The Long-Run Implications of Slum Clearance: A Neighborhood Analysis

Jessica LaVoice*

January 2022

Abstract

This paper analyzes the federal urban renewal and slum clearance program. This program was one of the largest and most controversial policies used to rehabilitate neighborhoods in the United States. Using a newly constructed dataset, I examine the characteristics of neighborhoods cleared for redevelopment and the effect that such projects had on neighborhoods over time. I show that conditional on experiencing urban blight, black neighborhoods were twice as likely as white neighborhoods to be targeted for clearance. Redevelopment led to a decline in housing density, population density, and the share of black residents while simultaneously increasing median rents and incomes.

Keywords: Urban Renewal, Slum Clearance, Housing Act of 1949
JEL Codes: I38, N32, N92, R23, R38, R58

*I am extremely grateful to Allison Shertzer and Randall Walsh for their continued guidance and support throughout this project. I also thank Jason Cook, Maggie Jones, and Brian Kovak for helpful comments and suggestions, as well as participants at the applied microeconomics brown bag at the University of Pittsburgh, the NBER Development of the American Economy poster session, University of Michigan's H2D2 Conference, and the AERUS Midwest Graduate Student Summit. Financial support for this project has been generously provided by the Economic History Association's Exploratory Travel and Data Grant. This research was also supported in part by the University of Pittsburgh Center for Research Computing through the resources provided. All errors are my own. Department of Economics, Bowdoin College, Brunswick, ME 04011. jlavoice@bowdoin.edu.

1 Introduction

One of the largest and most controversial location-based economic development policies used to rehabilitate neighborhoods in the United States was the federal urban renewal and slum clearance program, enacted by Title I of the Housing Act of 1949. This program subsidized the clearance of blighted urban areas. The vacant lots were subsequently sold to private developers for redevelopment. The program's stated objectives were to eliminate substandard and inadequate housing and realize the goal of a decent home and suitable living environment for every American family. This program became increasingly controversial as many black neighborhoods were demolished, causing concern that the program was being used to displace black residents from urban areas.[1] Such controversies dominate the overwhelmingly negative historical narrative surrounding the program.

However, the limited economics literature exploring the urban renewal and slum clearance program finds a positive impact on cities (Collins & Shester, 2013). While understanding how this program impacted city-level outcomes is an important contribution, aggregate positive outcomes can mask within-city dynamics, and these within city dynamics will likely have important distributional implications. To better understand such within city dynamics and any associated distributional implications, this paper theoretically and empirically explores the federal urban renewal and slum clearance program at the neighborhood level.

To reconcile the economics literature with the broader narrative about the urban renewal and slum clearance program, this paper begins by examining the characteristics of neighborhoods targeted for urban renewal and slum clearance under the Housing Act of 1949, focusing on the role of race in determining site selection. I then use both theoretical and empirical approaches to understand the long-run effects of urban renewal and slum clearance projects on neighborhood-level population density, housing density, racial composition, median incomes, and median rental rates. I am interested in identifying the impact of urban

[1] Among neighborhoods where the share of black residents was 50% or higher in 1950, 14% would be cleared and redeveloped over the subsequent decades.

renewal projects on directly treated neighborhoods as well as understanding relative changes between treated and untreated low-income neighborhoods within a city.

It was not previously possible to empirically assess how the urban renewal and slum clearance program affected neighborhoods due to the lack of any systematic data collection of project locations. Thus, in order to empirically explore neighborhood-level results, I obtained a comprehensive list of all projects funded under the Housing Act of 1949 and used various primary sources to identify the exact locations and the expected land-use of projects funded before 1965 in 28 large U.S. cities.[2] I combine this project-level information with census tract level decennial census data from 1940 to 2000 to construct a neighborhood level dataset that identifies neighborhoods that were redeveloped under the urban renewal program. Using this newly assembled dataset, I first determine the role race played in site selection after controlling for housing values, median income, and other observable neighborhood characteristics.

I then outline a spatial equilibrium model of locational choice to help understand the impact of urban renewal and slum clearance on neighborhoods and investigate the welfare implications of neighborhood-level changes on households. In this model, households choose to live in one of two neighborhoods. Households are differentiated by income and race; neighborhoods are differentiated by housing supply, housing price, and neighborhood quality. An exogenous federal government can fund urban renewal projects that decrease housing supply and increase neighborhood quality in the lower quality neighborhood. The welfare implications of such projects depend on the relative magnitudes of the opposing effects caused by an increase in neighborhood quality (quality effect) and a decrease in the supply of housing (supply effect). However, households in the lowest end of the income distribution are made worse off in all scenarios.

Whether urban renewal projects are associated with the supply or quality effect dominating can be tested empirically by documenting urban renewal projects' relative effects on

[2] Figures A1 and A2 in the appendix show primary sources used to identify of urban renewal projects in Chicago and Pittsburgh, respectively. Similar information was found for all 28 cities in my sample.

treated and non-treated low-income neighborhoods *within* a city. To document this effect, I use a synthetic control group method to construct an artificial match for each neighborhood that received an urban renewal project. This method weights some combination of non-treated neighborhoods from the same city as a treated tract to minimize the pre-treatment difference in observable characteristics of the synthetic control group and the treated tract. I then compare the post-treatment outcomes of these two groups. While informative about city-wide patterns, the synthetic control group is likely experiencing an indirect treatment effect from displaced residents and thus should not be interpreted as a valid counter-factual for the directly treated tracts. The synthetic control group should instead be thought of as an artificially constructed slum that did not receive an urban renewal project but may be experiencing an indirect treatment effect.

Due to the selection problem caused by the fact that treated tracts were more likely to be experiencing urban blight and the bias caused by within city spillover effects, it is not possible to identify the long-run impacts of urban renewal and slum clearance programs on directly treated neighborhoods by simply comparing treated and untreated tracts within the same city. To address this concern, I use a k-nearest neighbors approach to locate slums in cities with limited program participation to use as a control group for treated slums.[3] I estimate the impact of the federal urban renewal program on neighborhood-level outcomes using a generalized difference-in-difference empirical framework and explore how these results vary over time by using an event-study framework.

I find that while the program did clear blighted urban areas, conditional on experiencing urban blight, neighborhoods with a high share of black residents were between two and three times more likely than white neighborhoods to be cleared and redeveloped. Furthermore, neighborhoods targeted for urban renewal experienced a decline in population density by 13%, a decline in housing density by 12%, and a decline in the share of black residents by 16%. These neighborhoods simultaneously experienced a 24% increase in median rents

[3] Some cities had a limited ability to participate in the program due to variation in the timing of required state legislation (Collins & Shester, 2013).

and an 18% increase in median incomes. The relative relationship between median rents in treated and untreated low-income neighborhoods within a city suggests that urban renewal drove up rental rates across all low-income neighborhoods, ultimately making housing less affordable. These results are consistent with the supply effect dominating the quality effect in the spatial equilibrium model discussed above and imply that all low-income households are made worse off by slum clearance and urban renewal policies.[4]

This paper contributes primarily to two different sets of literature, the first of which explores Title I of the Housing Act of 1949. Most of the literature is overwhelmingly negative in its assessment and highlights the controversies surrounding the program. In addition to the displacement of black residents, further criticisms included the destruction of low-cost housing, the demolition of cohesive neighborhoods, and the disregard of individual property rights (e.g., Jacobs 1961, Anderson 1964, von Hoffman 2000). Since there was no systematic collection of project locations, most of this research is qualitative or analyzes specific case studies. The one notable exception is work by Collins and Shester (2013) which identifies the causal impact of the federal urban renewal program on *city-level* outcomes. They conclude that slum clearance and urban renewal had positive and economically significant effects on city-level measures of income, property value, and population. They further show that these effects are not driven by changes in a city's demographic composition. The key distinction between their work and mine is that I explore the impacts of this program on neighborhood-level outcomes, and Collins and Shester explore the program on city-level outcomes. I contribute to this literature by documenting project locations and systematically exploring the impact of the urban renewal and slum clearance program at the neighborhood

[4]It is important to distinguish between the setting explored in this paper and recent work that documents the benefits of being relocated from modern-day public housing. For example, researchers have documented positive impacts for young children who relocated out of poverty due to the Moving to Opportunity (MTO) experiment or the destruction of public housing projects (e.g. Chetty et al. 2016, Chyn 2018). This literature is primarily documents relocation effects on individuals' outcomes whereas this paper's primary focus is on the impacts of large investment projects on neighborhoods. Furthermore, historical accounts of many neighborhoods cleared under the urban renewal and slum clearance program document that these neighborhoods were not considered to be slums or projects by neighborhood residents (e.g., Trotter and Day, 2010).

level. I show how aggregate positive outcomes can mask important negative distributional implications.

This paper also contributes to the literature documenting the determinants of neighborhood demographics and economic development. A subsample of this literature documents the role government policies, such as redlining, discriminatory zoning, and highway construction, played in shaping the demographic structure within cities.[5] For example, Rothstein (2017) argues that de jure segregation promoted discriminatory patterns that continue to this day. Understanding the government's role in shaping neighborhood demographics and economic development has important legal and policy implications. The United States Supreme Court has aligned its constitutional obligation to remedy discrimination (and its negative consequences) on the distinction between state-sponsored segregation and segregation resulting from individual choices or preferences. Thus, understanding how government policies contributed to the economic conditions of minorities in today's society remains an important research area.

The rest of this paper is structured as follows: Section 2 discusses background information about the Housing Act of 1949; Section 3 presents a spatial equilibrium model; Section 4 discusses the data and presents the determinants of slum clearance; Section 5 describes two identification strategies (one documenting the relative effect of urban renewal on treated and untreated neighborhoods and one documenting the direct effect of urban renewal on treated neighborhoods); Sections 6 present long-run effects of urban renewal projects on neighborhoods; and Section 7 concludes.

[5]Other work highlights the impacts of individual actions and preferences. For example, Shertzer and Walsh (2016) document that white flight contributed to segregation for the pre-World War II time frame, and Boustan (2010) documents the same for the post-World War II time frame.

2 Background

After the Great Depression and the end of World War II, housing policy rose to the top of the U.S. policy agenda.[6] At the time, overcrowded inner-city areas with high poverty levels and a high share of substandard housing were referred to as slums or as areas experiencing urban blight. The Housing Act of 1949 was passed with broad political support to subsidize locally-planned urban renewal projects in blighted urban areas through the urban renewal and slum clearance program. This program was overseen by the Housing and Home Finance Agency (HHFA), and its overarching goal was to rebuild and recreate cities. The Act's specific objective was to eliminate substandard and other inadequate housing through the clearance of slums. Proponents of the program saw potential citywide benefits that would be driven by an increase in tax revenues. The assumption was that subsidizing the clearance of slums would help stimulate housing production and community development to realize the goal of a decent home in a suitable living environment for every American family.

If a city wanted to participate in the urban renewal program, it first had to form a local public agency (LPA) to initiate, plan, and execute urban renewal projects. This agency was responsible for identifying slums and obtaining plots of land for redevelopment. The agency accomplished this objective by negotiating with property owners and, if that failed, using eminent domain. Displaced residents received little help in terms of moving expenses or advice in finding new homes.[7] The land was then cleared, improved upon, and sold to private developers.[8] The renewal site was then redeveloped according to a preexisting neighborhood plan established by the local public agency. These redevelopment projects are what I refer to as urban renewal or slum clearance projects. Federal subsidies covered two-thirds of the net project cost (the difference between the cost to acquire and clear land and the revenue received from selling the land to a redevelopment firm). Most of the new

[6] During the war, resources shifted to wartime production, causing a housing shortage.

[7] According to a report written by the HHFA regarding a census bureau survey of families displaced from urban renewal sites during the summer of 1964, 70% of all families relocated themselves without the help of the LPA.

[8] Examples of land improvements include paving roads and adding streetlights.

buildings constructed in urban renewal areas were high-rise apartment buildings with units designed for high-income families (Anderson, pg 7).[9]

Subsequent Housing Acts modified the 1949 program slightly. Most notably, the Housing Act of 1954 expanded the program, which initially funded projects of a predominantly residential character, to include more non-residential projects such as civic centers and office buildings. The 1954 Act also added a new emphasis on rehabilitation as opposed to wholesale demolition. However, by the end of 1962, less than one percent of project costs were allocated to rehabilitation (Anderson, pg 20).

Over time, urban renewal and slum clearance became increasingly controversial. The primary criticisms of the program were motivated by the destruction of cohesive black neighborhoods. One example of a controversial urban renewal project was the Civic Arena in Pittsburgh's Lower Hill District. Trotter and Day (2010) describe the Lower Hill District in the early 1900s as a dynamic and thriving neighborhood that was on par with Harlem as one of the cultural centers of black America. The Lower Hill was home to the all-black Crawford baseball team and the Crawford Grill, a renowned jazz club. The Lower Hill's population grew as more black residents were attracted to the area. The housing stock aged, and while other areas of Pittsburgh had been modernized, the Lower Hill still had cobblestone streets. In the 1950s, urban renewal displaced around 8000 residents and 400 businesses in the Lower Hill district for the construction of the Civic Arena. Trotter and Day (2010) quote area residents who stated that the 'most devastating thing that ever happened to the black community was to tear out the Lower Hill.'

Other examples of neighborhoods cleared to by controversial urban renewal projects include Boston's West End neighborhood, where high-rise apartment buildings (with fewer than 500 apartments) for the upper-middle-class displaced over 2000 Jewish and Italian families and Hayti, Durham, a thriving black community that was cleared to make way

[9]There was no incentive to build low-income housing. While public housing did exist at this time, the program was entirely separate from the urban renewal program. Two completely separate government agencies ran the two different federal programs (Anderson, pg. 7).

for the Durham Freeway. Similar projects occurring nationwide caused policymakers to become concerned that urban renewal was being used as a mechanism to displace unwanted populations from urban areas. This sentiment is evident in the 1959 Report of the U.S. Commission on Civil Rights, which stated: "The clearance of slums occupied largely by Negro residents and their replacement with housing accommodations beyond the means of most Negroes gives rise to the question whether slum clearance is being used for 'Negro clearance."' These controversies contributed to the program's end in 1974.

3 Model

While slum clearance and urban renewal may have positive and economically significant effects on cities, the welfare implications of such a policy are unlikely to be evenly distributed across a city's population. In this section, I outline a spatial equilibrium model of locational choice to document the impact of urban renewal projects on neighborhood outcomes and discuss the welfare implications of neighborhood level changes on households.[10]

This model consists of a city with two neighborhood options for low-income households. Neighborhoods are differentiated by the level of housing supply, neighborhood quality, and housing price. I will refer to these two neighborhoods as the low-price, low-quality neighborhood (neighborhood l) and the high-price, high-quality neighborhood (neighborhood h), where high and low price and quality are defined in relative terms. I assume that mobility between neighborhoods is costless. There exists a continuum of low-income households that live in the city. Households are characterized by their income and their race. In this model, there is also an exogenous federal government that can fund slum clearance and urban renewal projects. Consistent with both historical accounts and the empirical evidence that follows, these projects decrease the supply of housing and increase neighborhood quality in the low price, low quality neighborhood. There is no direct impact of urban renewal and slum clearance on neighborhood h.

[10] The full model is presented in the Appendix.

Households choose to live in one of the two neighborhoods and, conditional on neighborhood choice, they choose their optimal level of housing. Rents are paid to exogenous absentee landlords. Household preferences are represented by the indirect utility function V(.) which is a function of household income, the rental rate of housing, and neighborhood quality.[11] I assume higher income households are willing to pay more than a low income household for an increase in neighborhood quality (i.e. the single crossing assumption). This assumption allows for a ranking of neighborhoods that increases in both price and quality. Further, this assumption guarantees the existence of a set of boundary households, uniquely identified by income, who are indifferent between both neighborhoods.

An equilibrium in this model is defined as an allocation of households across neighborhoods such that households choose their neighborhood to maximize their utility and the housing market clears in each neighborhood. The single crossing assumption implies that household sorting will result in perfect income stratification across neighborhoods. Households with income less than that of the boundary household prefer the lower price, lower quality neighborhood, and households with income greater than the boundary household prefer the higher price, higher quality neighborhood. To the extent that black households are more likely to be in the lower end of the income distribution, we expect there to be a higher share of black residents in neighborhood l.

I assess how the equilibrium responds to urban renewal and slum clearance projects. First, the price of housing in the renewed area necessarily increases. This is due to both the the decrease in supply and the increase in neighborhood quality resulting in upward pressure on housing prices. The impact of such projects on neighborhood population, median income, and relative rental rates depends on the relative magnitudes of the opposing effects caused by an increase in neighborhood quality (quality effect) and a decrease in the supply of housing (supply effect). If the quality effect outweighs the supply effect, then some share of house-

[11] Additional assumption regarding this indirect utility function are outlined in the Appendix. Introducing preferences over the racial composition of neighborhoods results in multiple equilibria. See Sethi and Somanathan (2004) and Banzhaf and Walsh (2013) for examples of such models.

holds are incentivized to move out of neighborhood h into neighborhood l. This decrease the population in neighborhood h while increasing population in neighborhood l. Furthermore, it is the relatively lower income households from neighborhood h who relocate, meaning the median income in both neighborhoods increases. Lastly, the rental rate of housing in neighborhood h declines due to the decreased demand for housing. In this instance, many low income families are made better off. Those that remain in neighborhood h are better off due to the lower rental rate. Those that moved did so because they were made even better off than staying in the same neighborhood with the lower rental rate. Further, many of the families that remained in neighborhood l were also made better off due to the relatively large increase in neighborhood quality which comes at a relatively small price increase. Only those the very bottom of the income distribution are made worse off in this scenario. They would have preferred the original lower-quality neighborhood at the reduced price.

If instead the supply effect outweighs the quality effect, then some share of households, particularly the highest income household from neighborhood l, are incentivized to move out of neighborhood l into neighborhood h. This lowers the median income in both neighborhoods. It also means that the population in neighborhood l decreases, while the population in neighborhood h increases. The increase in population in neighborhood h is associated with an increase in the demand for housing, which increases the rental rate. This makes households living in neighborhood h worse off. They have the same neighborhood quality that they had before, but at a higher price. Furthermore, households that remained in neighborhood l are also made worse off. This is because the utility gained from a small increase in neighborhood quality is smaller than the utility lost from the large increase in the rental rate of housing due to extremely limited supply. When the supply effect dominates the quality effect, all low-income households experience a decline in welfare.

Understanding the neighborhood level predictions and the associated welfare implications for households depends on how much housing was last as a result of the renewal project and the size of the associated increase in neighborhood quality. Although, households in the lowest end of the income distribution are made worse off in all scenarios.

3.1 Model's Implications for Empirical Work

This section briefly summarizes the model's implications for the empirical work that follows. In the case where an increase in neighborhood quality is high enough to incentivize some households to leave neighborhood h and move into neighborhood l (i.e the population in neighborhood l increases *relative* to population in neighborhood h), everyone except households in the lower portion of the income distribution are made better off. In the case where a decrease in housing supply incentivizes some portion of the population in neighborhood l to move into neighborhood h despite the increase in the quality of neighborhood l (i.e. the population in neighborhood l decreases *relative* to the population of neighborhood h), all low-income households in the city are made worse off. Thus, by empirically documenting the relative impact of urban renewal and slum clearance policies between treated and untreated neighborhood within a city, we can infer the welfare implication of such policies on households.

Furthermore, if the neighborhood quality of l remains below the quality of h, we would expect the lower income population to remain in l and the relatively higher income population to remain in h. To the extent that black residents are more likely to be concentrated at the lower end of the income distribution, we would expect to see black residents remain in neighborhood l, even after redevelopment. If the neighborhood quality of l surpasses the quality of h, then the higher income population moves into neighborhood l and the lower income population moves into neighborhood h. To the extent that black residents are concentrated at the lowest end of the income distribution, we would expect the share of black residents residing in the cleared and redeveloped neighborhood to decline.

4 Data

Several different sources were used to collect data for this analysis. The Urban Renewal Project Directory (June 1974), published by the Department of Housing and Urban Development (HUD), provides a comprehensive list of all projects funded under the Housing Act of 1949 and its subsequent amendments. This directory includes a name and ID number for every project, as well as the federal grant amount given to the local agency for the project. Through the use of various primary sources, I collected and digitized the exact locations for pre-1965 projects in 28 of the largest cities in the U.S. based on 1950 population.[12] Where available, I located projects using annual reports published by each city's primary urban renewal agency. I supplement this information with aerial photographs and project plans from the National Archives.[13] I use census tracts as a proxy for neighborhoods and use project locations to define the urban renewal treatment status for every census tract within my 28 sample cities. I define a neighborhood as treated by the federal urban renewal program if any part of an urban renewal project lies within that census tract's boundaries.

While the program officially ran from 1949-1974, I focus on pre-1965 projects. The HHFA, the federal agency that oversaw the urban renewal program, was restructured to become the Department of Housing and Urban Development (HUD) in 1965. While there is little evidence that this changed the structure of the program, many publications were discontinued under the HUD administration, which makes documenting the locations of projects funded under HUD more difficult. Focusing on projects funded before 1965 is likely to bias my results toward zero since I will be comparing treated census tracts to non-treated tracts plus tracts that were treated post-1965.

[12] Table A1 of the appendix documents the number of projects in each city in my sample. I initially focused on the 30 largest cities based on 1950 population. Houston was dropped because of its lack of zoning laws, and San Antonio was dropped because it did not have delineated census tracts by 1940. At the inception of this project, no systematic locational data was available. Much of this data has recently become available through the Digital Scholarship Lab at the University of Richmond. I have verified my data's accuracy with the data that they collected.

[13] Figure A1 in the Appendix shows the urban renewal and slum clearance map for Chicago. Similar information is collected for each city in my sample.

The Urban Renewal Project Directory also documents the month and year a project was approved for planning (during the planning phase, an urban renewal plan was formulated to outline the objectives of the project, treatment to be utilized, and the controls over new land use), execution phase (approval dates for authorization of a grant contract), and completion phase (dates for completion of a grant contract).[14] These dates correspond to grant money transfers and not necessarily project progress. I use the planning and execution dates to define treatment timing for my outcome variables of interest since completion data are missing for many projects.[15]

These data are supplemented with information from another HUD publication, the Urban Renewal Project Characteristics (June 1966).[16] The June 1966 publication contains data on housing and demographic characteristics in the areas to be cleared for redevelopment, including the number of black and white families displaced and the number of standard and substandard houses that were demolished. Table A2 in the Appendix reports the number of standard and substandard houses that were demolished by the program, as well as the number of white and non-white families displaced. In total, 82% percent of the housing units that were demolished in these 28 cities were considered to be substandard units (this is the same percentage for the full sample of cities listed in the HUD publication), and 58% of the families that were displaced were non-white (compared to 54% of families in the full sample of cities).

This publication also documents the total land acquired for each project and the shares of land to be used for each of the following purposes: residential, commercial, industrial, public, and streets. Table 1 summarizes these data aggregated to the city level. While the program was meant to be primarily residential, and indeed this is the largest land use of the

[14] A "completed" project does not imply that physical redevelopment was completed and many completion dates were left blank in the last publication of the directory in 1974.

[15] Timing variables are presented graphically in Figure A8 of the appendix. This figure shows the 204 projects included in this analysis, ranked by start date on the horizontal axis, and the year each project entered a new phase of grant payment.

[16] This is the last version of this specific publication and hence is a practical reason for focusing on pre-1965 projects.

five categories, we see that the combined total of all other uses outweighs residential uses.[17]

All outcome variables are from decennial census data and span from 1940 to 2000. This data includes census tract level measures of population, housing stock, racial composition, median income, and median rents. Income and rents are all adjusted to be in terms of year 2000 dollars. All census data and shapefiles were acquired from IPUMS NHGIS. Census tracts had to be corrected for changes in boundaries over time. In general, as the population in one tract grew, a tract was divided in half, while if the population decreased in a tract, two tracts were merged together. Using ArcGIS, I identify the smallest geographic unit that appeared in any census and use weighted averages based on land area to estimate population and housing distributions in any year that the census tract boundaries do not overlap. For median incomes and rents, the same value was applied to both neighborhoods.

4.1 Characteristics of Targeted Tracts

The goal of the urban renewal program was to eliminate and prevent urban blight through the clearance of slums and the rehabilitation of urban areas. Thus, treated tracts should differ from non-treated tracts in predictable ways. Specifically, they should have more substandard housing units, lower rents, lower housing values, and a lower-income population.

Table 2 confirms these expectations. This table reports the means and standard deviations of treated and non-treated tracts in the pre-treatment period, as well as the p-value of a two-sided t-test. Panel A presents the results for population characteristic variables. Compared to non-treated census tracts, treated tracts had a higher population density, share of black residents, and unemployment rate. We also see lower income levels in treated tracts. The difference in the mean of treated versus non-treated tracts is statistically different at the 1% significance level for every variable.

Panel B presents housing characteristics. Treated tracts had a higher housing density

[17]While not the focus of this paper, streets are the second-largest land use, supporting the idea that inserting roads and highways through black neighborhoods is an important aspect of the urban renewal narrative.

with a higher percentage of houses needing major repairs and a higher share of vacant units. Treated tracts also had an older housing stock. Moreover, treated tracts had a lower share of housing without running water.

Panel C presents homeownership characteristics. Treated tracts had lower homeownership levels, and those who did own homes had homes of a lower value. Treated tracts also had a higher percentage of renters who typically enjoyed lower rents.[18]

I also estimate the likelihood of receiving an urban renewal project based on a neighborhood's observable characteristics. Table 3 presents the results of various probit regressions, each of which controls for city and year fixed effects. Columns (1)-(3) present the results from different empirical specifications using various pre-treatment years based on variable availability. Column (1) uses data from 1940, 1950, and 1960. While this specification includes the largest range of pre-treatment periods, I am not able to control for a census tract's median income, median house age, or the share of houses in need of major repairs or lacking running water. Column (2) limits my sample to only data from 1950 and 1960 and adds controls for median income and median house age. Column (3) uses only data from 1940 and controls for the share of houses reported needing major repairs and the share with no running water. These results suggest that the unemployment rate, homeownership rates, median house values, housing age, and the percentage of vacant units were all important characteristics for identifying neighborhoods to be cleared. Interestingly, after controlling for other neighborhood level characteristics, the share of houses needing major repairs is not a statistically significant predictor of which neighborhood would eventually be cleared and redeveloped.

The role of race in determining site selection is not obvious because other neighborhood-level observable characteristics are correlated with the racial composition of a neighborhood. Table 3 shows that controlling for housing quality measures and socioeconomic status, neigh-

[18] I also look at the difference between 1940 and 1950 values broken down by treatment status and see similar results, suggesting that both levels and trends are different for treatment and non-treatment tracts for almost every variable included in my analysis.

borhoods with a larger share of black residents are more likely to be cleared for redevelopment under the Housing Act of 1949. To further illustrate this fact, I identify tracts that should have been treated based on observable housing and economic characteristics in a race-blind experiment and compare predicted treatment status to actual treatment status by the racial composition of neighborhoods. To calculate the relevant predicted probabilities, I run a probit regression of treatment on housing and economic characteristics, not controlling for race, and use this model to calculate predicted treatment for every census tract in my 28 sample cities. These predicted values can be intuitively thought of as a measure of economic distress, with higher values representing higher levels of distress.

Panel (a) of Figure 1 shows the percent of tracts treated broken down by neighborhoods with high and low percentages of black residents and predicted treatment quartile.[19] If race was not a factor in determining the locations of urban renewal projects, we would expect similar treatment rates between high and low percentage black census tracts. This analysis shows that neighborhoods with a high percentage of black residents were more than two times as likely to be treated conditional on being in the top quartile of predicted treatment.

It could be the case that, conditional on being within the top quartile of the predicted treatment distribution, black neighborhoods were more likely to be treated due to their other observable characteristics. Panel (b) of Figure 1 replicates the previous analysis for only the top 10% of the predicted treatment distribution. This figure provides further evidence that black neighborhoods were disproportionately targeted for slum clearance.[20] These results are robust to the inclusion of distance to the city center as an additional control variable, addressing concerns that this program disproportionately cleared black neighborhoods due to the location of the neighborhood in relation to the city center. Differences in observable neighborhood characteristics are not driving the differences in treatment status across white

[19] A census tract is defined as a high percentage black neighborhood if the share of black residents residing in the neighborhood was above the sample mean.

[20] Panel (a) and (b) of Figures A9 in the appendix show this same analysis using the two alternative specifications shown in Table 3 to define predicted treatment (without using race). The general patterns seen in these figures confirm the robustness of this result.

and black neighborhoods.

5 Identification Strategy

Using the intuition from the model presented in Section 3 and the data discussed in Section 4, I explore two different empirical questions. First, I ask how urban renewal and slum clearance programs impacted neighborhoods within cities. The theoretical framework highlights the importance of spillover effects on other low income neighborhoods within a city. By comparing the *relative* effect of directly treated tracts and tracts receiving displaced residents, we can infer the welfare implications of urban renewal policies on low income residents. While I don't know exactly where displaced residents moved, I construct a within-city synthetic control group to match the pre-trend characteristics of treated tracts to artificially create an untreated slum that is as similar as possible to our treated slums. While this approach is informative about city-wide patterns and the associated theoretical welfare implications, the synthetic control should not be thought of as a valid counterfactual for directly treated tracts. This empirical exercise provides information about post-renewal differences between treated and non-treated tracts within a city that looked similar before treatment.

My second empirical exercise seeks to understand the impact of urban renewal on *directly* treated tracts independent of spillover effects. As shown in Section 4, the allocation of urban renewal projects cannot be viewed as a random assignment or a natural experiment. Particular neighborhoods were targeted based on pre-existing neighborhood characteristics. Therefore, any direct comparisons between treated and non-treated census tracts is likely to suffer from selection bias and spillover effects. To solve this problem, I use uses variation in program participation across cities and identify slums from cities with limited program participation to use as a control group for treated slums. I elaborate on each of these empirical exercises in Sections 5.1 and 5.2 respectively.

5.1 Relative Effects of Urban Renewal (Within City)

My first empirical exercise evaluates how the urban renewal and slum clearance program differentially impacted neighborhoods *within* cities. I use the synthetic control group method developed by Abadie and Gardeazabal (2003) and Abadie, Diamond, and Hainmueller (2010) to construct a synthetic match for each neighborhood that received an urban renewal project. This method constructs a weighted combination of non-treated neighborhoods from the same city as the treated neighborhood to minimize the difference between treated tracts and non-treated tracts pre-treatment characteristics. Most previous papers employ synthetic matching for the case of one treatment group and one intervention; however, I follow the algorithm used in Acemoglu et al. (2016), which extends the standard method to the case of many treated units with different intervention periods. I match on pretreatment levels of population density, housing density, median rents, share black, and median income.

The synthetic control groups likely experience an indirect treatment effect from displaced residents. For example, a resident who was displaced from their home due to urban renewal could have moved into a tract that has a non-zero weight in the respective synthetic control group. In this case, the synthetic control group provides information about the *relative* post-renewal differences between treated and non-treated tracts that looked similar before treatment. The synthetic control group should *not* be interpreted as a counter-factual for the directly treated tracts. The treated tract can intuitively be thought of as neighborhood l in the model presented in Section 3 and the synthetic control group can be thought of as neighborhood h (which was artificially constructed to be as similar as possible to neighborhood l before urban renewal occurs).

Statistical inference is deduced by randomly assigning treatment status to neighborhoods, constructing a synthetic cohort for each treated tract, and calculating the predicted effects under random assignment. I repeat this placebo analysis 100 times and compare the distribution of predicted effects to the effect estimated from the original sample.

5.2 Direct Effects of Urban Renewal (Across City)

To identify the effect of urban renewal on *directly* treated neighborhoods I exploit differences in program participation rates at the city level. I identify slums within the control cities (cities with limited program participation) to use as control groups for treated slums. I use a k-nearest neighbors approach to identify neighborhoods experiencing urban blight within control cities. My identifying assumption is that treatment and control tracts trend similarly in the pretreatment period, an assumption I test empirically, and that in the absence of any treatment, such trends would have continued throughout the post treatment period. I began with a fixed-effect empirical framework to estimate the impact of the federal urban renewal program on neighborhood level outcomes. My sample consists of treated tracts and predicted slums within control cities. My estimation equation is given below:

$$y_{ict} = \theta_i + \gamma_t + \beta treated_{it} + \lambda_c * t + \epsilon_{ict} \tag{1}$$

where y_{ict} is an outcome for neighborhood i in city c for year t, $treated_{it}$ is a binary variable indicating whether the tract received an urban renewal project by year t, θ_i are neighborhood fixed effects, γ_t are year fixed effects, and $\lambda_c * t$ is a city specific linear time trend. The coefficient of interest is β which is interpreted as the average treatment effect of receiving an urban renewal project. Since my control tracts are from cities with limited program participation, this strategy presents little concern about spillover effects. To explore how these results vary over time, I also use a flexible event study framework. The empirical specification is given by equation (2).

$$y_{ict} = \theta_i + \gamma_t + \lambda_c * t + \sum_{k=-2}^{5} \tau_k treated_i 1(t - t^* = k) + \epsilon_{ict} \tag{2}$$

where y_{ict} is an outcome for neighborhood i in city c for year t, θ_i are neighborhood fixed effects, γ_t are year fixed effects, and $\lambda_c * t$ is a city specific linear time trend. Furthermore, $1(t - t^* = y)$ are event year dummies, which are equal to 1 when the year of observation is -2,

..., 5 decades from the decade immediately preceding treatment, t^*, and $treated_i$ is a binary variable equal to 1 if tract i ever received and urban renewal project.[21] The coefficients of interest are τ_k. The point estimates for τ_{-2} and τ_{-1} describe the evolution of the outcome variable in eventually treated neighborhoods before urban renewal began net of changes in control neighborhoods after adjusting for model covariates. The point estimates for τ_1 to τ_5 describes the divergence in outcomes k years after the urban renewal project net of changes in control neighborhoods after adjusting for model covariates. These estimates are interpreted as the average treatment effect of urban renewal on outcomes relative to the census year before treatment.

I repeat this analysis using only residential or nonresidential projects to explore how results differ based on primary land use. Residential projects refer to treated census tracts where more than half of the treated land was used for residential purposes and non-residential projects refer to treated tracts where more than half of the treated land was used for non-residential purposes.

6 The Long-Run Effects of Urban Renewal

Section 6.1 presents the results from the within city exercise that explores the relative effect of urban renewal on treated and untreated tracts and Section 6.2 presents the results from the across city exercise which explores the direct effect of urban renewal on directly treated neighborhoods.

6.1 Relative Effects of Urban Renewal

To understand the impact that urban renewal and slum clearance had *within* cities, I construct a synthetic control group to match the pre-trends of treated tracts. Due to spillover effects between treated and untreated neighborhoods, synthetic control groups should be in-

[21] k=0 is omitted and the other coefficients are interpreted relative to the census year immediately preceding treatment.

terpreted as the evolution of artificially constructed untreated slums within treatment cities. This empirical exercise helps understand the within city dynamics (like those discussed in the spatial equilibrium model in Section 3) resulting from urban renewal policies.

Figures 2 and 3 present the primary set of results. Figure 2 shows the average outcome variables for treated tracts and the synthetic control groups separately. The matching algorithm overestimates some variables and underestimates others. While the levels are not exact, these graphs show support for the parallel trends assumption. Figure 3 shows the average effect (the average difference between the treated tracts and the synthetic control tracts) for each variable of interest. The shaded area shows the range of effects estimated from 100 placebo iterations in which treatment was assigned to random neighborhoods.

My first outcome of interest is population density. Panel (a) of Figure 2 shows the population density of treated tracts and the synthetic control group over my sample period. Compared to artificially created slums, treated tracts experienced a decline in population density over the subsequent half-century. We see from Panel (a) of Figure 3 that population density declined by about 2 people per every 1000 square meters, and the difference between treated tracts and the synthetic control group mitigated only slightly over time. Figure 4 shows the trends for residential and non-residential projects separately. While the effects are larger for non-residential projects, residential projects also experienced a decline in population density compared to the synthetic control group. Panel (b) of Figure 2 shows the evolution of housing density for both treated tracts and the synthetic control group. From Panel (b) of Figure 3, we see a decline in housing density by about 0.8 units per every 1000 sq. meters.[22]

Given that, on average, population density and housing density in treated tracts are declining, these results are consistent with the supply effect dominating the quality effect in the model presented in Section 3. The neighborhood's increased quality was not enough to incentivize an increase in population, ultimately causing a decrease in average income and

[22] The results are similar for both residential and non-residential projects. See Figure A15 in the Appendix.

increased rental rates across both neighborhoods. Hence, the theoretical predictions for the *relative changes* in rents and income across the two neighborhoods are ambiguous. Panel (c) and (d) of Figure 2 shows very similar trends in these variables in both the treated tracts and the synthetic control units. Thus, rents increased in treated tracts due to improved neighborhood quality, and rents increased in other untreated slums due to a rise in the demand for housing driven by displaced rents.

Panel (e) of Figure 2 shows the average percentage of black residents for both treated tracts and synthetic control groups. We see differential trends in the share of black residents across the treatment and control groups in the pretreatment period. This pattern is consistent with the results presented in Section 4 that black neighborhoods were disproportionately targeted for redevelopment. Post-redevelopment, we see the share of black residents level off in the treatment group and steady growth of the share of black residents in the control group. While the model presented in Section 3 does not make direct predictions about the racial composition of neighborhoods, this result is consistent with the idea that displaced black residents relocated into similar neighborhoods but now faced higher rents. Higher rents are associated with a decrease in housing supply and increased housing demand among low-income neighborhoods.

Effects on the share of black residents differ drastically by the land use of projects. Figure 5 shows that when a project was primarily used for residential purposes, the share of black residents trended similarly between the treatment and control group in the post-treatment period. However, for projects with primarily non-residential uses, the treated neighborhoods experienced a sharp decline in the share of black residents compared to the artificially created slums.

These findings, taken together with the model's insights, suggest that low-income households in both treated and untreated neighborhoods were made worse off by increasing the cost of housing. Thus, while the slum clearance and urban renewal program has been shown to have positive and economically significant effects on city-level measures of income, property value, and population, such a policy's welfare implications are unevenly distributed across cities' populations.

6.2 Direct Effects of Urban Renewal

This section discusses the effect of urban renewal and slum clearance on directly impacted tracts (tracts that had an urban renewal project within their boundaries). Figure 6 graphs the aggregate trends of the treated and control slums used in this analysis. Tables 4-8 presents the regression results from equation (1). Column (1) of each table presents the full sample results, Column (2) limits the treated sample to residential treated tracts, and Column (3) includes only non-residential treated tracts. Figure 7 presents the coefficients and 95% confidence interval for τ_k in equation (2). The point estimates for τ_{-2} and τ_{-1} confirm that, with the exception of share black, there is no statistical difference in the evolution of the outcome variable in eventually treated neighborhoods before urban renewal began net of changes in control neighborhoods after adjusting for model covariates. The pretrend in the share of black individuals is further confirmation of the discriminatory nature of site selection. Furthermore, when results are broken down by residential verse non-residential projects, 9 of the 10 regressions show evidence for the parallel trends assumptions, with only the share of black individuals in treated residential tracts showing any statistically significant pretrends. The point estimates for τ_1 through τ_5 describe the divergence in outcomes k decades after the urban renewal project was initiated net of changes in control neighborhoods after adjusting for model covariates.

Table 4 presents the results from equation (1) with population density as the outcome variable. Column (1) of Table 4 shows that, on average, over the post-treatment period, population density declined by 1.8 people per every 1000 square meters as the result of urban renewal and slum clearance. This coefficient is associated with a 13% decline from the pre-treatment average of 14 people per 1000 square meters. Columns (2) and (3) of Table 4 show that census tracts primarily used for non-residential purposes drive this result. However, even tracts with a project that was used for a primarily residential purpose saw a decline in population density. Panel (a) Figure 7 shows no differential trends in population density pre-treatment and a sharp decline in population density post-treatment that mitigates slightly over time.

A reduction in housing density likely drives the decrease we see in population density. Table 5 confirms this hypothesis. Over the post-treatment period, housing density declined by 0.54 houses per 1000 square meters. This is a 12% decline from the pre-treatment average of 4.4 houses per 1000 square meters. In neighborhoods with primarily residential projects, there is no decrease in housing units, as seen by the statistically insignificant coefficient in Column (2) of Table 5; however, non-residential projects caused a reduction of .85 houses per 1000 square meters, a 21% decline from the pre-treatment average. Lastly, Panel (b) Figure 7 shows the housing density results with the flexible event study framework. In the decade following treatment, there is a sharp and persistent decline in housing density that mitigates only slightly over time.

The reduction in housing supply, combined with an increase in neighborhood quality, is likely to create upward pressure on the rental market in treated neighborhoods. Table 6 shows that urban renewal projects did cause an increase in median rents in directly treated neighborhoods compared to the control group. Both residential and non-residential projects experienced this increase in rental rates, although rents increased by 18% in residential projects and by 36% in non-residential projects. Panel (c) of Figure 7 shows the flexible event study results for median rent. In the census year immediately after the first loan execution, there was an increase in median rent by about \$50 (a 19% increase from the \$267 pre-treatment median), which is associated with an initial decrease in the number of rental units available. By the following decade, median rents had increased by an additional \$50 and then began to mitigate slowly over time. This secondary increase is consistent with the completion of projects occurring approximately a decade after the first grant payment was executed and such projects being developed for higher-income households.

Column (1) of Table 7 shows that over the post-treatment period, median incomes were on average \$2,878 (measured in year 2000 dollars) higher in treated tracts compared to non-treated slums. This coefficient is associated with a 16% increase from the pre-treatment average of \$17,579. These results are similar across residential and non-residential projects, suggesting that, on average, residential and non-residential projects attracted households with similar incomes relative to baseline populations. Panel (d) of Figure 7 shows the flexible event study results for median income.[23] In the census year immediately following the first grant payment, there was no change in median income. This result is likely because a random selection of households within a neighborhood was displaced by the project. As seen in Figure A8, the project was unlikely to be completed until the following decade. As such, in the following census year, we see a sharp rise in income, consistent with higher-income households moving to the newly-improved high-quality neighborhood. However, these effects are mitigated over time and become statistically insignificant in subsequent decades.

We know from Section 4 that minority neighborhoods were more likely to be cleared and redeveloped. Thus, we should expect the share of black residents to decrease as a result of urban renewal. Column (1) of Table 8 shows that, on average, over the post-treatment period, the share of black residents in directly impacted neighborhoods decreased by 5 percentage points, a 16% decrease from treated tracts' pre-treatment average of 31%. Columns (2) and (3) of Table 8 show that non-residential projects are driving this result. Thus, while the previous literature highlights residential projects being out of the price range of minority residents, there is little evidence that black families were unable to afford to live in treated neighborhoods post-renewal. It seems more likely that black families were displaced from urban areas that were subsequently transitioned to non-residential neighborhoods. Panel (e) of Figure 7 shows the event study results for the share of black residents in a treated tract. This variable is the only dimension that the sample of non-treated slums within control cities does not trend similarly to treated tracts within treated cities; treated cities

[23] Median income is not available for 1940, so only two pre-treatment periods are available for this outcome variable.

were experiencing sharper increases in the percentage of black residents. This trend is not surprising given the role race played in site selection. In the first census year after treatment, there was a modest decline in the share of black residents in a treated neighborhood. This gap grows even further in the following decade once projects reach completion and the new high-quality neighborhoods attracted more white residents to the area.

Overall, these findings suggest that the Housing Act of 1949 decreased housing density in treated neighborhoods, displacing lower-income black residents and increasing rents. This demographic switch is associated with increased median incomes. In other words, these neighborhoods gentrified and remained more expensive over the subsequent 50 years.

6.2.1 Robustness Checks

Figures A10 and A11 in the appendix show the results from the event study specification on the residential and non-residential subsamples. With the exception of the share of black residents in tracts receiving a residential project, there are no differential trends between treated and control neighborhoods in the pre-treatment period.

Tables A3-A7 replicate the results from Tables 4-8, varying the parameter used in the k-nearest neighbors matching algorithm that identifies untreated slums within control cities. Also included are the results of a k-nearest neighbors approach that matches only on 1950 values as opposed to the full pre-treatment period. Each coefficient in each table represents the results from a different regression. Figures A12-A14 in the Appendix replicate the flexible event study results presented in Figure 7 along these different dimensions. Signs, statistical significance, and the general magnitude of the coefficients remain consistent across all specifications.

7 Conclusion

In this paper, I theoretically and empirically explored the federal urban renewal and slum clearance program. This program was one of the largest and most controversial location-based economic development policies used to rehabilitate blighted urban neighborhoods in the United States. The basic premise of this program was that urban renewal eliminates slums and substandard housing, prevents the spread of blight, and revitalizes cities by subsidizing the clearance of blighted urban areas.

This program became increasingly controversial as many black neighborhoods were demolished, causing concern that the program was being used to displace black residents from urban areas. Such controversies dominate the overwhelmingly negative historical narrative surrounding the program. However, previous research has shown that cities with higher levels of program participation saw subsequent increases in city-level measures of income, property value, and population. By documenting project locations within cities, I show how aggregate positive outcomes can mask important negative distributional implications.

Consistent with historical concerns, I find that while the program did clear blighted urban areas, conditional on experience urban blight, neighborhoods with a high share of black residents were more than twice as likely to be cleared and redeveloped. Furthermore, this program had persistent impacts on cities' demographic and economic structure; neighborhoods targeted for urban renewal experienced a persistent decline in population density, housing density, and the share of black residents in directly treated neighborhoods while simultaneously experiencing increases in median rents and median incomes. Relative changes between median rents in treated and untreated neighborhoods within a city suggest that urban renewal drove up rental rates across all low-income neighborhoods and ultimately resulted in a decreased supply of affordable housing. A spatial equilibrium model of locational choice suggests that urban renewal policies had negative welfare implications for households at the lowest end of the income distribution.

The trade-off between urban growth and within city equity is not specific to U.S. cities in the 1950s but is a struggle many cities across the world still face. Documenting the city-wide benefits and understanding the welfare and distributional implications of such programs can help inform policies related to these issues.

References

Daniel Aaronson, Daniel Hartley, and Bhashkar Mazumder. The effects of the 1930s holc "redlining" maps. *Federal Reserve Bank Working Paper*, 2017.

Alberto Abadie and J. Gardeazabal. the economic costs of conflict: A case study of the basque country. *American Economic Review*, 93:113–132, 2003.

Alberto Abadie, Alexis Diamond, and Jens Hainmueller. Synthetic control methods for comparative case studies: Estimating the effect of california's tobacco control program. *Journal of the American Statistical Association*, 105(490):493–505, 2010.

Charles Abrams. Some blessings of urban renewal. In *Urban Renewal: The Record and Controversy*, pages 64–76. MIT Press, Cambridge, MA, 1966.

Daron Acemoglu, Simon Johnson, Amir Kermani, and James Kwak. The value of connections in turbulent times: Evidence from the united states. *Journal of Financial Economics*, 121: 368–391, 2016.

Elizabeth Oltmans Ananat. The wrong side(s) of the tracks: the causal effects of racial segregation on urban poverty and inequality. *American Economic Journal: Applied Economics*, 3(2):34–66, 2011.

Martin Anderson. *The federal bulldozer: A critical analysis of urban renewal, 1949-1962*. MIT Press, 1964.

H. Spencer Banzhaf and Randall Walsh. Do people vote with their feet? an empirical test of tiebout. *American Economic Review*, 98(3):843–63, 2008.

H. Spencer Banzhaf and Randall Walsh. Segregation and tiebout sorting: The link between place-based investments and neighborhood tipping. *Journal of Urban Economics*, 74: 83–98, 2013.

Richard D Bingham. *Public Housing and Urban Renewal: An Analysis of Federal-Local Relations*. Praeger Publishers, New York, 1975.

Leah Platt Boustan. Was postwar suburbanization "white flight"? evidence from the black migration. *The Quarterly Journal of Economics*, 125(1):417–443, 2010.

Richard W. Brooks. Covenants without corts: Enforcing residential segregation with legally unenforceable agreements. *American Economic Review: Papers & Proceedings*, 101(3): 360–365, 2011.

Jan K. Brueckner and Robert W. Helsley. Sprawl and blight. *Journal of Urban Economics*, 69(2):205–13, 2011.

Jan K. Brueckner and Somik V. Lall. *Cities in developing countries: Fueled by rural-urban migration, lacking in tenure security, and short of affordable housing*, volume 5. Elsevier, Handbook of Regional and Urban Economics, 2015.

Raj Chetty and Nathaniel Hendren. The impacts of neighborhoods on intergenerational mobility i: Childhood exposure effects. *The Quarterly Journal of Economics*, 133(3): 1163–1228, 2018a.

Raj Chetty and Nathaniel Hendren. The impacts of neighborhoods on intergenerational mobility ii: County-level estimates. *The Quarterly Journal of Economics*, 133(3):1107–1162, 2018b.

Raj Chetty, Nathaniel Hendren, and Patrick Kline. Where is the land of opportunity? the geography of intergenerational mobility in the united states. *The Quarterly Journal of Economics*, 129(4):1553–1623, 2014.

Raj Chetty, Michael Stepner, Sarah Abraham, Shelby Lin, Benjamin Scuderi, Nicholas Turner, Augustin Bergeron, and David Cutler. The association between income and life expectancy in the united states, 2001-2014. *Jama*, 315(16):1750–1766, 2016.

Eric Chyn. Moved to opportunity: The long-run effects of public housing demolition on children. *American Economic Review*, 108(10):3028–3056, 2018.

W.J. Collins and K.L Shester. Slum clearence and urban renewal in the united states. *American Economic Journal: Applied Economics*, 5(1):239–273, 2013.

Janet Currie and Aaron Yelowitz. Are public housing projects good for kids? *Journal of Public Economics*, 75(1):99–124, 2000.

David M. Cutler and Edward L. Glaeser. Are ghettos good or bad? *The Quarterly Journal of Economics*, 112(3):827–872, 1997.

David M. Cutler, Edward L. Glaeser, and Jacob L. Vigdor. The rise and decline of the american ghetto. *Journal of Political Economy*, 107(3):455–506, 1999.

William A. Darity Jr. Employment discrimination, segregation, and health. *American Public Health Association*, 93(2):226–231, 2003.

Otto A. Davis and Andrew B. Whinston. The economics of urban renewal. *Law and Contemporary Problems*, 26(1):105–17, 1961.

Dennis Epple and Holger Sieg. Estimating equilibrium models of local jurisdictions. *Journal of Political Economy*, 107(4):645–681, 1999.

Robert B. Fairbanks. The texas exception: San antonio and urban renewal, 1949-1965. *Journal of Planning History*, 1(2):181–96, 2002.

Robert B. Fairbanks. The failure of urban renewal in the southwest: From city needs to individual rights. *Western Historical Quarterly*, 37(3):303–25, 2006.

Ashley A. Foard and Hilbert Fefferman. Federal urban renewal legislation. *Law and Contemporary Problems*, 25(4):635–84, 1960.

Jr. Forman, William H. The conflict over federal urban renewal enabling legislation in louisiana. *Louisiana Studies*, 8(3-4):251–67, 1969.

Andrew Goodman-Bacon. Difference-in-difference with variation in treatment timing. *NBER Working Paper*, No w25018, 2018.

Housing and Home Finance Agency. *The housing of relocated families: summary of a bureau of the census survey of families recently displaced from urban renewal sites*. Housing and Home Finance Agency Office of the Administrator, 1965.

Jane Jacobs. *The Death and Life of Great American Cities*. New York: Modern Library, 1961.

Robert E. Lang and Rebecca R. Sohmer. Editor's introduction: Legacy of the housing act of 1949. *Housing Policy Debate*, 11(2):291–98, 2000.

Harari Mariaflavia and Maisy Wong. Long-term impacts of slum upgrading: Evidence from the kampung improvement program in indonesia. *NBER Working Paper*, 2017.

Benjamin Marx, Thomas Stoker, and Tavneet Suri. There is no free house: Ethnic patronage and diversity in a kenyan slum. *Working Paper*, 2014.

Johnson Nina and Jeffrey Tashman. Urban renewal in oregon. *Tashman Johnson LLC.*, 2002.

US Department of Housing and Urban Development. *Urban Renewal Project Characteristics: June 30, 1966*. US Department of Housing and Urban Development (HUD), 1967.

US Department of Housing and Urban Development. *Urban Renewal Directory: June 30, 1974*. US Department of Housing and Urban Development (HUD), 1974.

US Commission on Civil Rights. *Report of the United States Commission on Civil Rights*. 1959.

Charles R. Plott. Some organizational influences on urban renewal decisions. *American Economic Review*, 58(2):306–21, 1968.

Stuart S. Rosenthal. Old homes, externalities, and poor neighborhoods. a model of urban decline and renewal. *Journal of Urban Economics*, 63(3):816–840, 2008.

Richard Rothstein. *The color of law: A forgotten history of how our government segregated America*. Liveright, New York, 2017.

Robert J. Sampson. *Great American City: Chicago and the enduring neighborhood effect*. University of Chicago Press, 2012.

Lawrence D. Schall. Urban renewal policy and economic efficiency. *American Economic Review*, 66(4):612–28, 1976.

Rajiv Sethi and Rohini Somanathan. Inequality and segregation. *Journal of Political Economy*, 112:1296–1321, 2004.

Patrick Sharkey. *Stuck in place: Urban neighborhoods and the end of progress toward racial equality*. University of Chicago Press, 2013.

Allison Shertzer and Randall P. Walsh. Racial sorting and the emergence of segregation in american cities. *National Bureau of Economic Research*, No. w22077, 2016.

Allison Shertzer, Tate Twinam, and Randall P. Walsh. Race, ethnicity, and discriminatory zoning. *American Economic Journal: Applied Economics*, 8(3):217–246, 2016.

William L. Slayton. The operation and achievements of the urban renewal program. In *Urban Renewal: The Record and Controversy*, pages 189–229. MIT Press, Cambridge, MA, 1966.

Wilton Sogg and Warren Wertheimer. Legal and governmental issues in urban renewal. In *Urban Renewal: The Record and Controversy*, pages 126–88. MIT Press, Cambridge, MA, 1966.

Bruce C. Straits. Community adoption and implementation of urban renewal. *American Journal of Sociology*, 71(1):77–82, 1965.

Jon C. Teaford. Urban renewal and its aftermath. *Housing Policy Debate*, 11(2):443–65, 2000.

Joe W. Trotter and Jared N. Day. *Race and renaissance: African Americans in Pittsburgh since world war II*. University of Pittsburgh Press, 2010.

Alexander von Hoffman. A study of contradictions: The origins and legacy of the housing act of 1949. *Housing Policy Debate*, 11(2):299–326, 2000.

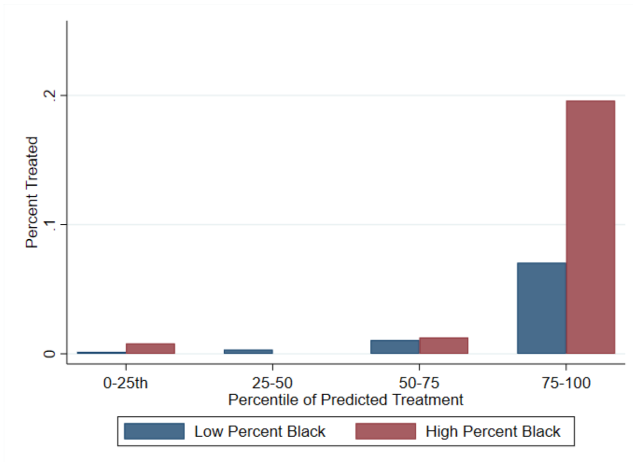
Pritchett Wendell E. The 'public menace' of blight: Urban renewal and the private uses of eminent domain. *Yale Law & Policy Review*, 21(1):1–52, 2003.

Michael White. *Urban renewal and the changing residential structure of the city*. The Community and Family Study Center, The University of Chicago, 1980.

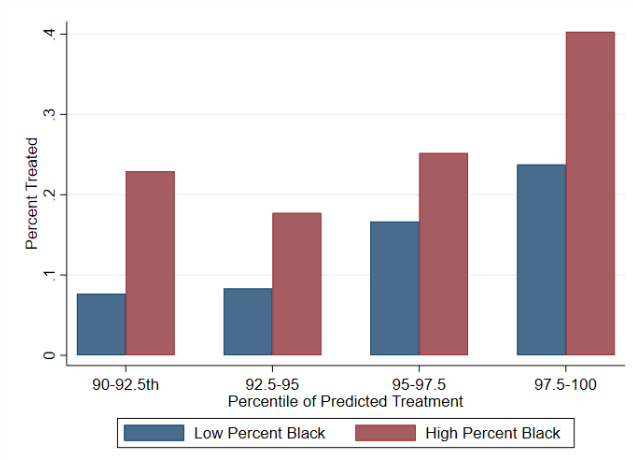
John B. Williams, Paul D Chapman, Louis G. Milan, and Donald T. Knutson. Myths/realities of urban renewal. *Journal of Housing*, 4:170–78, 1973.

James Q. Wilson. *Urban Renewal: The Record and the Controversy*. MIT Press, Cambridge, MA, 1966.

Figures



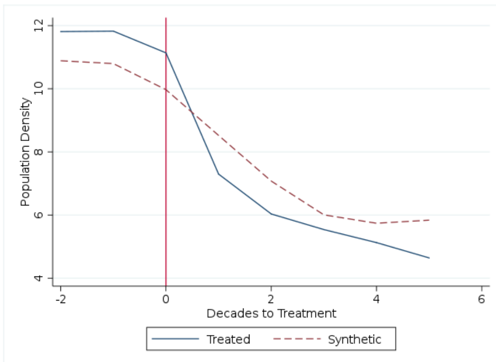
(a) Full Predicted Treatment Distribution



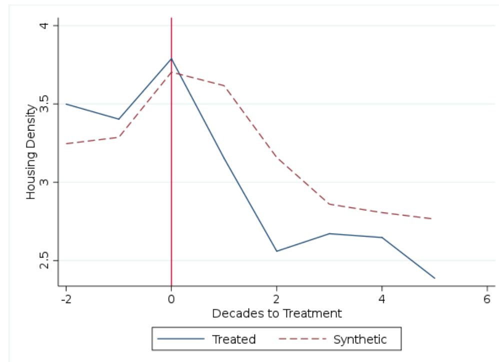
(b) Top 10% of Predicted Treatment Distribution

Figure 1: Racial Bias in Slum Clearance Site Selection

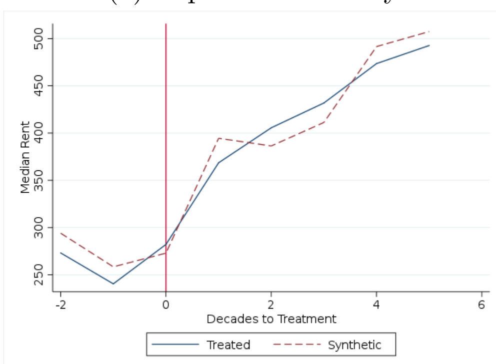
Notes: This figure graphs the share of tracts that received an urban renewal project by quartile of predicted treatment and the share of black residents in a neighborhood. High and low percent black are defined as being above and below the average share of black residents in the sample. Predicted treatment was calculated using a probit regression of treatment on all observable characteristics of neighborhood except racial composition.



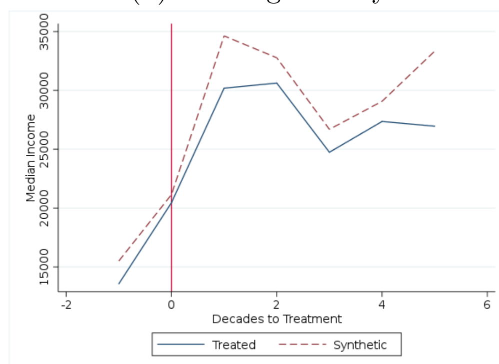
(a) Population Density



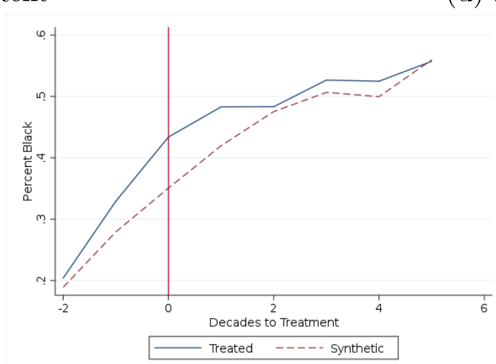
(b) Housing Density



(c) Median Rent



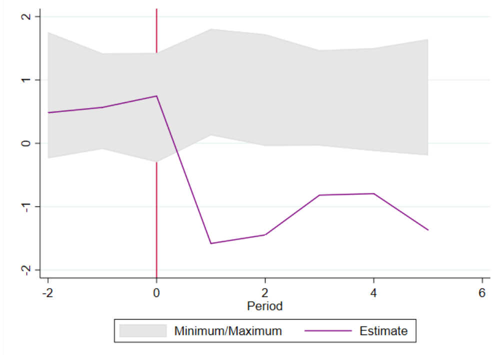
(d) Median Income



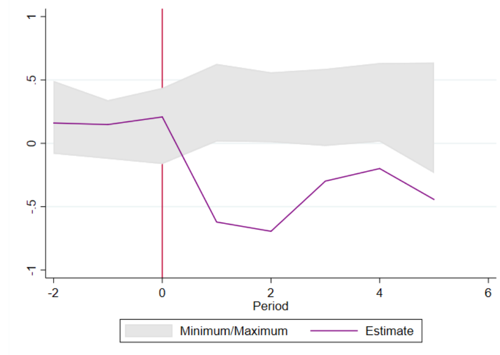
(e) Percent Black

Figure 2: Relative Impacts Within Cities (Summary Statistics)

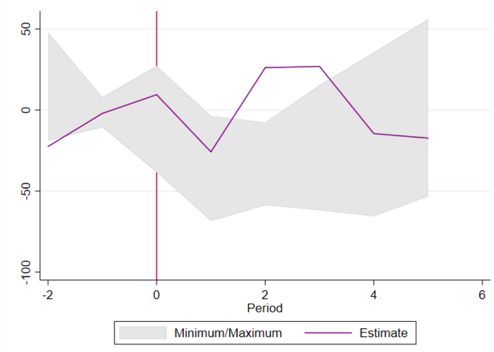
Notes: This figure shows the averaged data for treated neighborhoods and the synthetic control groups. A different synthetic control group was constructed for each treatment neighborhood in my sample. The synthetic control group was constructed to minimize the pretreatment differences in observable characteristics between the treatment and control groups.



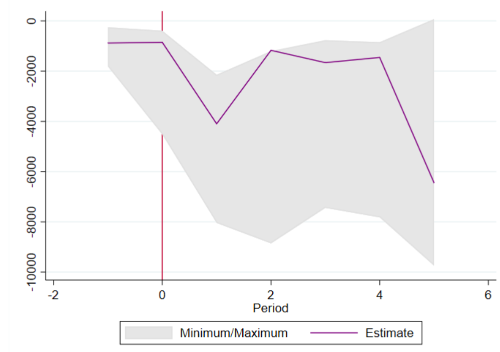
(a) Population Density



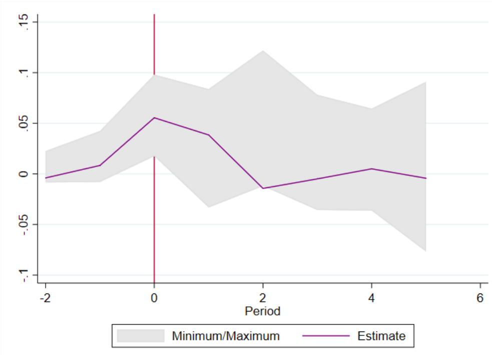
(b) Housing Density



(c) Median Rent



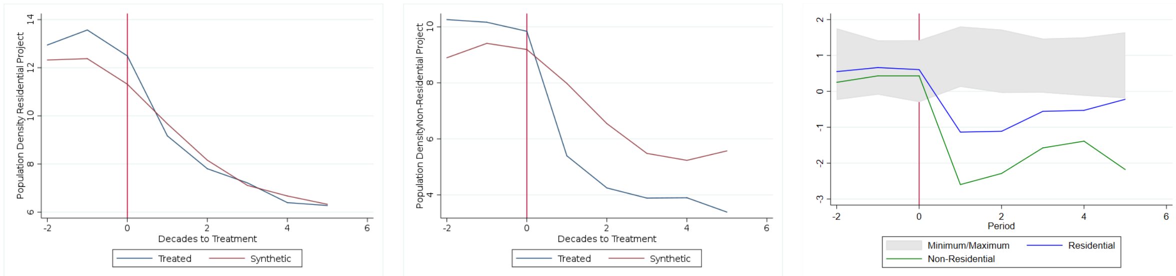
(d) Median Income



(e) Percent Black

Figure 3: Relative Effects of Urban Renewal Within Cities (Synthetic Control Framework)

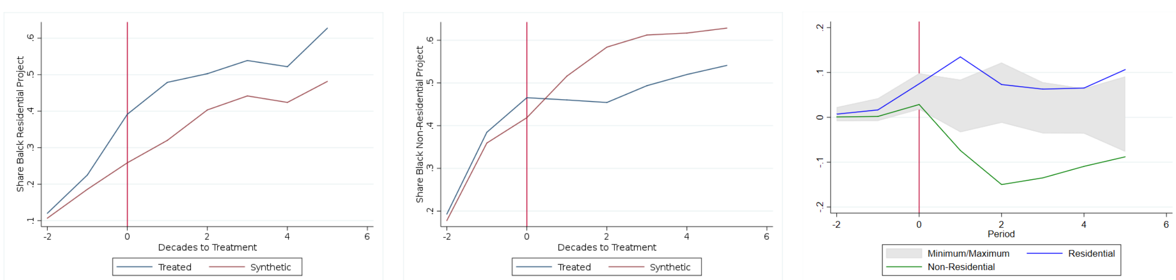
Notes: This figure shows the average differences between treated neighborhoods and the synthetic control groups. The shaded area shows the range of placebo effects estimated when treatment is randomly assigned to neighborhoods.



(a) Residential Projects (b) Non-Residential Projects (c) Treatment Effects

Figure 4: Relative Effects on Population by Project Type

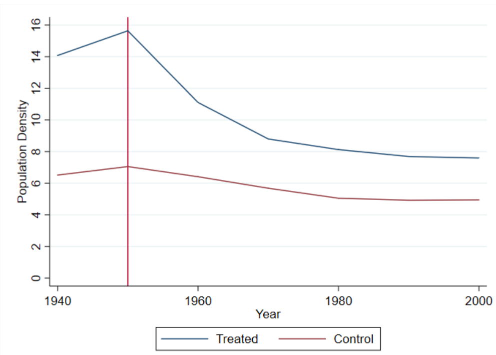
Notes: The outcome variable of interest in this Figure is population per 1000 sq. meters. Panel (a) and (b) of this figure shows the averaged data for treated neighborhoods and the synthetic control groups across residential and non-residential projects separately. A different synthetic control group was constructed for each treatment neighborhood in my sample. The synthetic control group was constructed to minimize the pretreatment differences in observable characteristics between the treatment and control groups. Panel (c) of this figure shows the average differences between treated neighborhoods and the synthetic control groups. The shaded area shows the range of placebo effects estimated when treatment is randomly assigned to neighborhoods.



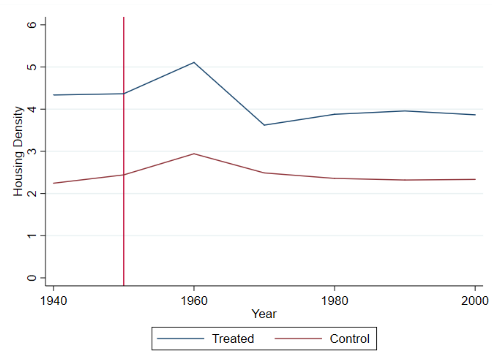
(a) Residential Projects (b) Non-Residential Projects (c) Treatment Effects

Figure 5: Relative Effects on Share Black by Project Type

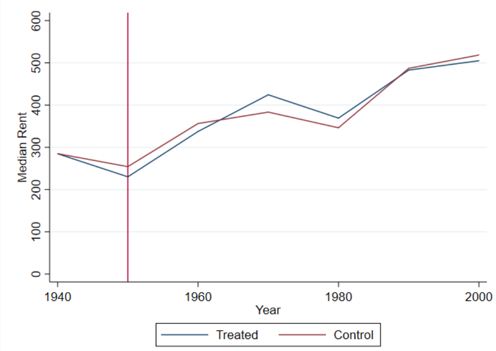
Notes: The outcome variable of interest in this Figure is the share of black residents in a neighborhood. Panel (a) and (b) of this figure shows the averaged data for treated neighborhoods and the synthetic control groups. A different synthetic control group was constructed for each treatment neighborhood in my sample. The synthetic control group was constructed to minimize the pretreatment differences in observable characteristics between the treatment and control groups. Panel (c) of this figure shows the average differences between treated neighborhoods and the synthetic control groups. The shaded area shows the range of placebo effects estimated when treatment is randomly assigned to neighborhoods.



(a) Population Density

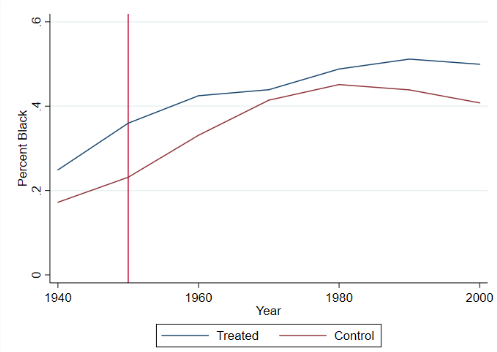


(b) Housing Density



(c) Median Rent

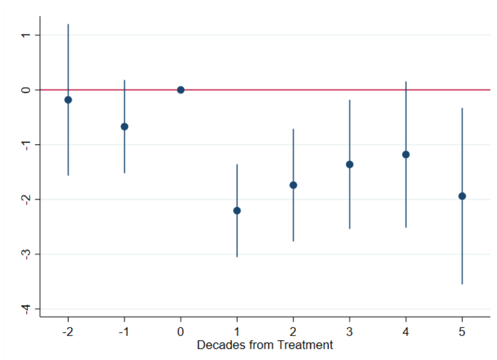
(d) Median Income



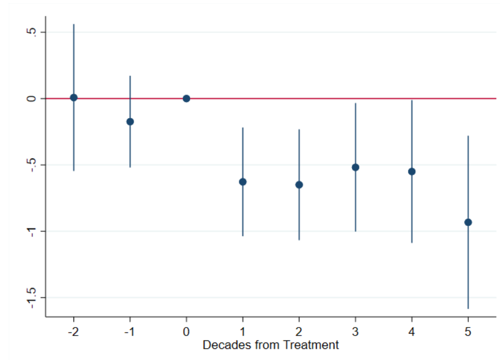
(e) Percent Black

Figure 6: Direct Impact of Urban Renewal (Summary Statistics)

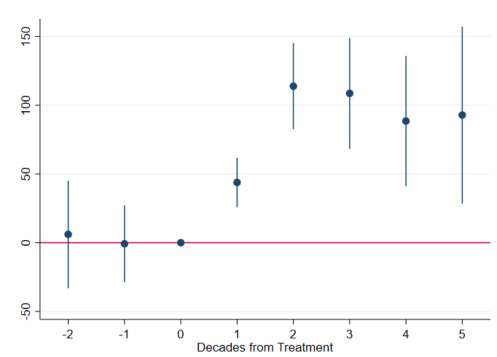
Notes: This figure shows the raw data for treated neighborhoods and predicted slums from control cities. A control city is defined as a city with four or fewer projects during my study period (1949-1965). Slums in control cities are determined through the use of a k-nearest-neighbor algorithm. Neighbor matches are restricted to neighborhoods in cities within the same region of the country to help control for regional effects. In this specification, k=5 was used in the k-nearest neighbors algorithm.



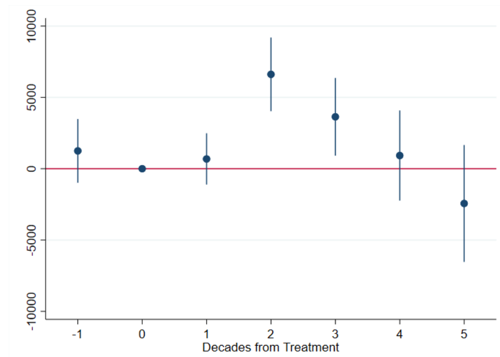
(a) Population Density



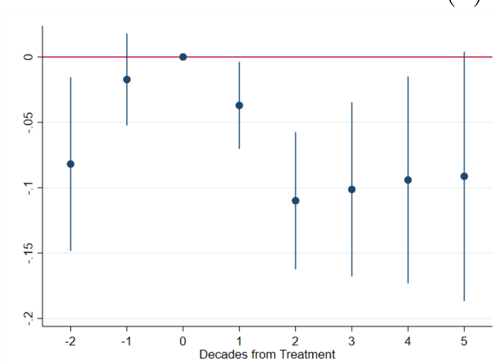
(b) Housing Density



(c) Median Rent



(d) Median Income



(e) Percent Black

Figure 7: Direct Effects of Urban Renewal (Flexible Event Study Framework)

Notes: This figure shows the regression results on the τ_k coefficients from equation 14. In this specification, k=5 was used in the k-nearest neighbors technique to identify urban blight in control cities. Robust standard errors are clustered at the neighborhood level.

Tables

Table 1: Project Characteristics - Land Use

City	Projects	Acres	Resid.	Comm.	Indus.	Public	Streets
Baltimore	15	433	151	107	8	47	120
Boston	9	760	369	82	77	78	154
Buffalo	2	454	227	52	0	30	144
Chicago	31	1,202	464	138	106	201	294
Cincinnati	5	432	39	47	171	33	143
Cleveland	7	597	255	50	122	48	123
Columbus	6	365	138	37	52	27	112
Dallas	0	-	-	-	-	-	-
Detroit	16	984	355	118	120	135	256
Denver	4	100	32	10	28	1	29
Washington D.C.	6	755	217	47	100	93	298
Indianapolis	0	-	-	-	-	-	-
Kansas City	2	13	0	5	0	0	8
Los Angeles	1	136	16	73	0	7	39
Louisville	6	791	261	77	101	77	275
Memphis	6	561	230	62	36	36	197
Milwaukee	5	175	65	15	15	17	64
Minneapolis	6	429	157	45	90	4	133
Newark	11	389	172	58	8	32	119
New Orleans	2	15	3	1	2	4	6
New York	25	656	336	64	0	49	207
Oakland	2	192	31	3	66	3	89
Philadelphia	21	260	93	18	19	50	80
Pittsburgh	6	560	148	63	59	129	161
Portland	2	92	8	34	10	8	31
San Francisco	4	757	459	66	0	6	229
Seattle	2	112	24	11	43	6	27
St. Louis	4	710	163	30	293	9	215
Total	206	11,930	4,413	1,313	1,526	1,130	3,556

Notes: This information was obtained from "Urban Renewal Project Characteristics" (June 30,1966) U.S. Department of Housing and Urban Development - Renewal Assistance Administration.

Table 2: Neighborhood Characteristics

	1940			1950		
	treated	non-treated	p-value	treated	non-treated	p-value
Panel A: Population Characteristics						
Population Density	13.8	6.3	[0.000]	14.4	6.5	[0.000]
	(0.60)	(0.08)		(0.71)	(0.08)	
Unemployment Rate	0.27	0.15	[0.000]	0.16	0.10	[0.000]
	(0.01)	(0.00)		(0.01)	(0.00)	
Percent Black	0.25	0.05	[0.000]	0.31	0.07	[0.000]
	(0.02)	(0.00)		(0.02)	(0.00)	
Median Income				1906.63	2781.20	[0.000]
				(50.11)	(18.12)	
Panel B: Housing Characteristics						
Housing Density	4.25	1.87	[0.000]	4.3	2.01	[0.000]
	(0.21)	(0.03)		(0.23)	(0.03)	
Percent Vacant	0.08	0.05	[0.000]	0.04	0.04	[0.992]
	(0.00)	(0.00)		(0.00)	(0.00)	
Percent Needing Repairs	0.15	0.08	[0.000]			
	(0.01)	(0.00)				
Percent No Water	0.04	0.06	[0.029]			
	(0.00)	(0.00)				
Median House Age				38.7	27.6	[0.000]
				(0.25)	(0.10)	
Panel C: Home Ownership Characteristics						
Percent Owner	0.13	0.39	[0.000]	0.17	0.50	[0.000]
	(0.01)	(0.00)		(0.01)	(0.00)	
Median Value	1839.17	3710.59	[0.000]	1931.76	7000.48	[0.000]
	(126.27)	(21.31)		(161.05)	(45.37)	
Percent Renter	0.79	0.54	[0.000]	0.80	0.46	[0.000]
	(0.01)	(0.00)		(0.01)	(0.00)	
Median Rent	22.80	26.69	[0.000]	31.86	35.82	[0.087]
	(0.51)	(0.12)		(1.34)	(0.17)	
Observations	448	14939		448	14939	

Notes: This table presents summary statistics for the 28 cites in my sample broken down by treated and non-treated census tracts. P-values are from 2-sided t-tests. The null hypothesis that the difference of treated and non-treated means are equal to zero. Median income and median house age are not available in 1940. Share needing major repairs and share without running water are only available in 1940.

Table 3: Determinants of Urban Renewal

	(1)	(2)	(3)
Percent Black	0.37***	0.37***	0.60***
	(0.11)	(0.13)	(0.17)
Unemployment Rate	1.51***	0.98**	3.99***
	(0.27)	(0.50)	(0.51)
Median Income		-0.000	
		(0.000)	
Median House Age		0.021***	
		(0.004)	
Percent Vacant	1.38***	0.840**	4.92***
	(0.36)	(0.398)	(0.62)
Median House Value	-0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Median Rent	-0.001***	-0.001	-0.002***
	(0.0003)	(0.001)	(0.0004)
Percent Owned	-3.23***	-3.09***	-0.51
	(0.31)	(0.312)	(0.43)
Percent Rented	-0.51**	-0.560***	2.10***
	(0.23)	(0.231)	(0.38)
Population Density	0.001	-0.032***	-0.009
	(0.007)	(0.010)	(0.018)
Housing Density	0.025	0.082***	0.068
	(0.016)	(0.020)	(0.064)
Share Needing Major Repairs			-0.29
			(0.41)
Share with No Running Water			-2.31***
			(0.62)
City Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	No
Years Included	1940-1960	1950-1960	1940
Observations	34204	21757	11220
R-squared	0.34	0.35	0.38

Notes: This table presents the results of a probit regression of treatment on observable neighborhood characteristics. Robust standard errors are in parenthesis. Standard errors are clustered at the neighborhood level when panel data is used. $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$. The outcome variable equals one if a tract received an urban renewal project before 1965.

Table 4: Direct Effects of Urban Renewal on Population Density

	(1)	(2)	(3)
$Treated_{it}$	-1.79***	-1.47***	-3.02***
	(0.41)	(0.51)	(0.60)
Neighborhood Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
City Specific Linear Time Trends	Yes	Yes	Yes
Pretreatment Mean of the Treated	14.00	15.39	12.58
Sample	Full	Residential	Non-resid.
Observations	6286	4725	4746
R-squared	0.86	0.88	0.84

Notes: Robust standard errors are clustered at the neighborhood level. $*p < .10$, $**p < .05$, $***p < .01$. The outcome variable in all columns is population per 1000 sq. meters. In this specification, k=5 was used in the k-nearest neighbors technique to identify urban blight in control cities. Column (1) uses all treated tracts while column (2) uses only treated tracts where the majority of the land was used for residential purposes and column (s) uses only treated tracts were the majority of the land was used for non-residential purposes.

Table 5: Direct Effects of Urban Renewal on Housing Density

	(1)	(2)	(3)
$Treated_{it}$	-0.54***	-0.24	-0.85***
	(0.19)	(0.27)	(0.23)
Neighborhood Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
City Specific Linear Time Trends	Yes	Yes	Yes
Pretreatment Mean of the Treated	4.42	4.82	4.01
Sample	Full	Residential	Non-resid.
Observations	6286	4725	4746
R-squared	0.88	0.90	0.87

Notes: Robust standard errors are clustered at the neighborhood level. $*p < .10$, $**p < .05$, $***p < .01$. The outcome variable in all columns is housing units per 1000 sq. meters. In this specification, k=5 was used in the k-nearest neighbors technique to identify urban blight in control cities. Column (1) uses all treated tracts while column (2) uses only treated tracts where the majority of the land was used for residential purposes and column (s) uses only treated tracts were the majority of the land was used for non-residential purposes.

Table 6: Direct Effects of Urban Renewal on Median Rent

	(1)	(2)	(3)
$Treated_{it}$	64.68***	52.10***	87.43***
	(10.62)	(12.17)	(16.08)
Neighborhood Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
City Specific Linear Time Trends	Yes	Yes	Yes
Pretreatment Mean of the Treated	267	287	245
Sample	Full	Residential	Non-resid.
Observations	6286	4725	4746
R-squared	0.67	0.74	0.67

Notes: Robust standard errors are clustered at the neighborhood level. $*p < .10$, $**p < .05$, $***p < .01$. The outcome variable in all columns is median rents. In this specification, k=5 was used in the k-nearest neighbors technique to identify urban blight in control cities. Column (1) uses all treated tracts while column (2) uses only treated tracts where the majority of the land was used for residential purposes and column (s) uses only treated tracts were the majority of the land was used for non-residential purposes.

Table 7: Direct Effects of Urban Renewal on Median Income

	(1)	(2)	(3)
$Treated_{it}$	2878***	4423***	3755***
	(901)	(1274)	(1214)
Neighborhood Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
City Specific Linear Time Trends	Yes	Yes	Yes
Pretreatment Mean of the Treated	15949	17072	14662
Sample	Full	Residential	Non-resid.
Observations	5388	4050	4746
R-squared	0.67	0.74	0.87

Notes: Robust standard errors are clustered at the neighborhood level. $*p < .10$, $**p < .05$, $***p < .01$. The outcome variable in all columns is median income. In this specification, k=5 was used in the k-nearest neighbors technique to identify urban blight in control cities. Column (1) uses all treated tracts while column (2) uses only treated tracts where the majority of the land was used for residential purposes and column (s) uses only treated tracts were the majority of the land was used for non-residential purposes.

Table 8: Direct Effects of Urban Renewal on Share Black

	(1)	(2)	(3)
$Treated_{it}$	-0.05***	0.02	-0.15***
	(0.02)	(0.03)	(0.02)
Neighborhood Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
City Specific Linear Time Trends	Yes	Yes	Yes
Pretreatment Mean of the Treated	0.31	0.29	.34
Sample	Full	Residential	Non-resid.
Observations	6286	4725	4746
R-squared	0.79	0.81	0.79

Notes: Robust standard errors are clustered at the neighborhood level. $^*p < .10$, $^{**}p < .05$, $^{***}p < .01$. The outcome variable in all columns is percentage black. In this specification, k=5 was used in the k-nearest neighbors technique to identify urban blight in control cities. Column (1) uses all treated tracts while column (2) uses only treated tracts where the majority of the land was used for residential purposes and column (s) uses only treated tracts were the majority of the land was used for non-residential purposes.

Appendix

Additional Figures

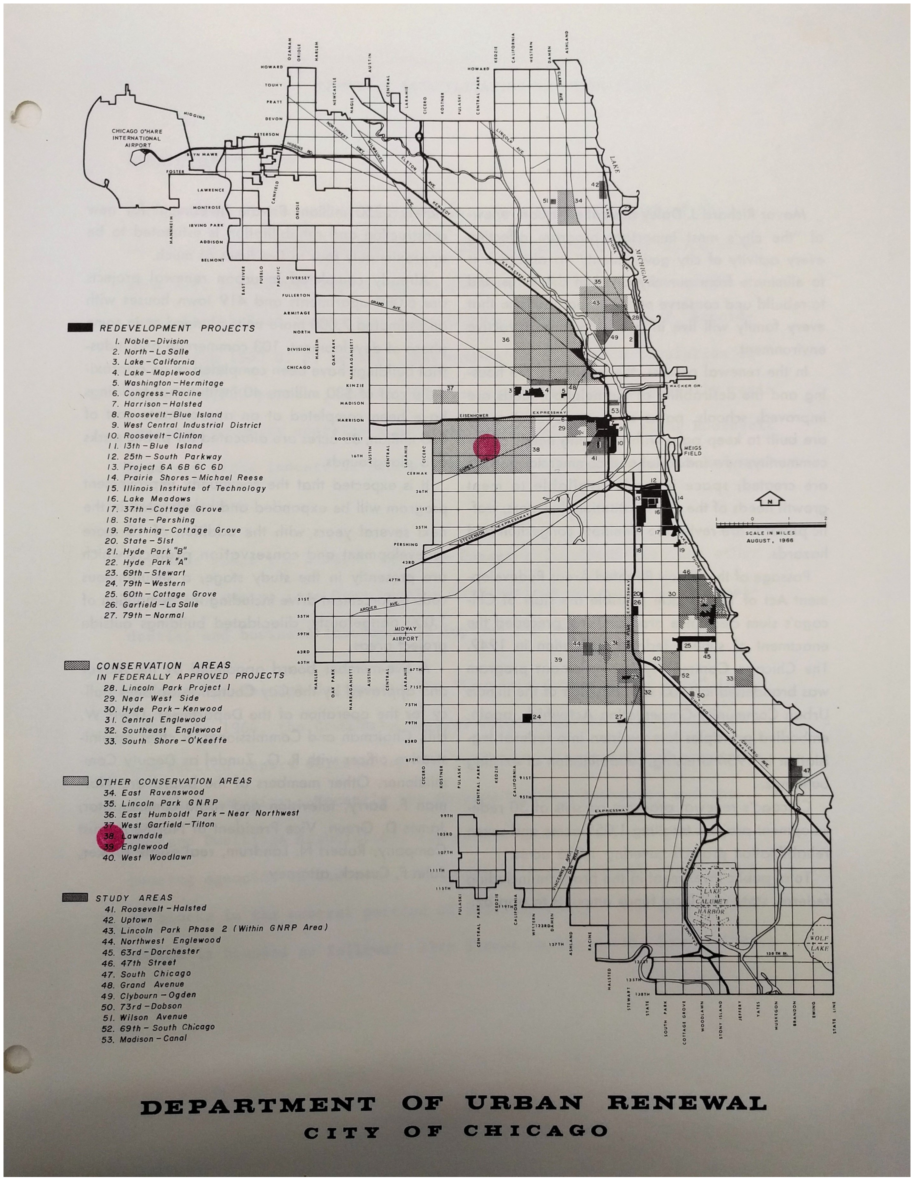


Figure A1: Urban Renewal Projects in Chicago

Notes: This figure shows the primary source for Urban Renewal projects in Chicago.

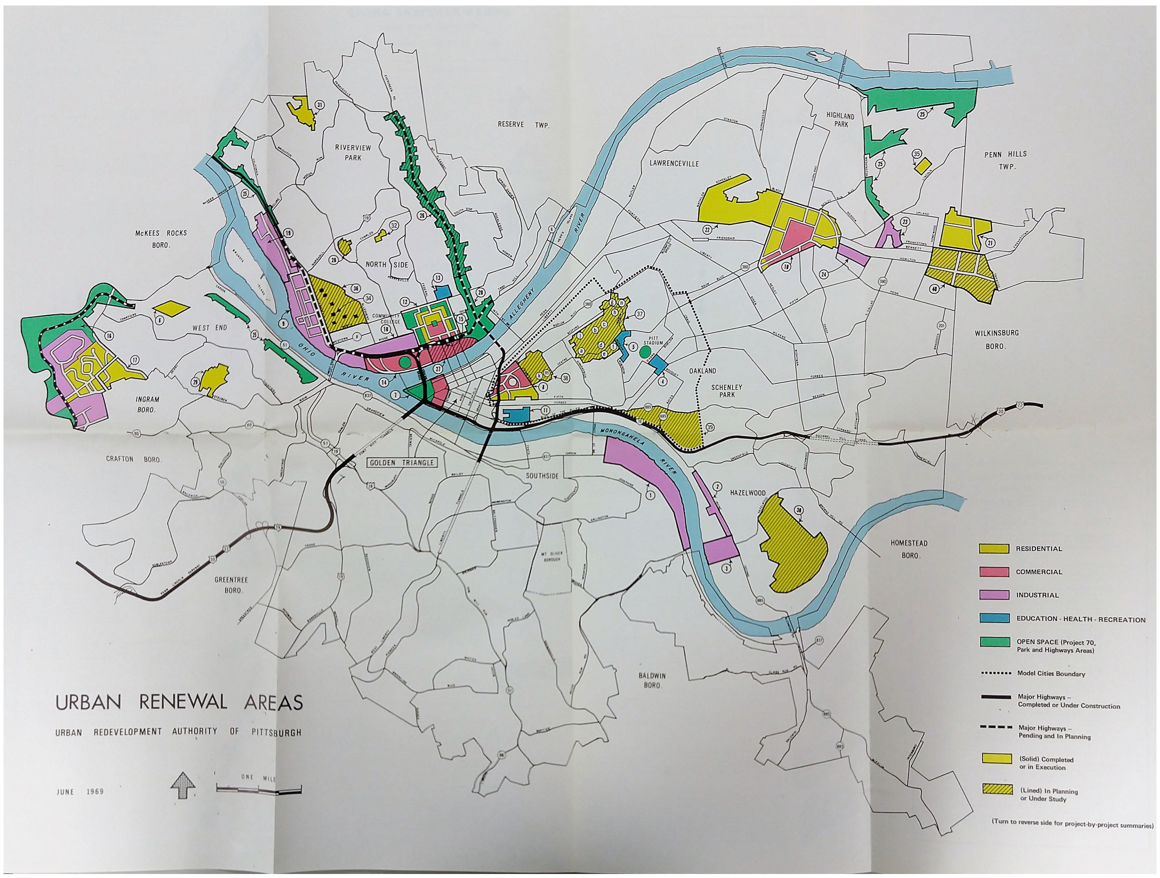


Figure A2: Urban Renewal Projects in Pittsburgh

Notes: This figure shows the primary source for Urban Renewal projects in Pittsburgh.

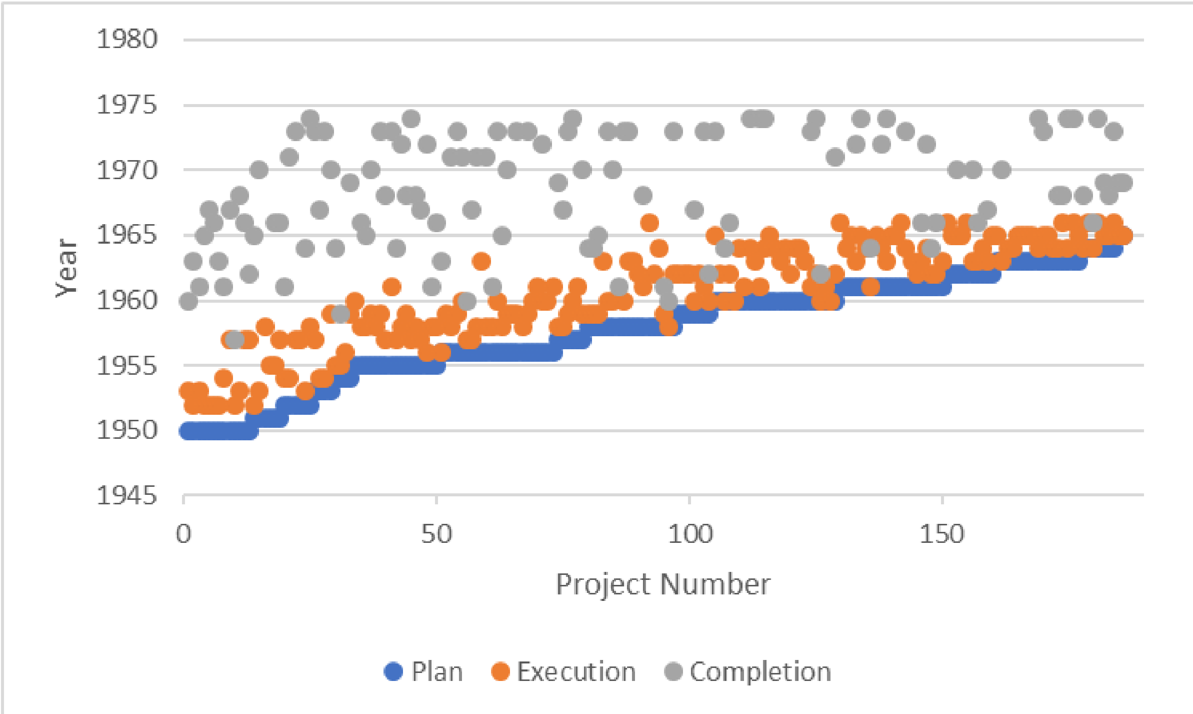
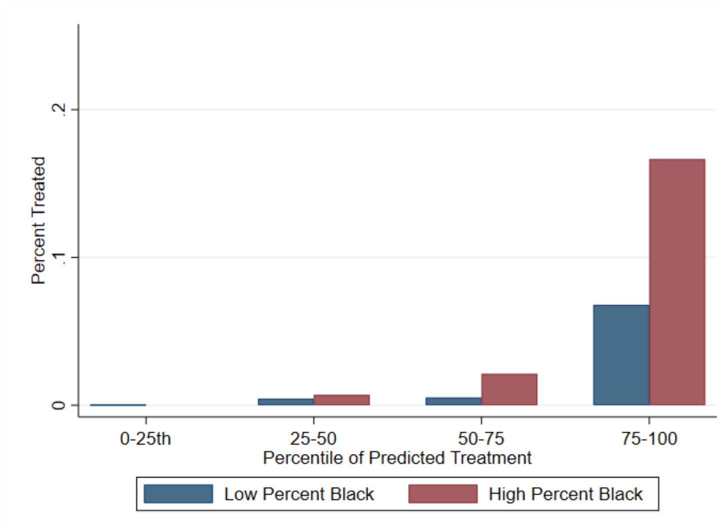
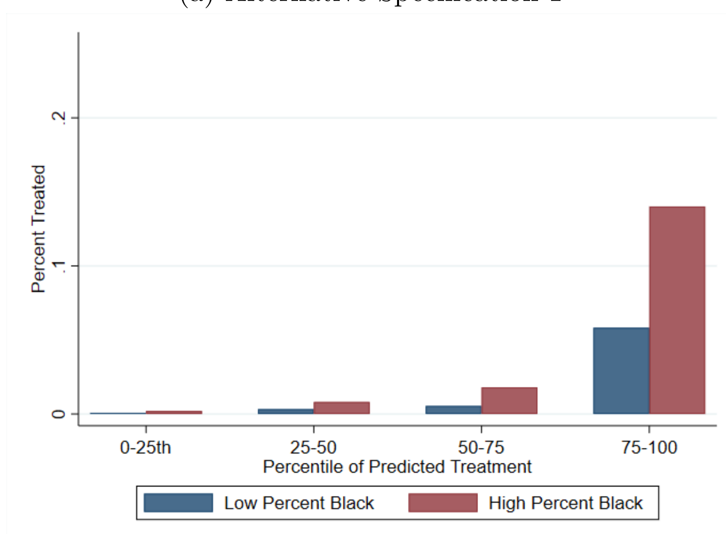


Figure A3: Project Timing

Notes: This figure plots the timing variables associated with the urban renewal projects used in this analysis. Data comes from the "Urban Renewal Directory" (June 30,1974) U.S. Department of Housing and Urban Development - Community Planning and Development.



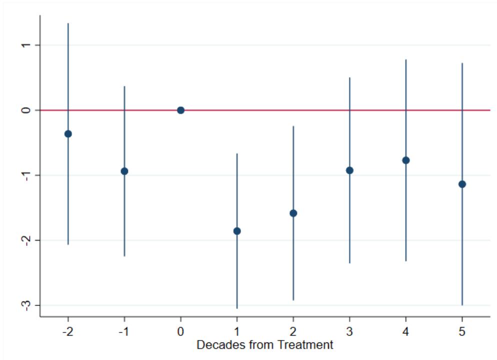
(a) Alternative Specification 1



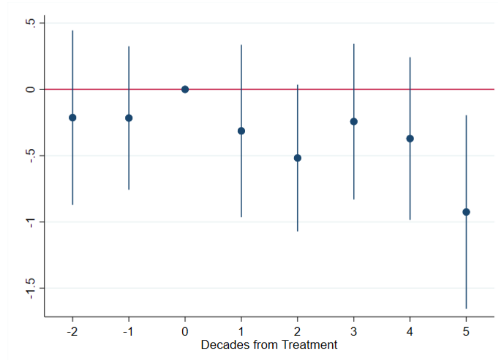
(b) Alternative Specification 2

Figure A4: Racial Bias in Slum Clearance Site Selection - Alternative Specifications

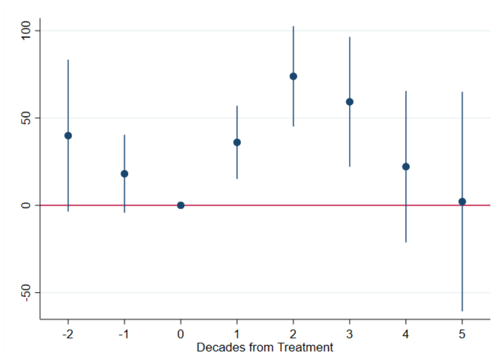
Notes: This figure graphs the share of tracts that received an urban renewal project by quartile of predicted treatment and the share of black residents in a neighborhood. High and low percent black are defined as being above and below the average share of black residents in the sample. Predicted treatment was calculated using a probit regression of treatment on all observable characteristics of neighborhood except racial composition. These specifications correspond to the specifications used in column (1) and column (2) of Table 3.



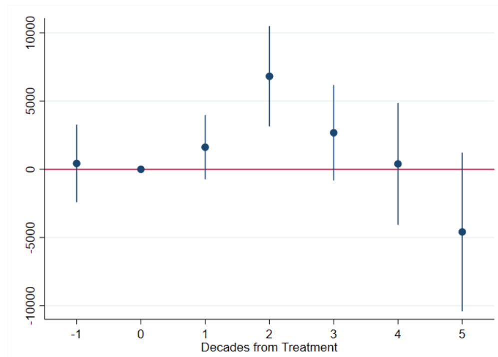
(a) Population Density



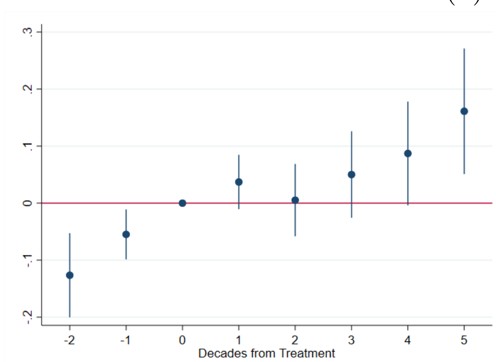
(b) Housing Density



(c) Median Rent



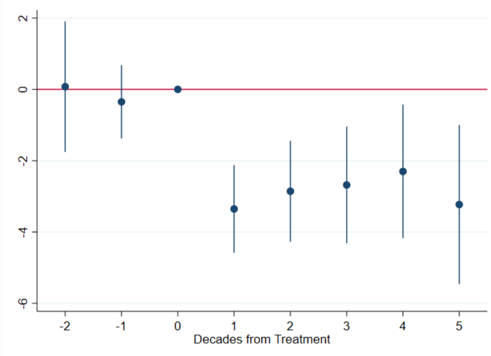
(d) Median Income



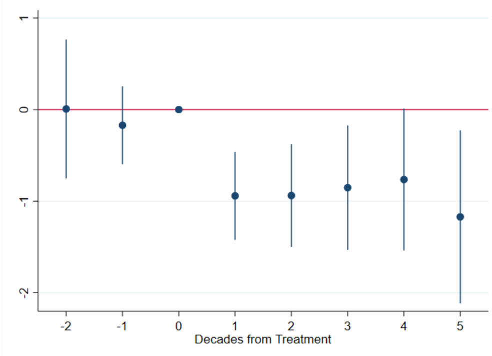
(e) Percent Black

Figure A5: Direct Effects of Urban Renewal - Residential Projects Only

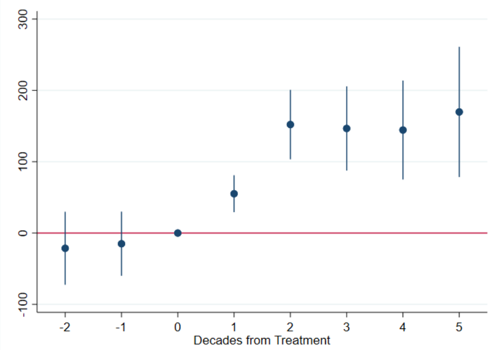
Notes: This figure shows the regression results on the τ_k coefficients from equation 14. In this specification, k=5 was used in the k-nearest neighbors technique to identify urban blight in control cities. Robust standard errors are clustered at the neighborhood level. Only residential projects were used in this specification.



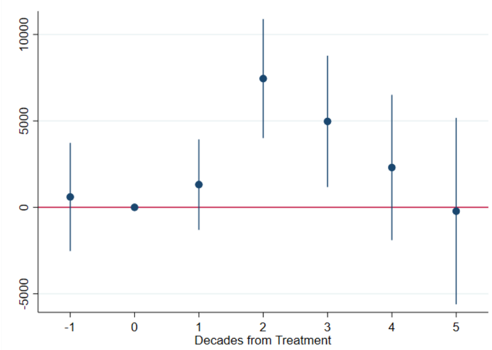
(a) Population Density



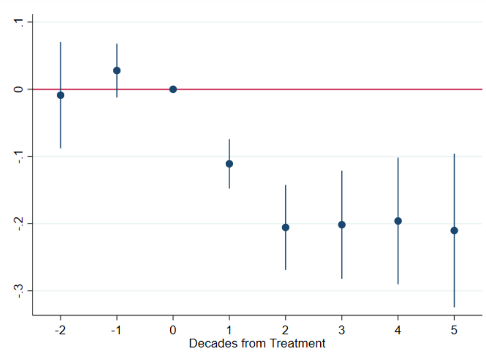
(b) Housing Density



(c) Median Rent



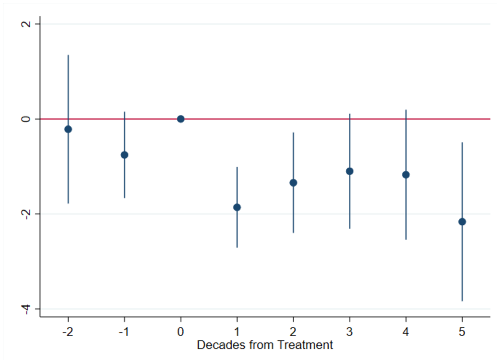
(d) Median Income



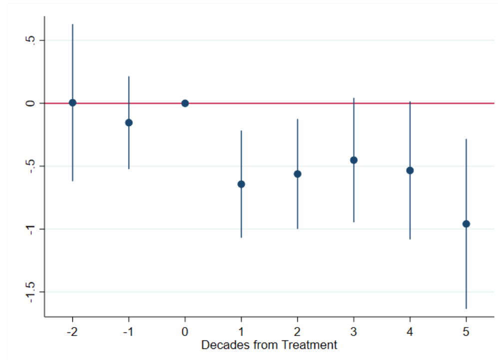
(e) Percent Black

Figure A6: Direct Effects of Urban Renewal - Non-Residential Projects Only

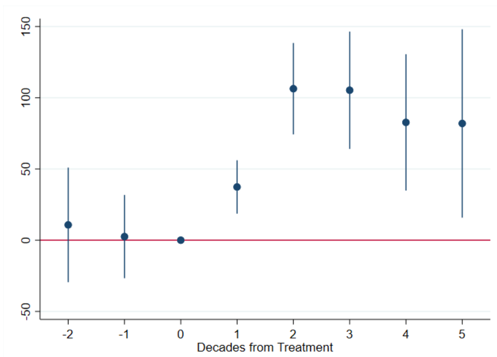
Notes: This figure shows the regression results on the τ_k coefficients from equation 14. In this specification, k=5 was used in the k-nearest neighbors technique to identify urban blight in control cities. Robust standard errors are clustered at the neighborhood level. Only non-residential projects were used in this specification.



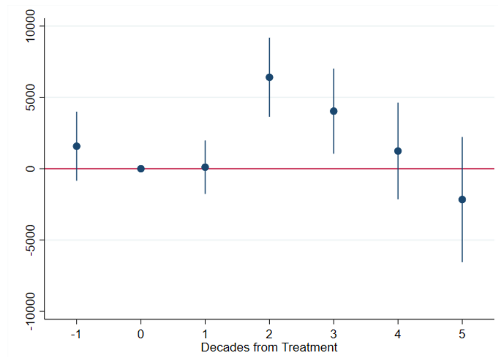
(a) Population Density



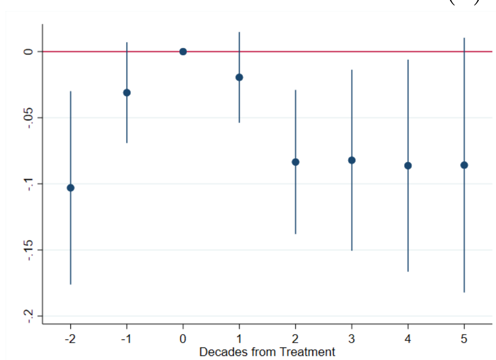
(b) Housing Density



(c) Median Rent



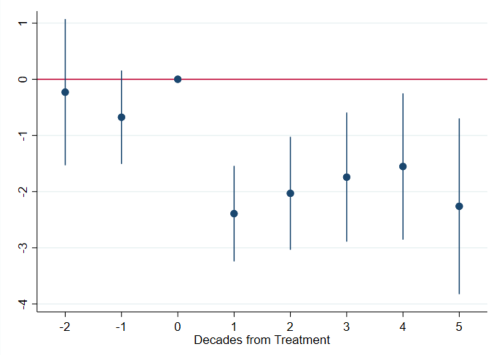
(d) Median Income



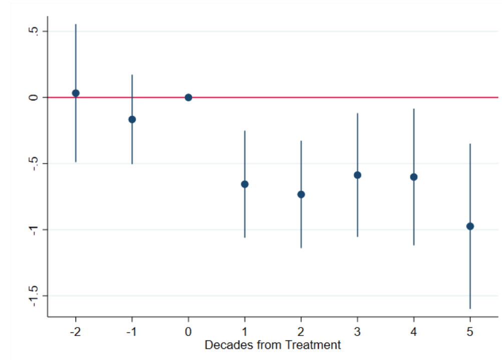
(e) Percent Black

Figure A7: Direct Effects of Urban Renewal - Flexible Event Study Framework

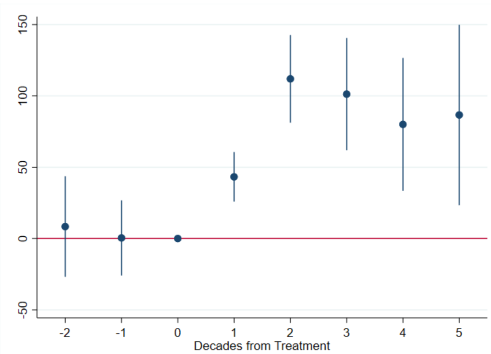
Notes: This figure shows the regression results on the τ_k coefficients from equation 14. In this specification, k=3 was used in the k-nearest neighbors technique to identify urban blight in control cities. Robust standard errors are clustered at the neighborhood level.



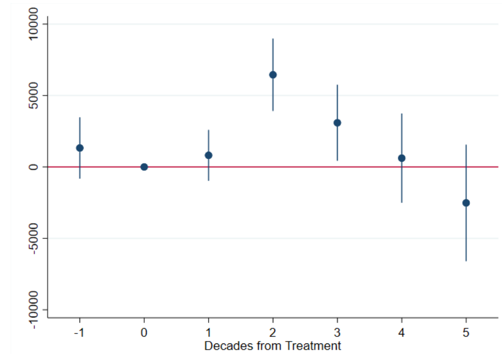
(a) Population Density



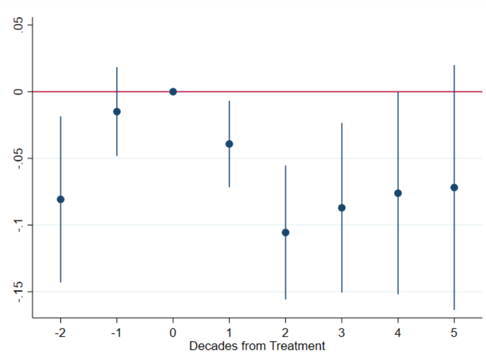
(b) Housing Density



(c) Median Rent



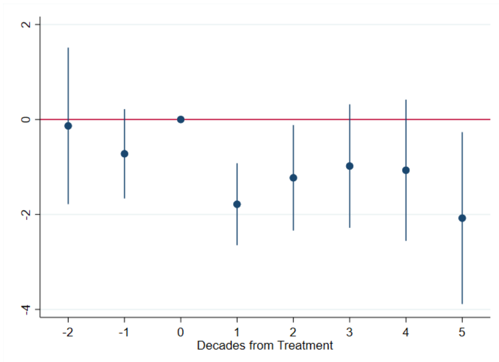
(d) Median Income



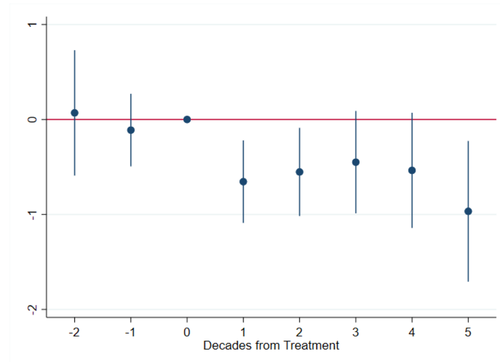
(e) Percent Black

Figure A8: Direct Effects of Urban Renewal - Flexible Event Study Framework

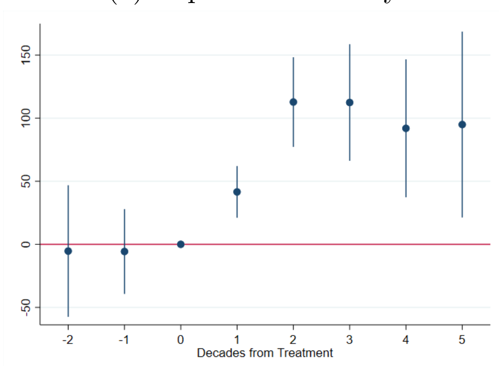
Notes: This figure shows the regression results on the τ_k coefficients from equation 14. In this specification, k=7 was used in the k-nearest neighbors technique to identify urban blight in control cities. Robust standard errors are clustered at the neighborhood level.



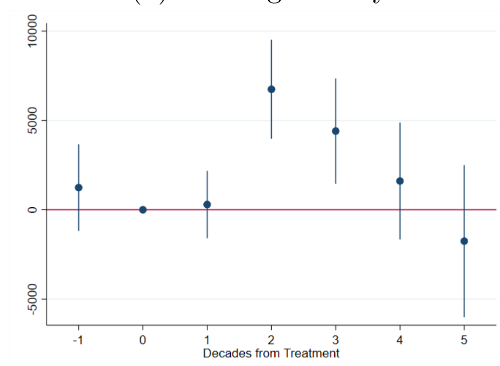
(a) Population Density



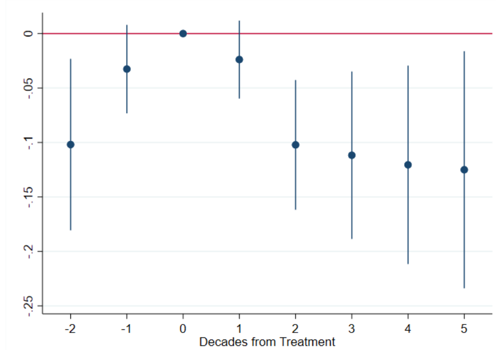
(b) Housing Density



(c) Median Rent



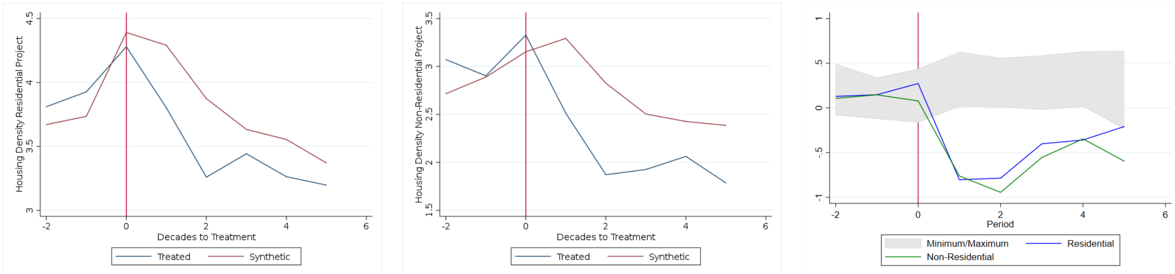
(d) Median Income



(e) Percent Black

Figure A9: Direct Effects of Urban Renewal - Flexible Event Study Framework

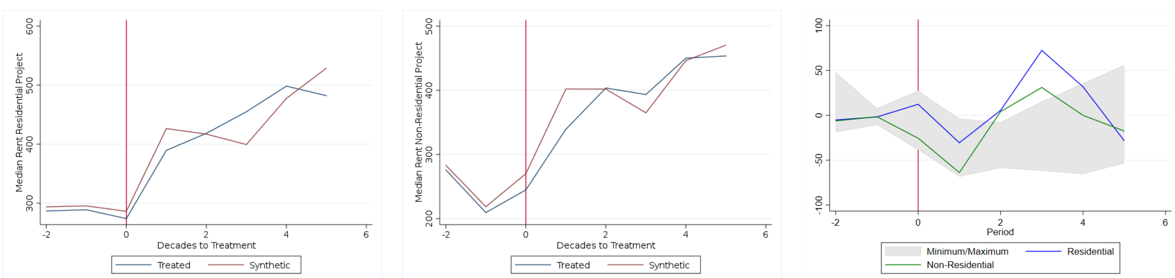
Notes: This figure shows the regression results on the τ_k coefficients from equation 14. In this specification, k=5 was used in the k-nearest neighbors technique to identify urban blight in control cities. In this specification, *data was only matched on 1950 values.* Robust standard errors are clustered at the neighborhood level.



(a) Residential Projects (b) Non-Residential Projects (c) Treatment Effects

Figure A10: Relative Effects on Housing Density by Project Type

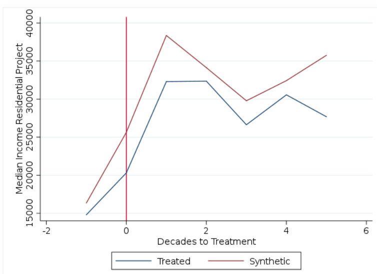
Notes: The outcome variable of interest in this Figure is houses per 1000 sq. meters. Panel (a) and (b) of this figure shows the averaged data for treated neighborhoods and the synthetic control groups across residential and non-residential projects separately. A different synthetic control group was constructed for each treatment neighborhood in my sample. The synthetic control group was constructed to minimize the pretreatment differences in observable characteristics between the treatment and control groups. Panel (c) of this figure shows the average differences between treated neighborhoods and the synthetic control groups. The shaded area shows the range of placebo effects estimated when treatment is randomly assigned to neighborhoods.



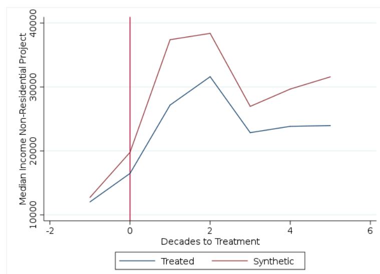
(a) Residential Projects (b) Non-Residential Projects (c) Treatment Effects

Figure A11: Relative Effects on Median Rent by Project Type

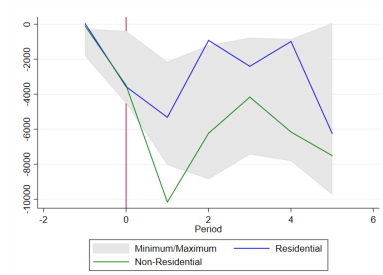
Notes: The outcome variable of interest in this Figure is median rent. Panel (a) and (b) of this figure shows the averaged data for treated neighborhoods and the synthetic control groups across residential and non-residential projects separately. A different synthetic control group was constructed for each treatment neighborhood in my sample. The synthetic control group was constructed to minimize the pretreatment differences in observable characteristics between the treatment and control groups. Panel (c) of this figure shows the average differences between treated neighborhoods and the synthetic control groups. The shaded area shows the range of placebo effects estimated when treatment is randomly assigned to neighborhoods.



(a) Residential Projects



(b) Non-Residential Projects



(c) Treatment Effects

Figure A12: Relative Effects on Median Income by Project Type

Notes: The outcome variable of interest in this Figure is median income. Panel (a) and (b) of this figure shows the averaged data for treated neighborhoods and the synthetic control groups across residential and non-residential projects separately. A different synthetic control group was constructed for each treatment neighborhood in my sample. The synthetic control group was constructed to minimize the pretreatment differences in observable characteristics between the treatment and control groups. Panel (c) of this figure shows the average differences between treated neighborhoods and the synthetic control groups. The shaded area shows the range of placebo effects estimated when treatment is randomly assigned to neighborhoods.

Additional Tables

Table A1: Cities in Sample

City	Projects	Funding (Millions of $)	Locations Identified	Control City
Baltimore	15	82	15	
Boston	9	243	9	
Buffalo	2	33	2	Yes
Chicago	31	180	31	
Cincinnati	5	92	2	
Cleveland	7	97	1	
Columbus	6	24	4	
Dallas	0	0	0	Yes
Detroit	16	79	16	
Denver	4	7	4	Yes
Washington D.C.	6	96	6	
Indianapolis	0	0	0	Yes
Kansas City	2	2	1	Yes
Los Angeles	1	20	1	Yes
Louisville	6	90	3	
Memphis	6	29	1	
Milwaukee	5	24	3	
Minneapolis	6	41	6	
Newark	11	121	11	
New Orleans	2	2	1	Yes
New York	25	247	25	
Oakland	2	15	0	Yes
Philadelphia	21	43	21	
Pittsburgh	6	111	6	
Portland	2	11	2	Yes
San Francisco	4	118	4	Yes
Seattle	2	9	2	Yes
St. Louis	4	70	4	Yes
Total	204	1,657	183	12

Source: "Urban Renewal Directory" (June 30,1974) U.S. Department of Housing and Urban Development - Community Planning and Development.

Table A2: Project Characteristics - Housing and Race

City	Projects	Sub-Standard	Standard	White	Non-White
Baltimore	15	6,477	2,514	2,225	6,251
Boston	9	11,761	2,841	6,962	3,268
Buffalo	2	3000	814	1632	1612
Chicago	31	24,320	4,583	8,103	14,491
Cincinnati	5	7255	2286	328	3943
Cleveland	7	4147	2027	716	5173
Columbus	6	1876	400	712	767
Dallas	0	-	-	-	-
Detroit	16	8,677	1,780	1,970	5,397
Denver	4	462	80	500	139
Washington D.C.	6	6,070	2,156	1,925	5,620
Indianapolis	0	-	-	-	-
Kansas City	2	0	0	23	16
Los Angeles	1	3,413	1,674	1,294	48
Louisville	6	4641	1099	1931	1756
Memphis	6	2729	580	811	1393
Milwaukee	5	2433	1287	911	367
Minneapolis	6	2016	478	1738	710
Newark	11	5499	1334	1952	3620
New Orleans	2	323	19	6	162
New York	25	35,859	2,158	15,400	9,936
Oakland	2	1735	55	0	0
Philadelphia	21	4,853	1,682	674	3,132
Pittsburgh	6	5506	1934	2791	1819
Portland	2	1105	682	444	156
San Francisco	4	9858	3932	1633	3051
Seattle	2	243	163	65	10
St. Louis	4	9591	249	1609	5285
Total	206	163,849	36,807	56,355	78,122

Notes: This information was obtained from "Urban Renewal Project Characteristics" (June 30,1966) U.S. Department of Housing and Urban Development - Renewal Assistance Administration.

Table A3: Direct Effects of Urban Renewal on Population Density

	(1)	(2)	(3)
$Treated_{it}$ - knn(3)	-1.42***	-1.21**	-2.66***
	(0.43)	(0.51)	(0.61)
$Treated_{it}$ - knn(5)	-1.79***	-1.47***	-3.02***
	(0.41)	(0.51)	(0.60)
$Treated_{it}$ - knn(7)	-2.00***	-1.60***	-3.20***
	(0.41)	(0.51)	(0.60)
$Treated_{it}$ - match on 1950	-1.36***	-1.17***	-2.58***
	(0.44)	(0.52)	(0.63)
Neighborhood Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
City Specific Linear Time Trends	Yes	Yes	Yes
Pretreatment Mean of the Treated	14.00	15.39	12.58
Sample	Full	Residential	Non-resid.

Notes: Robust standard errors are clustered at the neighborhood level. *$p < .10$, **$p < .05$, ***$p < .01$. The outcome variable in all columns is population per 1000 sq. meters. Each table entry corresponds to a separate regression. Column (1) uses all treated tracts while column (2) uses only treated tracts where the majority of the land was used for residential purposes and column (s) uses only treated tracts were the majority of the land was used for non-residential purposes.

Table A4: Direct Effects of Urban Renewal on Housing Density

	(1)	(2)	(3)
$Treated_{it}$ - knn(3)	-0.54***	-0.29	-0.82***
	(0.20)	(0.28)	(0.24)
$Treated_{it}$ - knn(5)	-0.54***	-0.24	-0.85***
	(0.19)	(0.27)	(0.23)
$Treated_{it}$ - knn(7)	-0.59***	-0.27	-0.92***
	(0.18)	(0.27)	(0.22)
$Treated_{it}$ - match on 1950	-0.56***	-0.30	-0.83***
	(0.21)	(0.29)	(0.25)
Neighborhood Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
City Specific Linear Time Trends	Yes	Yes	Yes
Pretreatment Mean of the Treated	4.42	4.82	4.01
Sample	Full	Residential	Non-resid.

Notes: Robust standard errors are clustered at the neighborhood level. $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$. The outcome variable in all columns is housing units per 1000 sq. meters. Each table entry corresponds to a separate regression. Column (1) uses all treated tracts while column (2) uses only treated tracts where the majority of the land was used for residential purposes and column (s) uses only treated tracts were the majority of the land was used for non-residential purposes.

Table A5: Direct Effects of Urban Renewal on Median Rent

	(1)	(2)	(3)
$Treated_{it}$ - knn(3)	55.37***	41.44***	78.48***
	(10.60)	(12.26)	(15.84)
$Treated_{it}$ -knn(5)	64.68***	52.10***	87.43***
	(10.62)	(12.17)	(16.08)
$Treated_{it}$ - knn(7)	64.96***	50.58***	88.25***
	(10.44)	(12.05)	(16.09)
$Treated_{it}$ - match on 1950	58.94***	49.41***	65.14***
	(11.59)	(13.42)	(16.52)
Neighborhood Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
City Specific Linear Time Trends	Yes	Yes	Yes
Pretreatment Mean of the Treated	267	287	245
Sample	Full	Residential	Non-resid.

Notes: Robust standard errors are clustered at the neighborhood level. $*p < .10$, $**p < .05$, $***p < .01$. The outcome variable in all columns is median rents. Each table entry corresponds to a separate regression. Column (1) uses all treated tracts while column (2) uses only treated tracts where the majority of the land was used for residential purposes and column (s) uses only treated tracts were the majority of the land was used for non-residential purposes.

Table A6: Direct Effects of Urban Renewal on Median Income

	(1)	(2)	(3)
$Treated_{it}$ - knn(3)	1883**	3655***	2848***
	(938)	(1268)	(1235)
$Treated_{it}$ - knn(5)	2878***	4423***	3755***
	(901)	(1274)	(1214)
$Treated_{it}$ - knn(7)	3069***	4398***	3863***
	(892)	(1276)	(1215)
$Treated_{it}$ - match on 1950	2002**	4292***	2717**
	(947)	(1238)	(1262)
Neighborhood Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
City Specific Linear Time Trends	Yes	Yes	Yes
Pretreatment Mean of the Treated	15949	17072	14662
Sample	Full	Residential	Non-resid.

Notes: Robust standard errors are clustered at the neighborhood level. *$p <$ .10, **$p < .05$, ***$p < .01$. The outcome variable in all columns is median income. Each table entry corresponds to a separate regression. Column (1) uses all treated tracts while column (2) uses only treated tracts where the majority of the land was used for residential purposes and column (s) uses only treated tracts were the majority of the land was used for non-residential purposes.

Table A7: Direct Effects of Urban Renewal on Share Black

	(1)	(2)	(3)
$Treated_{it}$ - knn(3)	-0.03	0.04	-0.12***
	(0.02)	(0.03)	(0.02)
$Treated_{it}$ - knn(5)	-0.05***	0.02	-0.15***
	(0.02)	(0.03)	(0.02)
$Treated_{it}$ - knn(7)	-0.06***	0.02	-0.15***
	(0.02)	(0.03)	(0.02)
$Treated_{it}$ - match on 1950	-0.04*	0.04	-0.12***
	(0.02)	(0.03)	(0.03)
Neighborhood Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
City Specific Linear Time Trends	Yes	Yes	Yes
Pretreatment Mean of the Treated	0.31	0.29	.34
Sample	Full	Residential	Non-resid.

Notes: Robust standard errors are clustered at the neighborhood level. *p < .10, **p < .05, ***p < .01. The outcome variable in all columns is percentage black. Each table entry corresponds to a separate regression. Column (1) uses all treated tracts while column (2) uses only treated tracts where the majority of the land was used for residential purposes and column (s) uses only treated tracts were the majority of the land was used for non-residential purposes.

A Full Model

This section formalizes the spatial equilibrium model of locational choice presented in Section 3 of the paper. This model is then used to document the impact of urban renewal projects on neighborhood outcomes and discuss the welfare implications of neighborhood level changes on households. I show that implications of such projects depend on the relative magnitudes of the opposing effects caused by an increase in neighborhood quality (quality effect) and a decrease in the supply of housing (supply effect), although, households in the lowest end of the income distribution are made worse off in all scenarios.

This model consists of a city with two neighborhood options for low-income households.[24] These neighborhoods are indexed by j where $j \in \{l, h\}$. Neighborhoods are differentiated by the level of housing supply, S_j, neighborhood quality, q_j, and housing price, p_j. I will refer to these two neighborhoods as the low-price, low-quality neighborhood and the high-price, high-quality neighborhood, where the high-price, high-quality neighborhood is defined in relative terms to the low-price, low-quality neighborhood. I assume that mobility between neighborhoods is costless.

There exists a continuum of low-income households that live in the city. Households are characterized by their income, y_i and their race, $r \in \{b, w\}$. The distribution of income is given by $f(y)$ and has continuous support over the interval $[y_{min}, y_{max}]$. Households choose to live in one of the two neighborhoods and, conditional on neighborhood choice, they choose their optimal level of housing. Rents are paid to exogenous absentee landlords. Household preferences are represented by the indirect utility function V(y,p,q).[25] This specification of V(.) implicitly assumes the inclusion of a numeraire whose price is normalized to one. V(.) is assumed to be continuous with bounded first derivatives that satisfy $V_y > 0$, $V_p < 0$, and $V_q > 0$.

I also assume that household preferences satisfy the "single crossing" property. This assumption requires that the slope of an indirect indifference curve in the (q,p) plane is increasing in y.[26] In other words, higher income households are willing to pay more than a low income household for an increase in neighborhood quality. This assumption allows for a ranking of neighborhoods that increases in both p and q. Thus, neighborhood l is characterized by (q_l, p_l) and neighborhood h is characterized by (q_h, p_h) where $p_l < p_h$ and $q_l < q_h$. Further, this assumption guarantees the existence of a set of boundary households, uniquely identified by income, who are indifferent between both neighborhoods. I denote the income that characterizes these households by $\tilde{y}$.

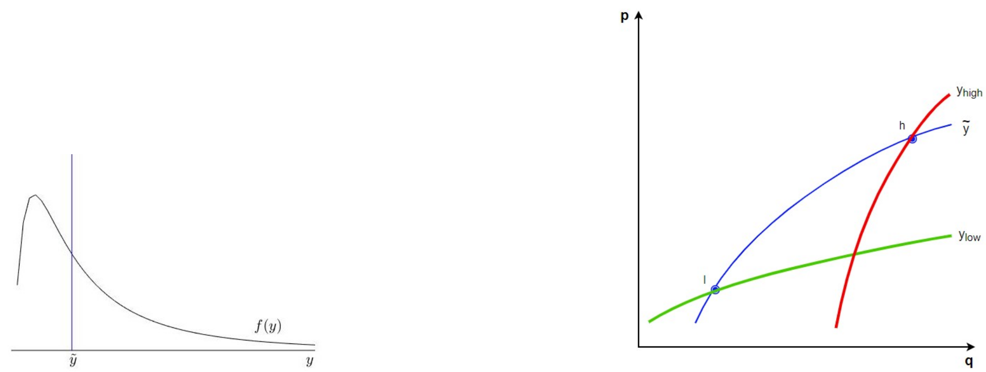
The single-crossing property implies that household sorting will result in perfect income stratification across neighborhoods. Households with income less than $\tilde{y}$ prefer neighborhood l and households with income greater than $\tilde{y}$ prefer neighborhood h. Panel (a) of Figure A1 shows an example of an income distribution and the vertical line indicates the income of a boundary household that is exactly indifferent between the low-quality, low-price neighborhood and the high-quality, high-price neighborhood. Panel (b) shows the two neighborhood

[24] The intuition of this model can be extended to think about the city as whole.

[25] Introducing preferences over the racial composition of neighborhoods results in multiple equilibria. See Sethi and Somanathan (2004) and Banzhaf and Walsh (2013) for examples of such models.

[26] See Epple and Sieg (1999) and Banzhaf and Walsh (2008) for a more detailed discussion of this assumption.

options in the (q,p) plane, along with the indifference curves associated with three different income levels, y_{low}, $\tilde{y}$, and y_{high} where $y_{low} < \tilde{y} < y_{high}$. Households with income less than $\tilde{y}$, like y_{low}, prefer neighborhood l and households with income greater than $\tilde{y}$, such as y_{high}, prefer neighborhood h. To the extent that minorities are more likely to be in the lower end of the income distribution, we expect there to be a higher proportion of minorities in neighborhood l.



(a) Neighborhood Sorting

(b) Neighborhood Options in (q,p) Plane

Figure A1: Single Crossing Property

Notes: This figure provides a visual representation of the equilibrium income sorting that is induced by the single crossing property. Panel (a) shows an example of an income distribution and Panel (b) shows the two neighborhood option in the (q,p) plane and the direct indifference curves associated with three different households.

In this model, there is an exogenous federal government that can fund slum clearance and urban renewal projects, denoted by R. Consistent with both historical accounts and the empirical evidence that follows, these projects decrease the supply of housing and increase neighborhood quality in the low price, low quality neighborhood. There is no direct impact of urban renewal and slum clearance on neighborhood h. These effects are summarized below:

$$\frac{\partial S_l(R)}{\partial R} \leq 0, \quad \frac{\partial q_l(R)}{\partial R} \geq 0, \quad S_h(R) = S_h, \quad q_h(R) = q_h \tag{1}$$

For simplicity, I assume that $q_l(R) < q_h$ for all R. This assumption guarantees a constant ranking of neighborhoods both before and after urban renewal.[27]

An equilibrium in this model is defined as an allocation of households across neighborhoods such that households choose their neighborhood to maximize $V(y, p, q)$ and the housing market clears in each neighborhood. This equilibrium is characterized by the following three equations and implicitly defines unique equilibrium prices (p_l, p_h) and the boundary income $\tilde{y}$.

$$V(\tilde{y}, p_l, q_l(R)) = V(\tilde{y}, p_h, q_h) \tag{2}$$

[27] I discuss the implications of relaxing this assumption in footnote 14.

$$\int_{y_{min}}^{\tilde{y}} D(p_l, y) f(y|w) dy + \int_{y_{min}}^{\tilde{y}} D(p_l, y) f(y|b) dy = S_l(R) \tag{3}$$

$$\int_{\tilde{y}}^{y_{max}} D(p_h, y) f(y|w) dy + \int_{\tilde{y}}^{y_{max}} D(p_h, y) f(y|b) dy = S_h \tag{4}$$

Equation (2) states that the indirect utility received by the boundary household has to be the same in neighborhood l and neighborhood h. Equations (3) and (4) state that the aggregate housing demanded by households that sort into neighborhood l and neighborhood h must equal the supply of housing in each neighborhood.

Using this model, I assess how the equilibrium responds to urban renewal and slum clearance projects. First, I determine the impact of such projects on housing prices in neighborhood l. Using the implicit function theorem, I find the following:

$$\frac{dp_l}{dR} = \frac{\frac{1}{\int D_p(p_l,y)f(y)dy}[S_R^l(R)[V_y^l - V_y^h - \frac{V_p^h D(p_h,\tilde{y})f(\tilde{y})}{\int D_p(p_h,y)f(y)dy}] + V_q^l q_R^l(R) D(p_l, \tilde{y}) f(\tilde{y})]}{V_y^l - V_y^h - f(\tilde{y})[\frac{D(p_l,\tilde{y})V_p^l}{\int D_p(p_l,y)f(y)dy} + \frac{D(p_h,\tilde{y})V_p^h}{\int D_p(p_h,y)f(y)dy}]} > 0 \tag{5}$$

where $V_k^j = \frac{\partial V(\tilde{y},p_j,q_j(R))}{\partial k}$, $D_k(p_j, y) = \frac{\partial D(p_j,y)}{\partial k}$, $S_R^j(R) = \frac{\partial S_j(R)}{\partial R}$, and $q_R^j(R) = \frac{\partial q_j(R)}{\partial R}$. Thus, prices in neighborhood l must increase as the result of urban renewal projects. Second, I determine the impact of such projects on the location of the boundary household within the income distribution. Using the implicit function theorem, I find the following:

$$\frac{d\tilde{y}}{dR} = \frac{-(\frac{V_p^l S_R^l(R)}{\int D_p(p_l,y)f(y)dy} + V_q^l q_R^l(R))}{V_y^l - V_y^h - f(\tilde{y})[\frac{D(p_l,\tilde{y})V_p^l}{\int D_p(p_l,y)f(y)dy} + \frac{D(p_h,\tilde{y})V_p^h}{\int D_p(p_h,y)f(y)dy}]} \tag{6}$$

Since the denominator is negative,[28] the sign of equation (6) depends on the relative magnitudes of the two terms in the numerator. The first term, which I refer to as the supply effect, is negative and measures the decrease in utils per unit of renewal caused by the decrease in housing supply which increases rental rates. The second term, which I refer to as the quality effect, is positive and measures the increase in utils per unit of renewal associated with living in a higher quality neighborhood. Thus, the impact of renewal on equilibrium outcomes will depend on the relative magnitudes of the supply and quality effects.

A.1 Case 1: Quality Effect Dominates

First consider the case where the quality effect is larger than the supply effect. In this case, $d\tilde{y}/dR > 0$. That is, the boundary household is characterized by a higher income level as the result of urban renewal. The increased quality of neighborhood l is large enough to incentivize some portion of the population to sort out of the relatively higher-price, higher-quality neighborhood into the lower-price, lower-quality neighborhood. Panel (a) of Figure A2 in the appendix shows the portion of the income distribution that relocates from neighborhood

[28]The single crossing property implies that $V_y^l - V_y^h$ is negative.

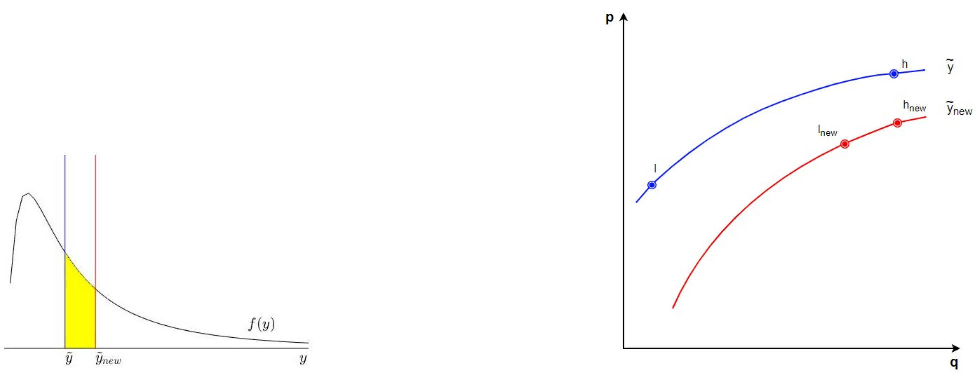
h to neighborhood l as a result of urban renewal and slum clearance.

Let N_j be the measure of households in community j and $\bar{y}_j$ be the average income in community j where $j \in \{l, h\}$.

Proposition 1: If $\frac{d\tilde{y}}{dR} > 0$, then the following must be true:

$$\frac{dN_l}{dR} > 0, \quad \frac{dN_h}{dR} < 0, \quad \frac{d\bar{y}_l}{dR} > 0, \quad \frac{d\bar{y}_h}{dR} > 0, \quad \frac{dp_l}{dR} > 0, \quad \frac{dp_h}{dR} < 0$$

This proposition states that the low-price, low-quality neighborhood experiences an increase in population, average incomes, and rental rates as a result of urban renewal policies. The high-price, high-quality neighborhood experiences a decrease in population and rental rates, and an increase in average incomes. The first four inequalities are mechanical and can be seen visually from Panel (a) in Figure A4. The impact of R on p_l is determined by the implicit function theorem and is shown in equation (5). Lastly, p_h decreases because the loss of population from neighborhood h is associated with a decrease in housing demand and housing supply remained unchanged. The resulting neighborhood choices are shown graphically in Panel (b) of Figure A2.



(a) Neighborhood Sorting (b) New Neighborhood Options

Figure A2: Quality Effect Dominates Price Effect

Notes: This figure provides a visual representation of the equilibrium income sorting that is induced by the single crossing property when the quality effect dominates the supply effect, which induces households to move out of neighborhood h into neighborhood l. Panel (a) shows an example of an income distribution and Panel (b) shows the neighborhood option in the (q,p) plane both before and after urban renewal was introduced.

To determine the welfare implications of this policy, I document the impact of renewal on the indirect utility function for households that stay in neighborhood h (y, p_h, q_h), households that move from h to l (y, p_m, q_m), and households that stay in neighborhood l (y, p_l, q_l). These effects are shown in equations (7), (8), and (9) respectively and can been seen graphically in Figure A3 in the appendix. Equation (7) shows that households in the high-price, high-quality neighborhood are made better off because the relocation of individuals out of their neighborhood decreased the demand for housing which led to a decrease in rental rates.

$$\frac{dV(y,p_h,q_h)}{dR} = V_y\frac{dy}{dR} + V_{p_h}\frac{dp_h}{dR} + V_{q_h}\frac{dq_h}{dR} \quad (7)$$
$$= V_{p_h}\frac{dp_h}{dR} > 0$$

Equation (8) shows the impact of urban renewal on the indirect utility of households that move from neighborhood h to neighborhood l.

$$\frac{dV(y,p_m,q_m)}{dR} = V_y\frac{dy}{dR} + V_p\frac{dp_m}{dR} + V_q\frac{dq_m}{dR} \quad (8)$$
$$= V_p\frac{dp_m}{dR} + V_q\frac{dq_m}{dR}$$

While this sign is theoretically indeterminate, it must be the case that utility benefits from a decrease in housing price outweigh the decrease in utility caused by a decrease in neighborhood quality. This is formalized in Proposition 2. Note that (p', q') indicates the new housing price and neighborhood quality associated with neighborhoods when $R > 0$ whereas (p, q) represent the housing price and neighborhood quality before renewal. I also use $\tilde{y}$ to denote the original boundary households and $\tilde{y}_{new}$ to identify the new boundary households.

Proposition 2: If $d\tilde{y}/dR > 0$, then $\frac{dV(y,p_m,q_m)}{dR} > 0$ for all households who move from neighborhood h to neighborhood l as a result of urban renewal and slum clearance.

> Proof: Movers are characterized by income y_m such that $\tilde{y} < y_m < \tilde{y}_{new}$. These households originally preferred neighborhood h because $V(y_m, p_h, q_h) > V(y_m, p_l, q_l)$ but now they prefer neighborhood l because $V(y_m, p'_l, q'_l) > V(y_m, p'_h, q'_h)$. Furthermore, all households in neighborhood h could have been made better off by staying in neighborhood h because housing prices decreased and all else remained the same. This implies that $V(y, p_h, q_h) < V(y, p'_h, q'_h)$. By the transitive property, it must be the case that $V(y_m, p'_l, q'_l) > V(y_m, p_h, q_h)$. Thus, households that move from neighborhood h to neighborhood l as the result of urban renewal are made better off because their indirect utility from living in l_{new} is higher than their indirect utility from living in neighborhood h before renewal. ■

The impact of urban renewal and slum clearance on households that remain in neighborhood l is more nuanced. Equation (9) shows the impact of renewal depends on the relative size of the increase in utility obtained from living in a higher quality neighborhood and the decrease in utility caused by an increase in housing price.

$$\frac{dV(y,p_l,q_l)}{dR} = V_y\frac{dy}{dR} + V_{p_l}\frac{dp_l}{dR} + V_{q_l}\frac{dq_l}{dR} \quad (9)$$
$$= V_{p_l}\frac{dp_l}{dR} + V_{q_l}\frac{dq_l}{dR}$$

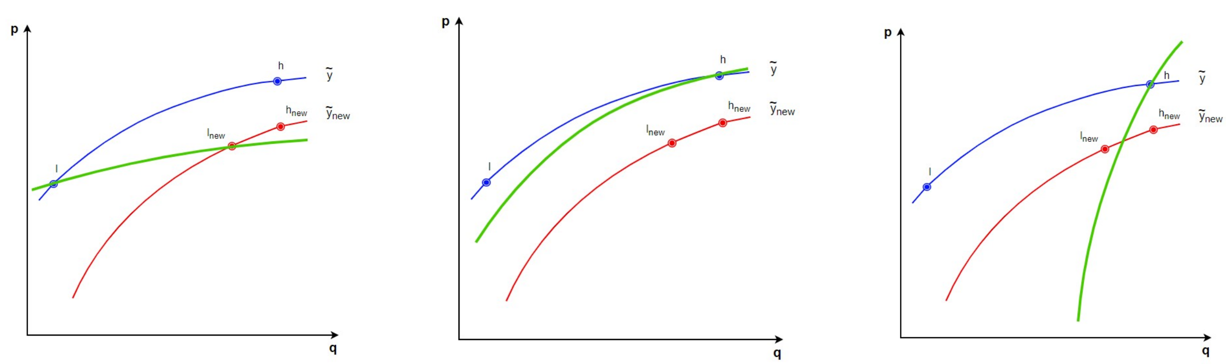
The overall effect depends on the household's location in the income distribution. This is formalized in Proposition 3.

Proposition 3: There exists a household y* such that

1. $dV(y, p_l, q_l)/dR < 0$ for all y<y*
2. $dV(y, p_l, q_l)/dR > 0$ for all y>y*

   Proof: The single crossing assumption guarantees the existence of a household that is indifferent between neighborhood l, denoted by (q_l, p_l) (the low price, low quality neighborhood before renewal), and neighborhood l_{new}, denoted (q_l', p_l') (the low price, low quality neighborhood after renewal). Denote this boundary household by y*. Note that $p_l < p_l'$ (see proposition 1) and $q_l < q_l'$ by assumption. For all y≤y*, the single crossing assumption implies that $V(y, p_l, q_l) \geq V(y, p_l', q_l')$. Thus $dV(y, p_l, q_l)/dR \leq 0$. Similarly, for all y*<y, $V(y, p_l', q_l') > V(y, p_l, q_l)$ which implies $dV(y, p_l, q_l)/dR > 0$.

Thus, when the quality effect outweighs the supply effect, most low-income households are made better off by the quality improvement of neighborhood l; however, households in the lowest end of the income distribution are made worse off. They preferred the original lower quality neighborhood at the discounted price.



(a) Low Income Household

(b) Movers

(c) High Income Households

Figure A3: Welfare Implications when Quality Effect Dominates

Notes: This figure provides a visual representation of the welfare implications of urban renewal when the quality effect dominates the supply effect. Each panel includes the neighborhood options and the indirect indifference curve of the boundary household both before and after urban renewal occurred. Panel (a) shows an indirect indifference curve for a low-income household who remains in neighborhood l, Panel (b) shows an indirect indifference curve for a household who moves from neighborhood h to neighborhood l, and Panel (c) shows an indirect indifference curve for a high income household who remains in neighborhood h.

A.2 Case 2: Supply Effect Dominates

Now consider the case where the supply effect is larger than the quality effect. In this case, $d\tilde{y}/dR < 0$. That is, the boundary household is now characterized by a lower income level.

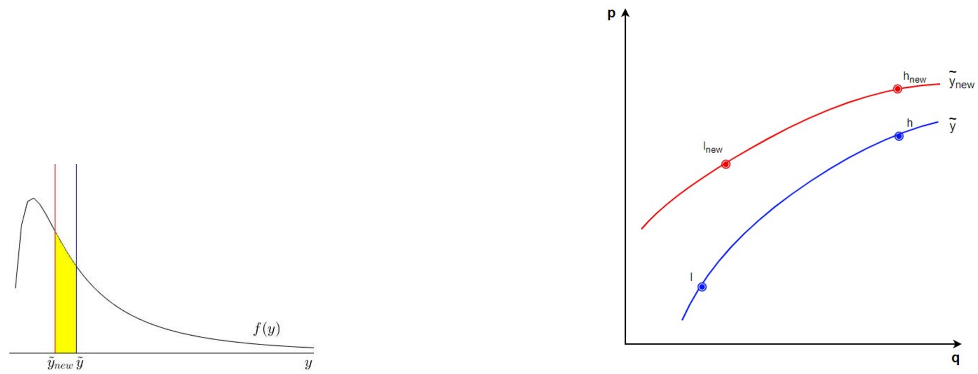
The decrease in the supply of housing in neighborhood l is large enough to incentivize some portion of the population to sort out of the low-price, low-quality neighborhood into the high-price, high-quality neighborhood. Panel (a) of Figure A4 in the appendix shows the portion of the income distribution that relocates from neighborhood l to neighborhood h as a result of urban renewal and slum clearance.

Proposition 4: If $\frac{d\tilde{y}}{dR} < 0$, then the following must be true:

$$\frac{dN_l}{dR} < 0, \quad \frac{dN_h}{dR} > 0, \quad \frac{d\bar{y}_l}{dR} < 0, \quad \frac{d\bar{y}_h}{dR} < 0, \quad \frac{dp_l}{dR} > 0, \quad \frac{dp_h}{dR} > 0.$$

This proposition states that the low-price, low-quality neighborhood experiences a decrease in population and average incomes, and an increase in housing price as a result of urban renewal policies. The high-price, high-quality neighborhood experiences an increase in population, a decrease in average incomes, and an increase in housing prices. The first four inequalities are again mechanical and can be seen visually from Figure A4. The impact of R on p_l is determined by the implicit function theorem and shown in equation (5). In both cases, average housing cost in neighborhood l must increase since supply has declined and amenities have increased. Lastly, p_h increases because the increase in population is associated with an increase in housing demand while housing supply remained unchanged. Panel (b) of Figure A4 shows the neighborhood options in the (q,p) plane as well as the indifference curves for boundary households both before and after renewal.

The impact of renewal on the indirect utility function of households that stay in neighborhood h, households that move from l to h, and households that stay in neighborhood l are shown in equations (10), (11), and (12) respectively and are represented graphically in Figure A5. Equation (10) shows that households remaining in neighborhood h are made worse off. An influx of households causes an increase the demand for housing, resulting in increased rental rates.



(a) Neighborhood Sorting

(b) New Neighborhood Options

Figure A4: Price Effect Dominates Quality Effect

Notes: This figure provides a visual representation of the equilibrium income sorting that is induced by the single crossing property when the supply effect dominates the quality effect, which induces households to move out of neighborhood l into neighborhood h. Panel (a) shows an example of an income distribution and Panel (b) shows the neighborhood option in the (q,p) plane both before and after urban renewal was introduced.

$$\begin{aligned} \frac{dV(y,p_h,q_h)}{dR} &= V_y\frac{dy}{dR} + V_{p_h}\frac{dp_h}{dR} + V_{q_h}\frac{dq_h}{dR} \\ &= V_{p_h}\frac{dp_h}{dR} < 0 \end{aligned} \tag{10}$$

Equation (11) shows the impact of urban renewal on the indirect utility of households that move from neighborhood l to neighborhood h.

$$\begin{aligned} \frac{dV(y,p_m,q_m)}{dR} &= V_y\frac{dy}{dR} + V_p\frac{dp_m}{dR} + V_q\frac{dq_m}{dR} \\ &= V_p\frac{dp_m}{dR} + V_q\frac{dq_m}{dR} \end{aligned} \tag{11}$$

While this sign is theoretically indeterminate, it must be the case that utility costs from an increase in housing price outweigh the increase in utility caused by an increase in housing quality. This is formalized in Proposition 5.

Proposition 5: If $d\tilde{y}/dR < 0$, then $\frac{dV(y,p_m,q_m)}{dR} < 0$ for all households who move from neighborhood l to neighborhood h as a result of urban renewal and slum clearance.

Proof: Movers are characterized by income y_m such that $\tilde{y}_{new} < y_m < \tilde{y}$. By definition, these households originally preferred neighborhood l because $V(y_m,p_h,q_h) < V(y_m,p_l,q_l)$ but now they prefer neighborhood h because $V(y_m,p_l',q_l') < V(y_m,p_h',q_h')$. Furthermore, all households in neighborhood h would have been made worse off by staying in neighborhood h because housing prices increased and all else remained the same. This implies that $V(y,p_h,q_h) > V(y,p_h',q_h')$. By the transitive property, it must be the case that $V(y, p_h', q_h') < V(y, p_l, q_l)$. Thus, households that move from l to h as a result of urban renewal are made worse off. ■

Equation (12) shows that households remaining in the low-price, low-quality neighborhood are positively impacted by an increase in neighborhood quality but negatively impacted from an increase in housing price. For households remaining in neighborhood l, it must be the case that the price effect dominates the quality effect.

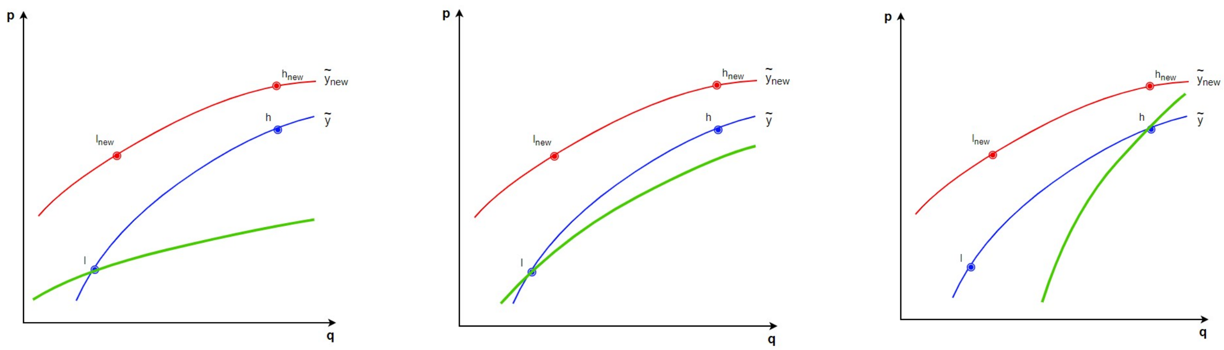
$$\begin{aligned} \frac{dV(y, p_l, q_l)}{dR} &= V_y \frac{dy}{dR} + V_{p_l} \frac{dp_l}{dR} + V_{q_l} \frac{dq_l}{dR} \\ &= V_{p_l} \frac{dp_l}{dR} + V_{q_l} \frac{dq_l}{dR} \end{aligned} \tag{12}$$

This is stated and proved formally in Proposition 6.

Proposition 6: If $d\tilde{y}/dR < 0$, then $\frac{dV(y,p_l,q_l)}{dR} < 0$ for all households remaining in neighborhood l.

Proof: Let $d\tilde{y}/dR < 0$ and consider households with income $y < \tilde{y}_{new}$. There exists a household y* that is indifferent between (p_l, q_l) and (p_l', q_l'). For households with income y<y*, they preferred neighborhood l over neighborhood l' so they are made worse off by renewal. Households with income $y^* < y$ prefer neighborhood l' over neighborhood l, but $V_y(y, p_h, q_h) > V_y(y, p_l, q_l)$ so these households were already located in neighborhood h and they stayed there after renewal took place. Thus, all households that remained in neighborhood l were made worse off. ■

Thus, when the supply effect dominates the quality effect, this model implies that all low-income households are made worse off by urban renewal. While the Housing Act was primarily residential focused, some projects funded through the act were non-residential and included stadiums, office buildings, and parking lots. In this case, the impact of renewal on neighborhood quality is limited but there is a large decrease in housing supply. These types of projects make all lower-income households in the city worse off due to increased rental rates.



(a) Low Income Household (b) Movers (c) High Income Household

Figure A5: Welfare Implications when Supply Effect Dominates

Notes: This figure provides a visual representation of the welfare implications of urban renewal when the supply effect dominates the quality effect. Each panel includes the neighborhood options and the indirect indifference curve of the boundary household both before and after urban renewal occurred. Panel (a) shows an indirect indifference curve for a low-income household who remains in neighborhood l, Panel (b) shows an indirect indifference curve for a household who moves from neighborhood l to neighborhood h, and Panel (c) shows an indirect indifference curve for a high income household who remains in neighborhood h.

Note that throughout this analysis I assume that $q_l(R) < q_h$ for all R which guarantees a constant ranking of neighborhoods both before and after urban renewal. These results can be easily modified to the case where $q_l' > q_h'$. In this case, urban renewal increases the quality of neighborhood l such that it surpasses the quality of neighborhood h. The results are largely consistent with three technical differences. The main difference is that the top end of the distribution sorts into l', which is now the higher quality neighborhood, and the bottom end of the income distribution sorts into h'. Second, in the case where the quality effect dominates the supply effect, low income households that are made worse off by renewal are now defined as households with income less than y^{**}, denoting the household indifferent between l and h'. Lastly, when the supply effect dominates the quality effect, there are some households at the top of the income distribution that are made better off by the higher quality housing option. In every scenario, households at the lowest end of the income distribution are made worse off by urban renewal and slum clearance policies.