boundaries, as one might imagine homes close to one another share similar economic characteristics. The sharp drop-off in race as seen in Figure 2 indicates that racial bias may have been at play in determining border lines. For this study, we examine homes within 100m of the border.

The second regression is a logistic regression meant to estimate the effect of being black on being placed on the lower grade side of a border.

Results

- A. RDD shows that being treated by the lower-grade boundary was highly statistically significant (t-score = 6.135) in predicting if a household is black, controlling for other economic variables (R-squared = .71)

	Estimate	Std. Error	t value	Pr(> t)
lgi	2.667e-01	4.347e-02	6.135	1.27e-09 ***
mindist	8.569e-04	5.243e-04	1.634	0.10254
occscore	-6.838e-03	1.302e-03	-5.251	1.88e-07 ***
age	1.484e-04	8.201e-04	0.181	0.85648
educ	9.115e-05	4.356e-04	0.209	0.83431
labforceI	-3.181e-02	8.528e-02	-0.373	0.70919
ownrshpI	1.143e-02	2.227e-02	0.513	0.60784
incwage	-1.251e-04	1.679e-05	-7.449	2.17e-13 ***
lgi:mindist	-2.049e-03	7.345e-04	-2.790	0.00539 **

Figure 3: RDD Results

- B. Logit shows a black household is 6.7 times more likely to be rated on the lower-grade side of a boundary than a white household with the same economic characteristics (z-score = 18.078)

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.1258874	0.5682553	3.741	0.000183 ***
raceI	1.9011908	0.1051641	18.078	< 2e-16 ***
occscore	-0.0205229	0.0080175	-2.560	0.010474 *
educ	-0.0236855	0.0024842	-9.534	< 2e-16 ***
labforceI	-1.0550197	0.4870291	-2.166	0.030293 *
age	-0.0110377	0.0045458	-2.428	0.015177 *
ownrshpI	-0.5468386	0.1243002	-4.399	1.09e-05 ***
incwage	-0.0003310	0.0001044	-3.171	0.001517 **

Figure 4: Logit Results

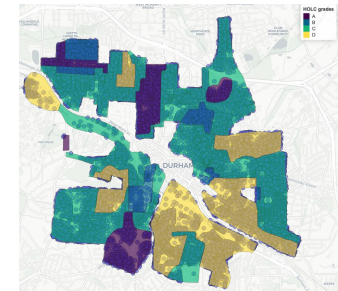


Figure 5: Geocoded households and neighborhoods

Conclusion

While the analysis is still far from complete, it does strongly suggest that racial bias was exogenously at play in drawing HOLC neighborhoods in Durham. There is strong statistically significant evidence from the natural experiment of homes being cut-off at boundaries that shows the outcome of race was determined by being placed on the lower grade side of a boundary. The more interpretable logistic model also shows that race was for more significant in magnitude and z-score of a predictor of being placed on the lower grade side of a boundary despite otherwise equal economic characteristics. This, of course, seems to contradict the hypothesis that race was not present as an exogenous factor in determining risk zones.

Of course, much further analysis needs to be conducted to draw a causal statement. First, the analysis should be expanded to other cities in NC and the South. Additionally, there should be a comparison of other outcomes with the RDD framework to see if race had a steeper cut-off. Within RDD, the selection of a more optimal bandwidth would assist with the analysis, as 100m is not the Imbens * Kalyanaraman optimal bandwidth.

There are also some important issues to try and solve in the future. Although we've shown it's likely race was a factor in drawing HOLC zones, there still exists endogeneity in that previous racial discrimination decreased economic outcomes of black households. It would be useful in the future to see if we could find a valid instrument to remove the endogeneity of prior racial bias in economic outcomes of households. This is related to the fact that there is likely some small multicollinearity between our covariates, and we could conduct tests to select and keep the most important covariates.

Finally, Durham has a unique racial history that influences our empirical strategy. One can see in Figure 1 that neighborhood C7 had a significantly higher proportion of black heads of household. This is because this neighborhood is where black NCCU professors and businessmen tended to reside, so they were typically *overqualified* for a C-rating, but were still given one anyway since they were black. In terms of our regressions, this actually would cause us to *underestimate* the impact of racial bias in our analysis, so this context should be included in further analysis.

References & Acknowledgements

1. Omer Ali is a Ph.D. post-doctoral fellow at the Samuel DuBois Cook Center on Social Equity
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3. Robert K. Nelson, LaDale Winling, Richard Marciano, Nathan Connolly, et al., "Mapping Inequality," American Panorama, ed. Robert K. Nelson and Edward L. Ayers, accessed October 5, 2021, [https://dsl.richmond.edu/panorama/redlining/\[YOUR VIEW\]](https://dsl.richmond.edu/panorama/redlining/[YOUR VIEW]).