The Effect of High Concentration Public Housing on Crime, Construction, and Home Prices: Evidence from Demolitions in Chicago

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Job Market Paper

January 13, 2009

Abstract

Despite popular accounts that link public housing demolitions to spatial redistribution of crime, and possible increases in crime, little systematic research has analyzed the neighborhood or city-wide impact of demolitions on crime. In Chicago, which has conducted the largest public housing demolition program in the United States, I find that public housing demolitions are associated with a 20% to 50% reduction in violent crime in neighborhoods where the demolitions occurred. I also find evidence of increases in residential construction and home prices in these neighborhoods. Furthermore, homes close to large public housing developments exhibit larger price growth than those located further from public housing, during the period when these developments are being demolished. Finally, using a panel of cities that demolished public housing, I find that public housing demolitions are associated with a drop of about 10% in a city's murder rate. I interpret these findings as evidence that while public housing demolitions may push crime into other parts of a city, crime reductions in neighborhoods where public housing is demolished are larger than crime increases elsewhere.

*Contact: *dhartley@econ.berkeley.edu.* I am grateful to Matt Aguilar and the CHA for releasing relocation data, Catherine Haggerty and NORC for creating new tabulations of resident relocation survey data, Brad Hunt for sharing his notes on the CHA's site selection process in the 1950's, Brian Jacob for sharing his data on CHA buildings and closures, and Tony X. Herbert, Jens Ludwig, Susan Popkin, and Janet Smith for helpful advice on locating data. I am indebted to my committee members: David Card, Tom Davidoff, Enrico Moretti, and John Quigley. This paper has also benefited greatly from conversations with: Erik Hurst, Patrick Kline, Ashley Langer, Bill Lester, Ulrike Malmendier, Ted Miguel, Adam Szeidl, and participants at the University of California, Berkeley Seminar in Labor Economics.

1 Introduction

Large public housing developments, particularly those with high-rise buildings, have had a reputation as epicenters of crime and gang activity. Beginning in October 1992, the United States Department of Housing and Urban Development (HUD) began to award grants to local public housing authorities that could be used for demolition and revitalization of public housing through a program that has come to be known as HOPE VI.[1] By 2003, HUD had awarded over $390M in demolition grants to local public housing authorities. In addition, HUD awarded more than $5.8B in revitalization grants from 1993 through 2006. Under HOPE VI, more than 50,000 units of distressed public housing will be demolished and about the same number of units will be developed. One of the objectives of the HOPE VI program is to "provide housing that will avoid or decrease the concentration of very-low-income families."[2] To that end, public housing in the United States is moving away from the old model of large developments including high-rise buildings and moving toward more low-rise, scattered-site, and mixed-income developments.[3] How has the HOPE VI program affected crime, and what effect has it had on housing markets near sites where public housing has been demolished?

This paper evaluates the impact of HOPE VI on crime and housing markets.[4] Economic theory does not provide a clear prediction about the impact of this program on crime. On one hand, if there are peer effects in crime, then one might expect demolishing high-rise public housing to reduce city-wide crime by decreasing the density of poverty in neighborhoods where poverty is most concentrated.[5] By similar reasoning, public housing demolition could lead to a reduction in city-wide crime if dispersing subsidized housing more evenly throughout the city results in fewer areas where informal social controls have broken down.[6] One might

[1] HOPE VI program information is available at: http://www.hud.gov/offices/pih/programs/ph/hope6/about/

[2] Popkin et al. [2002]

[3] Goetz [2003] points out that HOPE VI can be viewed as the second generation of subsidized housing dispersal programs. The first being the fair housing movement in the late 1960's and early 1970's.

[4] Another recent study of the local impact of a large federal program is Busso and Kline [2007]. The authors find that the federal Empowerment Zone program had significant positive effects on local labor and housing markets.

[5] Bayer et al. [2008] show evidence of the existence of criminal peer effects in juvenile correctional facilities in Florida. Case and Katz [1991] find evidence that residence in a neighborhood where peers are involved in crime increases the probability that an individual is involved in crime. Glaeser et al. [1996] analyze a social interaction model with multiple equilibria to explain spatial variation in crime rates. Freeman et al. [1996] propose a different model, also featuring multiple equilibria, in which spatial variation in crime rates is driven by the assumption that a criminal's chance of being caught is a decreasing function of the number of other criminals operating in the same area. Card et al. [2008] document evidence of thresholds in the minority share of a neighborhood beyond which the neighborhood may move toward an equilibrium with either 0% or 100% minority share. These non-linearities are consistent with the existence of multiple equilibria predicted by social interaction models.

[6] Geographic concentration of poor households may lead to breakdowns in informal social controls, exacerbating crime problems. See Skogan [1990]. Sampson and Raudenbush [1999] and Morenoff et al. [2001] find that the degree of "collective

also expect public housing demolition to decrease city-wide crime if the physical structure of high-rise public housing buildings provides a unique environment which is hard to police, and thus particularly suited to gang activity.[7] On the other hand, the level of city-wide crime could remain the same if crime is simply displaced from neighborhoods that are being revitalized to other poor neighborhoods.[8] Finally, net crime might even be expected to increase if displaced residents have a hard time adapting to their new neighborhoods, rival gangs are pushed into each other's territory, or police find it hard to adapt to new spatial patterns of criminal activity.[9]

I split my analysis into two parts. In the first part, I examine the local effect of public housing demolition on neighborhoods where high-rise public housing was demolished in Chicago. I find that public housing demolitions are associated with large reductions in neighborhood violent crime. Within these neighborhoods, I also find evidence that public housing demolitions lead to increases in home sale prices and residential construction. In the second part, I assess the degree to which crime was displaced by public housing demolitions. I begin by estimating the effect that public housing residents displaced by demolitions have on crime in their new neighborhoods. However, these results are inconclusive, as they suggest a zero displacement effect, but do not rule out a scenario in which demolitions lead to increases in crime in neighborhoods where public housing residents move that are as large as the decreases in crime in the neighborhoods from which they have come. For a more definitive answer, I estimate the effect of public housing demolitions on the murder rate of a panel of 121 cities that received HOPE VI demolition grants. I find that demolitions are associated with reductions in city-wide murder rates, implying that any increase in murder due to displacement is smaller in magnitude than decreases in murder in neighborhoods that are directly affected by public housing demolitions.

The degree to which the demolition of high-rise public housing can reduce crime, increase neighborhood and city-wide amenity values, and stimulate economic development

efficacy", social control of public space, is associated with the level of violent crime. Hirschfield and Bowers [1997] study the connection between crime and "social cohesion". See Sampson et al. [2002] for an overview of "neighborhood effects" in the sociology literature. Joseph et al. [2007] discuss the theoretical justifications for mixed-income development as a means to address poverty.

[7] This explanation is related to the theory of defensible space as popularized by Newman [1972].

[8] Evidence of crime displacement due to weather shocks has been shown by Jacob et al. [2007].

[9] Kling et al. [2005] find that male youths randomly selected to relocate to lower-poverty areas have lower probabilities of arrest for violent crime, but higher probabilities of arrest for property crime. Hagedorn and Rauch [2007] suggest that the fall in Chicago's homicide rate may have been delayed by conflicts created when gang members displaced by public housing closures relocated to rival gang territory. Rosin [2008] argues that police were not prepared for the new spatial distribution of crime caused by public housing demolition and resident relocation.

is interesting from both an urban economics perspective and a public policy perspective. From the viewpoint of urban economics, the fact that total crime might decrease by dismantling concentrated public housing developments and relocating residents to low-rise and scattered-site developments is consistent with economic theories of criminal peer effects, urban planning theories of defensible space, and sociological theories of crime and disorder. From a public policy perspective, the extent to which concentrated public housing imposes a larger externality, through its impact on crime and property values, than would be imposed by scattered-site public housing is important for policy makers and urban planners when weighing the costs and benefits of where and how to offer subsidized housing.[10]

Estimating the impact of public housing demolition on crime and housing markets is complicated by a number of issues. Estimates that simply compare the level of crime before demolition to the level of crime after demolition will reveal the change in crime that is correlated with public housing demolition, but, in general, will not reveal the change in crime that is caused by public housing demolition in the presence of other time-varying factors that influence crime, such as changes in the number of police or rising prison populations.[11] Naive comparisons of the change in crime levels in neighborhoods where public housing is demolished to the change in crime levels in neighborhoods where public housing is not demolished may be confounded by differences in pre-existing trends. To overcome these empirical problems, I compare neighborhoods where public housing has been demolished to other neighborhoods where public housing will be demolished or is in the process of being demolished. To estimate the effect of public housing demolition on neighborhood-level crime and housing markets in Chicago neighborhoods, I exploit variation in both the timing and number of high-rise public housing buildings or units closed per year. To estimate the city-wide effect of public housing demolition on crime, I employ an empirical strategy in which identification comes from variation in the timing of demolition grants awarded by HUD across cities. In both cases, the sample contains only the affected geographic units: the eight Chicago neighborhoods that contained high-rise family public housing in 1990 or

[10] While other studies have investigated the impact of public housing on public housing residents, none have looked at its impact on the surrounding neighborhood and the city as a whole. Using data from Chicago, Jacob [2004] compares the educational outcomes of children who moved out of public housing because their buildings were closed for demolitions to outcomes of those who remained. He finds no significant difference in outcomes between the two groups. Currie and Yelowitz [2000] and Oreopoulos [2003] also study educational and future labor market outcomes of children in public housing and do not find negative impacts of public housing when compared to other low-income households.

[11] Levitt [2004] names these among possible factors that contributed to falling crime rates in the 1990's.

the set of cities that received demolition grants. In practice, specifications for both sets of estimates include fixed-effects and year-effects. For the neighborhood level analysis, fixed-effects control for persistent differences in crime, housing, or construction levels between neighborhoods. Year-effects control for any transitory shocks that affect outcomes in all eight neighborhoods where public housing is demolished. Thus, identification relies on the assumption that there are no other factors that affect crime or housing outcomes that are correlated with public housing closures, and cannot be controlled for by neighborhood- and year-effects. A parallel identification assumption is required for the city-level analysis.

In Chicago, I find that demolition of high-rise public housing led to large decreases in violent crime in the neighborhoods where demolitions occurred. I estimate a decrease of about 11.5 murders per year per high-rise public housing neighborhood. For the eight neighborhoods that contained high-rise public housing, this represents a decrease of about 90 murders per year from a pre-demolition average of 170 murders per year, roughly a 53% drop. The estimates for rape translate to about 140 fewer rapes per year, or a 27% decrease from the pre-demolition average of 520 rapes per year. Estimates for assault indicate a fall of about 1,715 per year, or 30% due to demolitions. Robberies fall by about 2,600 (42%). Crimes involving guns fall by about 2,020 per year (37%). Personal crimes in street locations fall by about 3,065 per year (26%). Using a unique data set of property-related documents which I collected electronically, I find evidence of an increase in median home prices in the range of 19% to 26% associated with public housing demolitions, despite an increase in the construction of new residential units. This housing supply response to public housing demolitions comes to about 240 additional residential units constructed per year (as measured by building permits), in the neighborhoods where high-rise public housing was demolished. I also find evidence that public housing demolitions increased property values within a half mile of demolition sites by at least $110M city-wide. Finally, using a panel of cities that received HOPE VI demolition grants, I find evidence that public housing demolitions reduced city-wide per capita murder rates by about 10%. These results indicate that, within cities, the direct benefit of public housing demolition in reducing murder within a neighborhood is larger than any possible spillover or displacement effects which might increase murder in other parts of the city.[12]

[12] An overview and assessment of the literature concerning the unexpected decrease in crime during the 1990's is provided by Levitt [2004]. While public housing demolitions are not mentioned as a possible explanation, one of the factors that is

These results have several implications for policy makers. First, although the increased amenity value of land near the demolition sites may also be due to factors such as the removal of large dilapidated buildings, the opening of new retail establishments, or improvements in school quality, it is likely that decreased crime is a major component. With that caveat, a back-of-the-envelope calculation for the cost of neighborhood crime can be found by dividing the estimated increase in median home prices ($37K to $50K) by the estimated reduction in crime (11.5 murders). The result puts the cost of one murder and the package of other violent crimes associated with one murder in the range of $3,200 to $4,300 dollars per home in the eight neighborhoods where high-rise public housing was demolished.[13] Second, my findings are consistent with the existence of criminal peer effects and other theories from the social sciences which predict that total crime production increases as the spatial concentration of poverty increases. An optimal strategy for local public housing authorities and policy makers whose objective is to minimize crime may be to distribute low-income housing evenly through the city. However, there is no guarantee that this policy would maximize welfare. Consider a scenario in which households have heterogeneous preferences with respect to crime and have sorted into neighborhoods based upon these preferences. The value of decreasing crime to a household that decided to live near a high-rise public housing development may be less than the cost of increasing crime for a household that chose to live far from public housing developments. However, the fact that city-wide crime decreases substantially indicates that the cost of increasing crime in neighborhoods far from public housing would have to be very large for the demolition of public housing to have a negative impact on social welfare through its effect on crime.

2 Background on Public Housing and HOPE VI

2.1 A Brief History of Public Housing

In the United States, federally provided public housing dates back to 1918, when 16,000 units were built for workers during World War I. The passage of the 1937 National Housing Act

mentioned is the receding crack epidemic. In as far as demolition of high-rise public housing denied gangs a place to sell crack in which there was less risk of being caught by police than on the street or in smaller public housing developments, the receding crack epidemic may be related to changes brought about by the HOPE VI program.

[13] In a recently published study, Linden and Rockoff [2008] find that the arrival of a sex offender leads to a drop in nearby home sale prices of about $5,500. Similarly, Pope [2006] estimates that sex offenders lead to about a $3,500 drop in home prices. Gibbons [2004] finds an increase in property value of a slightly smaller magnitude is associated with a tenth of a standard deviation reduction in incidents of criminal damage in inner London.

established the current system of local, independent housing authorities that receive federal money and perform the tasks of building and managing public housing. Under this program, and continuing through World War II, the Federal government financed the construction of 365,000 permanent housing units and an even greater number of temporary units. As World War II veterans returned, and African-American migration from the rural south to northern cities continued, urban housing was in short supply. In 1949, a new Housing Act was passed, providing loans and subsidies for the construction of about 810,000 units of low-rent housing.[14] While the pace of building and the uptake rate of federal funds varied from city to city, a large number of federally subsidized, low-rent housing units were built over the next fifteen years. However, from the mid-1970's through the early 1990's, conditions in public housing deteriorated significantly. Problems associated with public housing included high crime and low educational and employment outcomes of residents. Furthermore, much of the stock of public housing was in disrepair. Funding had been cut during the 1980's, resulting in deferred maintenance, and contributing to the large and growing costs of rehabilitation.[15]

In Chicago, site selection for new public housing units to be constructed during the 1950's was a contentious issue. The CHA initially proposed some sites on vacant land in outlying neighborhoods that were predominantly White and other sites in poor African-American neighborhoods closer to the center of the city, which were not vacant but were deemed to be "blighted slums". This classification was meant to indicate areas where housing was not structurally sound, and living conditions were deemed to be unsanitary. Many of the city council members whose wards contained the sites that were proposed in the outlying areas organized an opposition which threatened to derail the entire plan of building up to 40,000 new units of housing over a six-year period. In the end, the CHA was denied the use of most of the vacant land sites. Construction of public housing that took place from 1950 to 1964 was either as an extension of an existing development, or on a site that was in a poor African-American neighborhood. The public housing buildings built in Chicago during this time were almost all high-rises.[16]

[14] Meyerson and Banfield [1955].
[15] Polikoff [2006].
[16] Bowly, Jr. [1978].

2.2 The HOPE VI Program

From the mid-1970's through 1992, laws requiring one-for-one replacement of demolished units in order to qualify for HUD funding made demolition of public housing a prohibitively expensive option for local public housing authorities. However, after severe funding cuts during the 1980's, much of the public housing stock was in need of repair. In October 1992, a new housing bill and HUD appropriations bill changed the law to make funding available for demolition and redevelopment of distressed public housing developments. The program created by the law eventually became known as HOPE VI (the sixth iteration of a program identified by an acronym which stood for "Housing Opportunities for People Everywhere").[17]

During the period from 1993 through 2006, the HOPE VI program awarded the CHA \$258M in revitalization grants representing 4.4% of the total \$5.8B awarded to local housing agencies. Of the 127 housing authorities that were awarded HOPE VI demolition grants from 1996 through 2003, the CHA received \$83.4M of grant money for the demolition of 12,500 units of public housing, representing about 21% of the total HOPE VI demolition grants awarded in terms of dollars or numbers of units. Figure 1 shows the cumulative number of housing units for which demolition was funded by HOPE VI grants during this period.

The only other cities that were awarded more than \$10M in demolition grants were New Orleans with \$25.2M, Philadelphia with \$23.0M, Pittsburgh with \$16.5M, Detroit with \$15.1M, Atlanta with \$14.2M, and Buffalo and Memphis both with \$10.4M. The two largest cities, New York and Los Angeles, were awarded only \$0.7M and \$6.0M, respectively. Appendix Table 14 lists cities which received HOPE VI demolition grants, the number of units the grant covered, the dollar amount of the grant, and the fiscal year in which it was awarded.

The scope of the HOPE VI program was broadened when, in 1996, the United States Congress passed the Omnibus Consolidated Rescissions and Appropriations Act. Section 202 of this law required local housing authorities to remove any units from their stock that cost more to maintain than the combined cost of demolition and provision of voucher-based private sector rental assistance (known as Section 8 Vouchers or Housing Choice Vouchers). As a result, in 1998, the CHA announced that all Chicago's gallery-style high-rise public housing developments had failed the viability test and were slated for demolition. In February 2000, the Chicago Housing Authority's Plan for Transformation was approved by HUD. The

[17] Polikoff [2006].

plan called for the demolition of roughly 22,000 units of public housing out of an existing stock of about 40,000 units. The remaining units were to be rehabilitated and an additional 8,000 units were to be constructed, leaving the city with approximately 25,000 new or revitalized units by the end of the ten-year plan, equivalent to the number of units that were occupied at the time the plan was drawn up. The proposed redevelopments focused on mixed-income housing employing private developers and management companies.[18]

3 Local Effect of Public Housing Demolition

In this section, I estimate the local effect of public housing demolition on crime, home prices, and residential construction for neighborhoods in Chicago where high-rise public housing was demolished.

3.1 Data Sources and Descriptive Statistics

For this analysis, I use data on public housing, crime, home sales, and building permits for the City of Chicago.

3.1.1 CHA Building Occupancy, Closure, and Demolition Data

I use data on the stock of public housing units from the early 1990's (42,681 units) and monthly occupancy rates and building closures for a subset of buildings comprising 23,347 units. These building-level detail data sets are from the Chicago Housing Authority and were provided to me by Brian Jacob.[19] These data cover the years from 1990 through 2000. Figure 2 shows which community areas contained high-rise family public housing developments and which contained low-rise family public housing developments.[20] I also use building level data on the number of housing units demolished from 2000 through 2007 from the Chicago Housing Authority's annual plans and reports. Table 1 lists all family CHA developments, indicates whether the development contains high-rise buildings, the year of construction, and

[18] More information on the CHA's Plan for Transformation can be found at `http://www.thecha.org/transformplan/files/plan_for_transformation_brochure.pdf`. Rosenbaum et al. [1998] study Lake Parc Place, one of the first low-income public housing developments in Chicago that was converted to mixed-income housing.

[19] Brian Jacob is the Walter H. Annenberg Professor of Education Policy in the Gerald R. Ford School of Public Policy at the University of Michigan

[20] I use the terms neighborhood and community area interchangeably throughout this paper. Chicago community areas are sets of around 10 to 30 census tracts whose boundaries were drawn by social scientists at The University of Chicago in the 1920's. Venkatesh [2001] provides a detailed account.

the number of units the development has, broken down by the community area in which the units are located.

Building occupancy and closure data come from two sources. Occupancy and closure data for the years 1990 through 2000 were provided to me by Brian Jacob. Jacob's data come from a comprehensive building list provided by the Chicago Housing Authority detailing the stock of public housing in Chicago in the early 1990's at the address level and the number of units at each address. A separate file contains monthly observations (from 1990 - 2000) of the number of units that were occupied for a subset of the buildings on the list. The building list provides the addresses of 42,681 units of public housing. Of these, 32,707 are family housing and 9,974 are senior housing. I focus on the family housing buildings. The occupancy file covers 27,874 of the 32,707 family units. Of the 4,833 family units which are not covered in the occupancy data, 2,939 units are in scattered-site buildings, and 955 units are in City-State housing developments (leaving only 939 family units which are not scattered-site or City-State that are missing from the occupancy data). Furthermore, all 19,237 family units that are not City-State, and are not scattered-site and are in buildings with more than 35 units, are included in the occupancy data set.

I compile occupancy and building closure data from CHA annual reports from 2001 through 2007. Building closure lists in the annual reports give the address of the building, allowing me to link these later closures to the CHA building list. However, the occupancy data are by development. To determine occupancy by community area, I assign each development to one or multiple community areas based upon the fraction of units located in each community area for the old developments as documented in the building list.

The data contain a total of 107 high-rise building closures from the period 1990 - 2007. The number of units in the buildings affected by closures ranges from 48 to 230 with a mean of 130. The buildings are spread across eight community areas. Of the buildings that were closed, 86 were in the Near West Side, Grand Boulevard, Douglas, and the Near North Side community areas. Figure 3 shows the annual number of high-rise buildings closed. I compile building demolitions by address from CHA annual plans and reports for the years 2000 through 2007. I rely on newspaper articles and online publications to identify demolitions that occurred before 2000. Table 2 provides summary statistics from the 1990 census and 2000 census regarding the eight community areas where high-rise public housing was demolished and the City of Chicago as a whole.

3.1.2 Chicago Neighborhood Crime Data

I use crime data drawn from Chicago Police Department annual reports, which provide detailed counts of major crime types for each of the city's 77 community areas. These data cover the period from 1991 through 2007. I also use data on murders in Chicago from 1965 to 1995 that provide census tract level geographic details from Block et al. [1998]. Both data sets use crime definitions that conform to those of the FBI's Uniform Crime Reporting Program. I use the terms murder and homicide interchangeably throughout this paper. Whenever I use either word, I am referring to "the willful killing of one human being by another," which includes murder and non-negligent manslaughter, but does not include justifiable homicide.[21] Table 3 provides crime counts for the eight neighborhoods where high-rise public housing was demolished.

3.1.3 Chicago Housing Data

I collect data on the universe of residential property transactions from the *Chicago Tribune* website. These data are taken from county records and provided to the *Chicago Tribune* by a private company named Record Information Services. The data contain the address, latitude, longitude, parcel identification number, and transaction price of all real estate transactions from 2000 through the end of 2007. I drop commercial transactions, transactions under $10K, and transactions over $10M.

I augment these data with records from the Cook County Recorder of Deeds (CCRD) website. The CCRD website contains documents going back to 1988 and is searchable by parcel identification number. I am in the process of retrieving summary information for every document filed with the Cook County Recorder of Deeds (CCRD) that is related to any of the parcel identification numbers that I obtained from the *Chicago Tribune* data set. However, retrieval of documents from the CCRD website is rather slow (even with the help of a script that I wrote to automate the process). As such, my current data set of housing transactions for the period from 1988 through 1999 is based upon a random and much smaller sample of the parcel identification numbers that I retrieved from the *Chicago Tribune* data.

[21] More information regarding the FBI's definition of crimes under the Uniform Crime Reporting Program can be found here: http://www.fbi.gov/ucr/cius2007/about/offense_definitions.html.

Building permit data come from the website chicagoareahousing.org. The data include addresses and contain the universe of building permits that were granted from 1993 through 2004.

3.2 Empirical Methodology

My goals are to estimate the local effect of public housing demolition on crime, housing prices, and residential construction, and to measure the city-wide effect of public housing demolition on crime. Correlation between public housing demolition and crime reduction does not necessarily indicate that public housing demolition is causing crime to fall. Levitt [2004] identifies increases in the number of police, the rising prison population, the receding crack epidemic, and the lagged effect of the legalization of abortion in 1973 as factors contributing to the nationwide decline in crime during the 1990's. All of these factors may contribute to the decrease in crime in Chicago during the period in which public housing was being demolished, and could potentially contribute to a spurious correlation between public housing demolition and crime. In addition, it is likely that other, unobserved, factors also have an influence on crime during this period. For these reasons, identifying the correct counterfactual level of crime had public housing not been demolished is difficult.

One solution could be to use a difference-in-differences estimator: essentially a comparison between the change in crime in neighborhoods where public housing was demolished and the change in crime in similar neighborhoods where public housing was not demolished. However, historical factors indicate that neighborhoods where high-rise public housing was built are not comparable to other neighborhoods. The problems are rooted in the original sites selected for high-rise public housing in the 1950's and 1960's. The site selection process was extremely contentious. In the end, high-rise public housing was built either as an extension to existing low-rise public housing developments or in low-income African-American neighborhoods which had been designated as "blighted".[22] This meant that almost all high-rise public housing in Chicago was built in the neighborhoods closest to the downtown central business district or along a contiguous stretch of land extending directly south of downtown (see Figure 2).

Using neighborhoods where high-rise public housing sites were proposed but rejected as

[22] Bowly, Jr. [1978], Meyerson and Banfield [1955], and Polikoff [2006].

controls is problematic as the sites that were rejected had quite different characteristics than the sites that were eventually built upon. Site selection was a long and contentious process. Initially the CHA investigated sites on the far north side, far south side, and center of the city. It rejected the far north side sites based largely upon high land costs. The remaining sites were then presented to the Mayor and City Council, who eventually rejected the far South Side sites at the behest of the aldermen who represented these neighborhoods and who wanted to prevent African-Americans from moving in. As Table 4 shows, the sites rejected by both the CHA and the City Council were located in neighborhoods that had relatively fewer African-Americans, had higher income, had lower population density, and were further from the central business district than the sites where high-rise public housing was eventually built.[23]

From 1960 through 1990, the neighborhoods containing high-rise public housing remained relatively low-income and predominantly African-American. Selecting suitable neighborhoods for comparison based on 1990 characteristics is difficult, because all other neighborhoods that are situated as close to downtown as the high-rise neighborhoods tend to be predominantly White, Hispanic, or Asian and higher income. There are other low-income African-American neighborhoods in Chicago, but they are much farther from downtown and a number of them contain low-rise family public housing. It is important to exclude the neighborhoods with low-rise public housing from any possible set of comparison neighborhoods because they have been affected by the Plan for Transformation in an unsystematic fashion. Some have been closed and demolished, while others have been filled with relocatees from the high-rises. Attempting to address the differences between neighborhoods where high-rise public housing was demolished and a set of comparison neighborhoods via statistical methods of re-weighting or matching (such as by the propensity score) would yield imprecise estimates due to the lack of common support. Table 5 displays the predicted probability of a neighborhood containing high-rise public housing in 1990 based on a probit using only the percentage of African-American households and the percentage of households below the poverty line as explanatory variables. The estimate is from the sample of 68 neighborhoods which did not contain low-rise public housing. Seven of the eight neighborhoods with high-rise public housing have the highest propensity scores, illustrating the fact that

[23] Meyerson and Banfield [1955] present a detailed case study of the site selection process and the political wrangling that was associated with it.

neighborhoods with high-rise public housing have quite different characteristics than those without high-rise public housing.

3.2.1 Estimators That Exploit the Timing of Building Closures

Therefore, my proposed solution is to exploit variation in the timing and number of building closures prior to demolition among the eight neighborhoods which had high-rise public housing. Instead of comparing neighborhoods with high-rise public housing to those without high-rise public housing, I compare neighborhoods with high-rise public housing with themselves before and after building closures.

In the next section, I present least squares estimates of β and θ_j in the following regression models:

$$Y_{i,t} = \alpha_i + \gamma_t + \beta C_{i,t} + \epsilon_{i,t} \tag{1}$$

and

$$Y_{i,t} = \alpha_i + \gamma_t + \sum_{j=a}^{b} \theta_j F_{i,t-j} + \epsilon_{i,t} \tag{2}$$

where $Y_{i,t}$ denotes an outcome in community area i in year t, for example, the number of murders in Grand Boulevard in 1999. $C_{i,t}$ represents several possible cumulative variables: the cumulative number of buildings closed, the cumulative number of units closed, or a binary variable which is set equal to one once the cumulative number of units closed has reached a particular threshold in community area i and remains equal to one for the remaining years in the sample. $F_{i,t-j}$ represent leads and lags of flow variables: the number of buildings closed in a particular year, the number of units closed in a particular year, or a binary variable indicating only the particular year in which the cumulative number of units closed has reached a particular threshold. The flow variables can be obtained by taking first differences of the cumulative variables $F_{i,t} = C_{i,t} - C_{i,t-1}$. α_i and γ_t are community area fixed-effects and year-effects, respectively. Finally, $\epsilon_{i,t}$ represents unobservable determinants of outcome $Y_{i,t}$.

The first specification, Equation 1, provides a summary of the mean impact of building or unit closure from the time of closure through the end of the sample period, while the second specification, Equation 2, is useful for analyzing the dynamics of outcome $Y_{i,t}$ relative to the year of a closure event. Specifically, the first specification assumes that the effect of public housing demolition on crime at time t remains the same, irrespective of how many years prior to t the demolition occurred. The second specification allows for the effect of a demolition two years ago to differ from the effect of a demolition three years ago. Equations 1 and 2 are estimated using a sample consisting only of the eight community areas where high-rise public housing was demolished. It is important to note that inclusion of community area fixed-effects will absorb any unobservable characteristics of community areas which are time-invariant. For example, fixed-effects will control for persistent differences in population density between neighborhoods which may affect crime. Furthermore, the year-effects will absorb common transitory shocks to the eight high-rise public housing neighborhoods. For example, aggregate changes and trends in crime will be controlled for (it is well known that crime exhibits large trends over time). The β and θ_j parameters are identified by variation in the timing and number of building or unit closures across the eight affected community areas. It is also important to note that the estimates which use number of buildings or units closed as an explanatory variable contain the parametric assumption that effects on the outcome are linear in the explanatory variable. Estimates which use an indicator for whether a threshold number of units has been closed avoid the linearity assumption, but rely upon choosing the correct threshold.

Any time-varying omitted variables which affect the outcome variable and are correlated with the timing and number of closures but not absorbed by the year effects will cause OLS estimates of the β parameter to be biased. One possible scenario in which OLS estimates may be biased is if the order of building closures is determined by the crime level in prior years. If this were the case, then a serially correlated shock to crime in a particular neighborhood would cause crime to rise and might induce building closures. Building closures would occur at the same time that crime is falling back to its mean level; hence, the effect of public housing closures on lowering crime would be overstated. This problem is mitigated by the fact that almost all of the high-rise buildings in the family public housing developments are slated to be demolished eventually. There is anecdotal evidence that indicates that this type of selection may be a problem in the earlier period of the sample.[24] However, beginning in 2000, the Plan for Transformation laid out the timetable for the remaining demolitions, so there was less opportunity to selectively close buildings in response to crime shocks from 2000 on.

[24] Jacob [2004] and Polikoff [2006] mention incidents such as the shooting of seven-year-old Dantrell Davis prior to demolitions at Cabrini-Green and demolition of three Robert Taylor buildings known as "the hole" due to entrenched gang problems.

A check of whether buildings tend to be selected for closure in response to elevated crime in prior years can be implemented by testing whether the θ_j parameters are significantly greater than zero for $j = -1, -2, -3, ...$

Another time-varying omitted variable that could bias OLS estimates is population. A decrease in population can result in less violent crime simply because there are fewer possible victims. Ideally, I would estimate the effect of public housing demolition on the crime rate (crime per capita). However, population counts for Chicago community areas are only available every ten years when the census is conducted. Columns (1) through (3) of Table 6 show population counts for the eight neighborhoods with high-rise public housing for 1980, 1990, and 2000. As a robustness check I estimate community area populations between census years by assuming linear population trends for non-public housing residents (post 2000 numbers come from linear extrapolation of the 1990 to 2000 trend) and adding that figure to annual public housing occupancy numbers. This allows for a negative correlation between public housing demolition and population. In fact, it may overstate the negative correlation if some households who leave public housing obtain private market housing in the same neighborhood in which they were living prior to leaving public housing. In this sense, estimates of the effect of public housing demolition on crime rates that use my population estimates are conservative. These estimates are not substantively different from those obtained using crime as the outcome variable and are available upon request.

Another problem which is theoretically possible, although less likely, may arise if building closures were selected based upon serially correlated shocks to housing prices.[25] In this case, an upward shock to housing prices might induce closures in subsequent years and also result in a further rise in housing prices in subsequent years. OLS estimates of β would attribute the further increase in housing prices to the closures, and hence β would be biased upwards. Whereas the pre-closure θ_j estimates could be used to check for evidence of closure selection on persistent crime shocks, the situation is not as clear cut for housing prices or housing supply. Since homes are assets, home prices are dependent upon expectations of future rents. For forecastable closures, such as those laid out in the Plan for Transformation, one would expect to see any expected increase in future rents due to increased amenity level from demolition of high-rise public housing capitalized into housing prices at the time

[25] Evidence of high serial correlation in home price growth has been shown in many studies. See, for example, Case and Shiller [1989].

the information is released. However, since this is the first time such a program has been undertaken, there may be substantial uncertainty regarding the degree to which future rents will increase. If this uncertainty is gradually resolved as demolitions occur, then the home prices may increase initially at the time demolition plans are announced and subsequently increase further as demolitions occur. In this situation, observing pre-closure θ_j estimates that are greater than zero does not provide a test of whether buildings were selected for closure based upon serially correlated positive shocks to home prices. However, it seems unlikely that there was enough flexibility in scheduling that demolitions could have been timed in this manner.

3.3 Results

In this section I present evidence about several empirical findings. First, I discuss the impact of public housing demolition on crime in Chicago neighborhoods where demolitions occur. Next, I consider the effect of demolitions on housing and labor markets near the demolitions.

3.3.1 Functional Form

Since I do not have a strong prior about the correct functional form of the model, I consider linear, log-linear, Poisson, and square-root specifications. While the linear, log-linear, and Poisson specifications are the easiest to interpret, estimates from the Box-Cox regression model where the dependent variable is

$$Y_{it}^{(\lambda)} = \frac{Y_{it}^{\lambda} - 1}{\xi} \tag{3}$$

imply that the square-root transformation is most appropriate when murder is the outcome of interest. Appendix Table 15 shows estimates of λ for the outcome variables that are discussed in the next few sections. For murder per capita, the estimate of $\lambda = 0.524$. Likelihood ratio tests strongly reject tests of $\lambda = 0$, which would imply that the log-linear specification is appropriate, and $\lambda = 1$, which would imply that the linear specification is appropriate. For crime outcomes other than murder, the Box-Cox estimates indicate that the appropriate transformation of the outcome variable lies somewhere between log and square-root. Estimates of λ for crimes other that murder can be found in Appendix Table 15. The average of the ten Box-Cox parameters excluding murder that are presented in column (2) is 0.25. Thus, for ease of comparison among different crimes, I focus on specifications which use the fourth-root transformation of the crime count as the dependent variable.

3.3.2 Local Effect of Demolitions on Murder

Figure 4 plots estimates of the θ_j coefficients from Equation 2. The estimates are obtained by regressing murder on the flow of closures (the number closed in a particular year as opposed to the cumulative number of closures), twenty leads of the flow of closures, and ten lags of the flow of closures. A large number of leads is possible, as the murder series extends back to 1965. However, it is important to note that with ten lags, the coefficients at the far right of the plot are identified only by the closures that occur toward the beginning of the program. The estimates are from a linear specification for ease of interpretation. Coefficients can be interpreted as the estimated effect of a single closure in the years before and after it occurs. On inspection, it appears that the effect prior to closure is about zero, while the effect after closure is clearly negative. I take this as evidence in support of interpreting my estimates of Equation 1 as causal estimates of the effect of closures on murder.

Table 7 presents estimates of Equation 1 for murder. Standard errors for the Poisson specifications are clustered by community area. For the linear, log-linear, and square-root specifications, heteroskedasticity and autocorrelation consistent standard errors calculated according to Newey and West [1987] are shown in parentheses. The number of lags used in the Bartlett kernel are reported in the row titled "bw". This bandwidth was selected using the procedure outlined in Newey and West [1994].

Estimates shown in the top panel of Table 7 use cumulative number of high-rise buildings closed prior to demolition as the explanatory variable. For the linear specification, each building closure is associated with about 1.4 fewer murders per high-rise neighborhood. A mean of 13.38 high-rises per affected community area were closed during the course of the sample; thus, the estimate implies that building closures led to a decrease of about 19 murders per year or a total of 150 murders per year in all affected community areas. This translates to approximately an 87.8% reduction in murders in the neighborhoods where high-rises were demolished; however, it is important to keep in mind that tests of the Box-Cox curvature parameter reject the linear model.

The second column of Table 7 presents estimates from the log-linear specification. In this case, each building closure is associated with about a 3.8% reduction in murder, translating to about a 50.4% reduction in murder. Note that the number of observations for the log-linear specifications is 329 rather than 344, as in the other specifications. This is because there are 15 observations for which the number of murders is zero.

The third column of Table 7 shows Poisson regression estimates. The point estimate reveals that each building closure is associated with about a 1.7% drop in murders or about a 23.1% reduction overall.

The last column of Table 7 displays estimates from the square-root transformed specification. In this case, the estimate of -0.111 indicates that each building closure is associated with a 0.111 decrease in the square-rooted annual count of murders. Since the mean number of cumulative closures per community area is 13.38 by the end of the sample, this implies a total reduction of 1.49 square-rooted murders from the mean square-rooted number of murders $21.26^{1/2} = 4.61$. Thus, the cumulative effect of building closures is to reduce the square-rooted number of murders from 4.61 to 3.12, roughly 11.5 fewer murders, or a 54.0% decrease.

The specifications shown in the second panel use the number of public housing units closed in high-rise buildings as the main explanatory variable. As of 2007, 13,970 units had been closed in high-rise public housing buildings, or a mean of 1,746 per high-rise community area. In the first column of the second panel, the estimate of 0.0103 translates into a reduction of about 18 murders per year or approximately an 84.6% reduction. All four specifications in the second panel result in point estimates that translate to similar percentage reductions in murder as the specifications in the top panel. This is to be expected, as the variation in the number of units per high-rise building is not terribly large.

Finally, the specifications presented in the bottom panel use an indicator variable, which is equal to one when the cumulative number of high-rise units closed in the neighborhood exceeds 500, as the main explanatory variable. The estimate reveals a drop of about 11.4 murders per year associated with the period after 500 units have been closed for demolition, or about a 53.6% drop. The log-linear specification in the second column shows about a 36.9% drop in murders, but is not statistically different from zero. The Poisson specification in the third column reveals a point estimate indicating about a 5.1% decrease in murders, but is also not statistically significant. The square-root specification shows that a drop of

0.628 square-rooted murders is associated with the period after 500 units have been closed. This translates into a drop of about 5.4 murders per year per community area, or a 25.4% reduction.

Considering all the evidence presented, I take the square-root specifications using either buildings closed or units closed as the most credible specifications and conclude that public housing closures are responsible for a drop of about 52% to 54% in the number of murders in the eight community areas where high-rise public housing was demolished. This represents a total drop of about 90 - 94 murders. Put another way, public housing closures account for about 60% of the decrease in the number of murders from 1991 (188 murders) to 2007 (33 murders) shown in Table 3.

3.3.3 Local Effect of Demolitions on Other Crimes

Table 8 presents OLS estimates of the effect of closures on the fourth-root of crimes other than murder. For these remaining crimes, I focus on the specifications in the top two panels and those in the fourth and fifth panels, which use the cumulative number of high-rise buildings closed and the cumulative number of units closed as explanatory variables. These specifications are more appealing than the specification presented in the third and sixth panels for two reasons. The first reason is that they exploit variation in both the timing and number of building or unit closures. Second, they do not rely upon the use of an ad-hoc threshold. The estimates for rape imply a reduction of about 17 rapes per community area per year or about a 27% decrease from the pre-1995 mean of 65 per high-rise neigborhood per year. The decrease in assaults associated with closures is about 215 per neighborhood per year, a 30% decrease. The drop in robberies is about 325 per community area per year (a 42% drop). Crimes involving guns drop by about 253 per neighborhood per year (a 37% decrease). Finally, closures are associated with a drop of about 383 personal crimes ocurring in street locations per community area per year (a 26% decrease).

Figure 5 plots estimates of the θ_j coefficients from Equation 2 where the dependent variable is the fourth-root of each particular crime. These plots provide evidence about whether the estimates in the previous paragraph are simply due to continuation of a pre-existing trend or whether there is a clean break from before closure to after closure. In the latter case, a causal interpretation of the estimates is more plausible. For rape, Figure 5 shows that the estimates on leads of building closures tend to be around zero except four and five years after building closure. Estimates on leads of building closures for assault seem to be close to zero or above zero. The lags show a clear drop, with estimates for four, five, and six years after building closure significantly negative. The estimates on the leads of building closure for robbery appear to be zero prior to building closure, and significantly negative after building closure. A similar patterns appears for crimes involving a gun and for personal crimes in street locations. Burglary and residential burglary are close to zero prior to building closure and then become negative after building closure. Theft and auto theft seem to show a negative effect prior to building closure. The pattern of leads and lags for crime in commercial locations shows a near zero effect for the entire period.

In summary, the estimates of Equation 1 show reductions in crime that are statistically different from zero for all five violent crime categories and for burglary, residential burglary, and theft. However, the effect of building closures on rape and assault disappear within ten years after building closure and there appears to be a downward trend in theft prior to building closure.

3.3.4 Local Effect of Demolitions on Housing and Labor Markets

Figure 6 presents plots of the θ_j coefficients from Equation 2 for log-linear specifications of the effect of building closure on median housing transaction prices and number of new residential units that have been authorized by building permits.

As opposed to crime, one would expect to see housing prices and construction activity respond prior to building closure. If real estate developers had perfect foresight, then I would expect housing prices to adjust at the time information of public housing demolition plans is released. Prices would adjust to a level that capitalizes the increased future rents due to increased amenity levels. Increased amenity levels would be expected if it was thought that some sector of the population would value removal of the high-rise public housing buildings either because of crime reduction or architectural bias against large, poorly maintained, imposing buildings.

However, if there was some uncertainty about the size of the amenity increase, then prices may adjust gradually as developers become more certain that there is a segment of the population which values the changes that have occurred in the neighborhood. Furthermore, one would expect supply to adjust in a manner so as to maximize developer profit. This may involve having units ready just in time for a jump in demand, but typically it would not make sense for new units to be ready before crime has dropped and demand has increased.

The plots shown in Figure 6 are consistent with a model of forward-looking real estate developers making investment decisions in the face of uncertainty about the size of the potential demand increase. First, six years prior to building closure, housing transaction prices already show increases relative to the period prior to that period. Then, transaction prices appear to rise a bit more after building closure. Finally, as construction activity picks up after public housing closure, transaction prices fall slightly.

Table 9 contains estimates of Equation 1 for log median home price and log new residential units. The specification in the top panel uses the cumulative number of high-rise public housing buildings closed as the explanatory variable. For this specification, the effect of public housing closures on home prices is not significantly different from zero. The effect of building closures on construction of new residential units is significantly positive at the 90% confidence level. The estimate implies about a 3% increase in the number of new residential units to be built for every high-rise public housing building closed for demolition, or an increase of about 43% overall.

Considering the plot of leads and lags of the effect of building closure on log median home prices presented in Figure 6, it is likely that the model used to calculate the estimates for column (1) of Table 9 is misspecified. Theory predicts that housing prices should increase prior to building closure if closure is expected, and Figure 6 reveals that they do.

As an alternative, I turn to a specification that exploits information that I have regarding the exact location of each housing transaction and its distance to the nearest public housing development in which high-rise building demolition is taking place. Figure 7 plots the housing price gradient as distance to the nearest public housing development where high-rises are being demolished increases from 0.1 mile to 0.6 mile. The gradient is plotted in 2000, 2003, and 2007. While housing prices at all distance are increasing, the increase nearest to public housing is the most dramatic. Thus, the slope of the gradient appears to be decreasing over time as high-rises are demolished.

Table 10 presents estimates of the price gradient for housing transactions near high-rise public housing developments. The estimates are from the following regression model

$$p_{n,i,t} = \alpha_i + \gamma_t + \delta_t dist_{n,t} + \epsilon_{n,i,t} \tag{4}$$

where $p_{n,i,t}$ is the log price of transaction n which is for a home located in community area i and which occurred in year t. α_i is a community area fixed effect and γ_t is a year effect. The $dist_{n,t}$ variable is the interaction of a year indicator and distance to the nearest high-rise public housing development. The δ_t are the coefficients of interest, the distance to public housing gradient in a particular year. The sample only contains transactions from the years 2000 through 2007, because the data are too thin for the years between 1988 and 1999. For the estimates presented in the first column, the sample is limited to transactions that occurred between 0.1 and 0.6 mile of a high-rise public housing development. The specification in the second column further limits the sample to only include transactions from the eight neighborhoods which had high-rise public housing developments.

The estimate in the first row and column of Table 10 reveals that transaction prices rose by about 30% in the year 2000 as the distance to the nearest high-rise public housing development increased from 0.1 mile to 0.6 mile. However, adding the coefficient in the first row and column to the coefficient on "(year==2007)*dist" in the first column results in a slope of only 0.114, meaning that the prices rose by about 5.5% when moving from 0.1 mile to 0.6 mile away from the nearest high-rise public housing development in 2007.

In the bottom panel of Table 10, I attempt to quantify the size of the externality that high-rise public housing was imposing upon nearby property values. The row entitled "Mean reduction in 2000 Price" is calculated by taking the mean difference between the exponentiated predicted value of log prices from the regression model and the exponentiated counterfactual predicted values, had the gradient been equal to zero in 2000. The counterfactual assumes that there was a 0% increase in prices in 2000 when moving from 0.1 to 0.6 mile away from high-rise public housing and that all values would have been the same as those predicted at 0.6 mile. A zero gradient appears to have been approximately true in 2006. Finally, the row entitled "Gross Reduction in 2000" multiplies the mean reduction by the number of transactions to determine the number of dollars that were lost in property transactions in 2000. Of course, this is a lower bound for the size of the externality, as it is likely that only a small amount of the land or homes that was between 0.1 and 0.6 mile of a high-rise public housing development transacted in 2000.

4 City-Wide Effect of Public Housing Demolition

In this section, I estimate the degree to which the direct reductions in neighborhood crime associated with public housing demolition, shown in the previous section, are countered by increases in crime in other parts of the city due to displacement.

4.1 Data Sources and Descriptive Statistics

For this analysis, I use data on the relocation of public housing residents in Chicago who were displaced by public housing demolitions. I also use city-level data on HOPE VI demolition grants and city-level data on murder rates for a panel of cities in the United States.

4.1.1 Data Concerning Relocation of CHA Residents

From a policy evaluation standpoint, I am interested in measuring the effects of the CHA's Plan for Transformation; however, the degree to which I am able to learn about the effects of public housing deconcentration in general depends upon the specifics of the relocation process.

Several possible scenarios would allow the measurement of different effects. In the first scenario, residents who are induced to move by building closures evenly disperse throughout the same neighborhood in which their public housing development was located. In this scenario, neighborhood composition does not change; hence, the local effect measured in the previous section would simply measure the effect of deconcentrating public housing residents within a neighborhood and of demolishing poorly maintained high-rises. In this case, one might not expect any crime displacement to other neighborhoods. A second possible scenario would be that all former public housing residents left their old neighborhoods for other parts of the city or moved out of the city entirely. Of course, the reality is some combination of both scenarios.

The CHA's website describes the relocation process in the following way:

> Every resident who occupied a CHA unit on October 1, 1999 and continues to comply with the terms of their lease during the rebuilding process is entitled to return to a redeveloped or rehabilitated unit. Many of these residents will need to relocate from their existing apartments on at least a temporary basis to accommodate renewal. The CHA, in conjunction with other city departments and social

service organizations, manages this complex relocation process, helping residents choose temporary and permanent replacement housing.[26]

I use data from two sources to learn about relocation of displaced CHA residents. The first, a study conducted by the National Opinion Research Center (NORC), sheds some light on where public housing residents moved when their buildings were closed. Eight hundred residents whose buildings were closing in 2002 and 2003 were surveyed then and again in 2006. The follow-up survey response rate was 83%. Of those who did respond, 37% were living within one mile of their original building, 38% between one and five miles of their original building, 20% between five and ten miles of their original building, and the remaining 8% were living more than 10 miles from their original building. The residents' original buildings were located in 11 different community areas. In 2006, 46% of those who responded were living in the same 11 community areas (39% of the residents from the eight neigborhoods with high-rise public housing were still living in those eight neighborhoods). Only 3% were no longer living in the city. However, it is likely that the non-response rate was higher for households that left Chicago. As of 2006, 19% of respondents had permanently relocated to a CHA building, 37% had permanently relocated to voucher-based housing (Section 8), 35% were temporarily relocated in a CHA building, 4% were temporarily relocated in voucher-based housing, and the remaining 5% were still in their original unit. Adding the non-respondents and those who reported moving out of Chicago results in an upper bound of 20% for the proportion of households that has left the city. The same assumption results in 38% remaining in the 11 neighborhoods where buildings were closed, and 42% moving to other neighborhoods within the city, primarily on the South Side and West Side.

The second source of information regarding displaced resident relocation is an August 2008 press release issued by the CHA. The press release reveals that 8,000 households who held a lease with the CHA in October 1999 had moved as a result of building closures. Over 4,277 of those households have chosen to receive Housing Choice Vouchers HCV (also known as Section 8 Vouchers), which can be used in the private rental market. The press release shows that only 116 households (or 2.7%) who opted to receive HCV's have moved out of the City of Chicago. The press release also provides a count of the number of these households by the community area in which they currently live as of August 2008. Figure 8 shows the

[26] http://www.thecha.org/transformplan/plan_summary.html.

geographic distribution of the relocatees as of August 2008.

4.1.2 HUD Demolition Grant and FBI Uniform Crime Reporting Data

I use data on HOPE VI demolition grants from HUD's website.[27] The data cover the period from fiscal year 1996 through fiscal year 2003, and provide the city, state, and name of the local housing authority that is receiving the grant. The name of the development, number of units to be demolished, dollar amount of the grant, and fiscal year are also specified.

Data on city-level murder rates come from the FBI's Uniform Crime Reporting Program. I use monthly murder counts reported by municipal police departments from 1988 through 2004 from the National Archive of Criminal Justice Data. For the years 2005 through 2007, I obtain annual murder counts for municipal police departments from the FBI's Uniform Crime Reporting website.[28]

4.2 Empirical Methodology

A critical question is whether public housing demolition leads to a net reduction in crime or simply causes it to move from one area to another. I attempt to determine whether public housing demolitions lead to a net reduction in crime in two ways. First, I estimate the impact of public housing relocatees on crime in Chicago neighborhoods. For this analysis, I use the specification presented in Equation 1. In this case, $C_{i,t}$ is a measure of the number of public housing residents that were displaced by demolitions and have relocated to community area i in year t. Second, I estimate the net effect of public housing demolition on the crime rate of a panel of roughly 120 cities which received HOPE VI demolition grants. For this analysis, I use specifications similar to Equations (1) and (2). However, in this case the outcome, $Y_{i,t}$, is the crime rate in city i in fiscal year t, α_i are city fixed-effects, γ_t are fiscal year-effects, and $C_{i,t}$ is a dummy variable that is equal to zero in every fiscal year before a city receives a HOPE VI demolition grant and is equal to one in the fiscal year that a grant is received and all subsequent fiscal years. This city-level analysis identifies only the net effect. If crime is simply displaced from one neighborhood to another, and there is no net change in crime for the city as a whole, then receiving a HOPE VI demolition grant should have no effect on a city's crime rate.

[27] http://www.hud.gov/offices/pih/programs/ph/hope6/grants/demolition/

[28] http://www.fbi.gov/ucr/ucr.htm

4.3 Results

In this section, I present evidence concerning the net effect of public housing demolition on crime. First, I consider measures of the amount of crime that follows displaced public housing residents to their new neighborhoods in Chicago. Subsequently, I turn to a panel of the roughly 120 cities which received HOPE VI demolition grants to learn about the effect of receiving a demolition grant on the city murder rate.

4.3.1 Displacement of Crime in Chicago

Table 11 presents estimates of the effect of relocatees on crime. I am cautious about assigning a causal interpretation to these estimates as they may be biased due to endogeneity of the explanatory variable. If households chose to move to neighborhoods that had experienced a serially correlated downward shock to crime in the previous period, then OLS estimates of the effect of relocatee households on crime will be negatively biased.

In Table 11, the variable labeled "Relocatee" is a proxy for the cumulative number of households that have relocated to a particular community area after having been displaced by CHA building closures. I calculate the number of relocatees by assuming that the fraction of households moving from one of the eight community areas where high-rise demolitions occur is always equal to the fraction in the NORC survey. For example, in the NORC survey, 14% of households who relocated from the Near West Side moved to Austin. Thus, for every building closure that occurs in the Near West Side, there is an increase in the Relocatees observation for Austin in the same year by 14% of the number of households affected by the building closure.

Table 11 contains estimates of the effect of relocatee households on violent crime. All specifications include community area effects variables and year effects. Box-Cox regression estimates indicate that the log transformation of the dependent variable is most appropriate. However, I choose to focus on Poisson regression specifications as they impose a functional form similar to log, but are better suited for count data.

The top panel of Table 11 contains estimates for a sample limited to the 29 community areas which received more than one relocatee and which did not contain high-rise or low-rise family public housing developments. For the most part, the estimates are negative in sign, but not significantly different from zero. The exceptions are the estimate for rape, which is significantly less than zero, and the estimate for personal crimes in a street location, which is positive but very close to zero. The upper limit of the 95% confidence interval for murder is about 0.00236, which corresponds to a 27.6% increase in murder. For all 29 community areas in the sample, the upper bound of the confidence interval implies an increase of about 103 murders per year. The lower 95% confidence bound implies a decrease of about 43.9%, or 164 fewer murders, for all 29 community areas.

The second panel from the top of Table 11 contains estimates for a sample limited to the 13 community areas that received more than 100 relocatees and which did not contain high-rise or low-rise family public housing developments. For this restricted sample, the point estimates for all six violent crime categories are negative. The estimate for murder is significantly less than zero, but only at the 90% confidence level. The other point estimates are not statistically different from zero.

The third and fourth panels of Table 11 contain estimates of the effect of relocatees on property crimes. For the sample of 29 community areas that received one or more relocatee, shown in the third panel, all point estimates are positive. The estimates for auto theft and crimes in commercial locations are statistically different from zero. The influx of relocatees is associated with an 11.7% increase in auto theft and an 8.8% increase in crimes in commercial locations. However, for the more restrictive sample of 13 community areas which received 100 or more relocatees shown in the second panel from the top, the point estimates are negative and not statistically different from zero. Finding that relocatees are associated with increased auto theft in a sample that includes community areas that receive relatively few relocatees, while finding no effect in the sample that is limited to only the community areas that receive a high number of relocatees is consistent with neighborhoods that receive few relocatees having either more valuable cars or more poorly secured cars than the neighborhoods that receive a high number of relocatees.

Taken together, the evidence about the effect of relocatees on crime is inconclusive. This is not entirely surprising, given the noisy measure of the number of relocatees that I am using.

4.3.2 City-Wide Effect of Demolitions on the Murder Rate

Next, I turn to estimates of the effect of receiving a HOPE VI demolition grant on a city's murder rate. Table 12 presents estimates of linear, log-linear, and square-root transformed specifications of Equation 1. Estimates in the upper panel are from a sample of all cities which received HOPE VI demolition grants from 1996 through 2003. The explanatory variable labeled "Demolition Grant" is a dummy variable which is equal to one in the fiscal year in which a particular city received its first demolition grant and remains equal to one through the end of the sample. The linear specification shows a reduction of about 1.9 murders per year per 100,000 residents, which translates to a reduction of about 12% from a pre-demolition mean murder rate of 16.3 murders per year per 100,000 residents for the sample of 121 cities that received demolition grants. The point estimate for the linear specification is significantly different from zero at the 95% confidence level. The log specification shows a drop of about 11% in the murder rate associated with receiving a demolition grant. This estimate is also significantly different from zero at the 95% confidence level. The third column shows the estimate for the specification in which the square-root of murders per capita is the dependent variable. For this specification, the point estimate is not quite significantly different from zero even at the 90% confidence level; however, the point estimate translates to about a 9% reduction in murders per capita, which is close to the percentage reduction in murders per capita implied by the linear and log-linear specifications.

The middle panel of Table 12 presents estimates of the same three specifications for a sample that has been limited to the 101 cities which received all of their HOPE VI demolition grant funding in a single fiscal year. For this sample, the timing of demolitions may be more clearly defined. The point estimates in each specification become slightly more negative using this limited sample. The estimates in the linear and log-linear specifications remain statistically different from zero at the 95% confidence level, while the estimate for the square-root specification is still close to the boundary of being significantly less than zero at the 90% confidence level.

The lower panel of Table 12 presents estimates from a falsification test. I randomly assign the demolition grant history of the 121 cities that received demolition grants to the 121 highest population cities that did not receive demolition grants. As expected, the effect of "False Demolition Grant" is not statistically different from zero.

Figure 9 plots the θ_j coefficients from Equation 2 for the square-root specifications. The left plot is for the full sample of 121 cities which received demolition grants. The coefficients can be interpreted as being relative to the period prior to five years before receiving a demolition grant. The coefficients appear to be close to zero prior to receiving a demolition grant, and negative beginning with the year that the demolition grant is awarded. The right plot shows coefficients for the set of the 121 highest population cities which did not receive demolition grants. Most of the coefficients are close to zero indicating that, as expected, the year in which another randomly assigned city received a demolition grant has no effect on the murder rate of a city that did not receive a demolition grant. Appendix Table 13 presents summary statistics for the 121 cities that received demolition grants and the highest population 121 cities that did not a receive demolition grant used in the falsification test.

It is interesting to compare the size of the direct effect of public housing demolition on murder with the city-wide effect. I estimate that public housing demolitions in Chicago lead to a combined reduction of about 90 murders per year in the eight community areas where high-rise public housing was demolished. This represents a drop of 11.8% from a mean of 762 murders per year for the entire City of Chicago in the pre-demolition period. Comparing the 11.8% direct effect to the 10% reduction measured across cities that received demolition grants implies that displacement effects account for only about a 2% increase in murder.

5 Conclusion

This paper provides empirical evidence regarding the neighborhood-level and city-wide impact of the HOPE VI public housing demolition program on crime, housing, and labor markets. It is the first to show that Chicago's large-scale public housing demolition program is associated with large drops in violent crime, increases in home prices, and increases in residential construction in the neighborhoods where public housing is demolished. Furthermore, estimates from 121 cities that received HOPE VI demolition grants indicate that public housing demolition is associated with a net reduction in the city-wide murder rate.

These results provide support for theories which predict that high concentrations of low-income households will lead to a greater amount of crime than would occur if low-income households were more evenly spatially distributed. The evidence is consistent with economic theories that emphasize the importance of social interaction or peer effects for crime, sociological theories that emphasize disorder and the breakdown of collective efficacy that can occur when poverty is spatially concentrated, and urban design theories that focus on the degree to which certain building designs enable criminals to avoid capture.

The preceding analysis demonstrates that, in Chicago, public housing demolitions lead to a 25% to 50% decrease in murder in neighborhoods where high-rise public housing is demolished. Furthermore, violent crimes other than murder drop by 20% to 40% in neighborhoods where high-rise public housing is demolished. The local neighborhood effect of public housing demolitions on murder in Chicago translates to a slightly larger drop in murder for the entire city than the 10% city-wide drop in the murder rate that I find using a panel of cities that received HOPE VI demolition grants. This implies that violent crime displacement due to public housing demolition is likely to be small.

There is also evidence of a 20% to 25% increase in median home prices and a 30% to 40% uptick in residential unit construction in Chicago neighborhoods where high-rise public housing was demolished. A back of the envelope calculation suggests that each neighborhood murder and the package of other crimes that are correlated with each murder impose a cost of about $3,200 to $4,300 dollars per home in neighborhoods where public housing was demolished. Furthermore, the relationship of home prices increasing with distance from high-rise public housing developments, which is present in the year 2000, has disappeared by the year 2006, when a large fraction of Chicago's high-rise public housing stock has been demolished. The implication is that large public housing developments were creating an externality that lowered nearby property values.

While I am unable to say whether deconcentration of public housing increases welfare, it is clear that policy makers with an objective of minimizing city-wide crime should avoid promoting the spatial concentration of low-income households by building large high-rise public housing developments as they did in Chicago in the 1950's and early 1960's. The results point to possible benefits of the current move toward a more even spatial distribution of public housing which emphasizes scattered-site low-rise construction and mixed-income developments.

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Figure 1: Cumulative Number of Housing Units to be Demolished with Funding from HOPE VI Demolition Grants

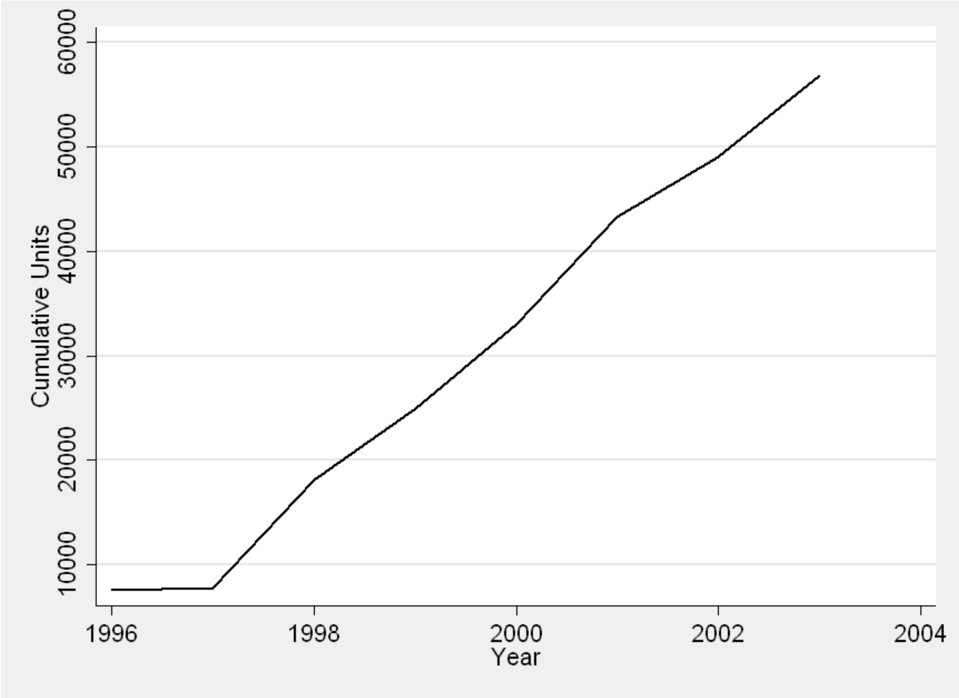
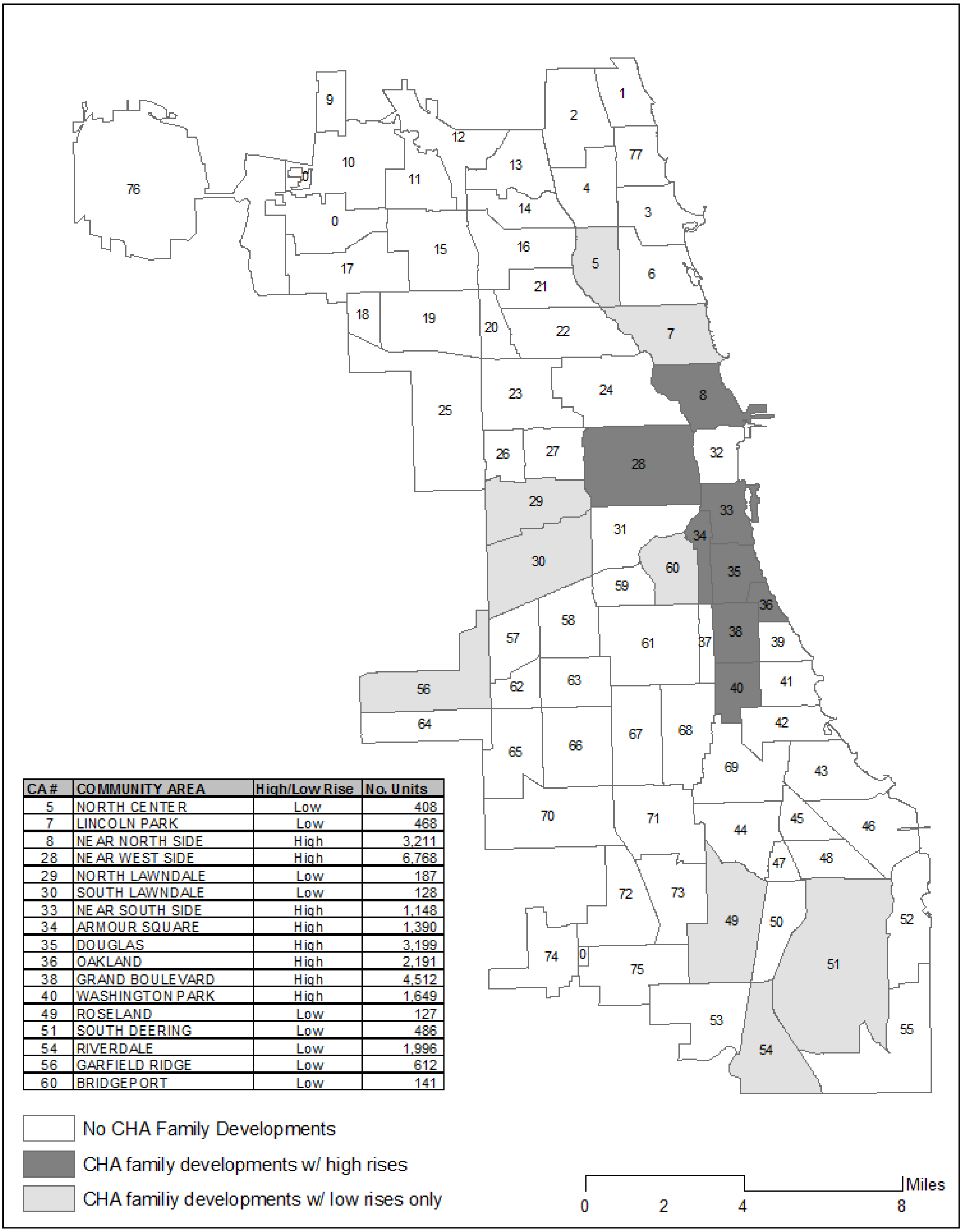


Figure 2: Community Areas with Family Public Housing Developments



CA #	COMMUNITY AREA	High/Low Rise	No. Units
5	NORTH CENTER	Low	408
7	LINCOLN PARK	Low	468
8	NEAR NORTH SIDE	High	3,211
28	NEAR WEST SIDE	High	6,768
29	NORTH LAWNDALE	Low	187
30	SOUTH LAWNDALE	Low	128
33	NEAR SOUTH SIDE	High	1,148
34	ARMOUR SQUARE	High	1,390
35	DOUGLAS	High	3,199
36	OAKLAND	High	2,191
38	GRAND BOULEVARD	High	4,512
40	WASHINGTON PARK	High	1,649
49	ROSELAND	Low	127
51	SOUTH DEERING	Low	486
54	RIVERDALE	Low	1,996
56	GARFIELD RIDGE	Low	612
60	BRIDGEPORT	Low	141

Figure 3: Annual Number of CHA Buildings Closed in High Rise Development Community Areas

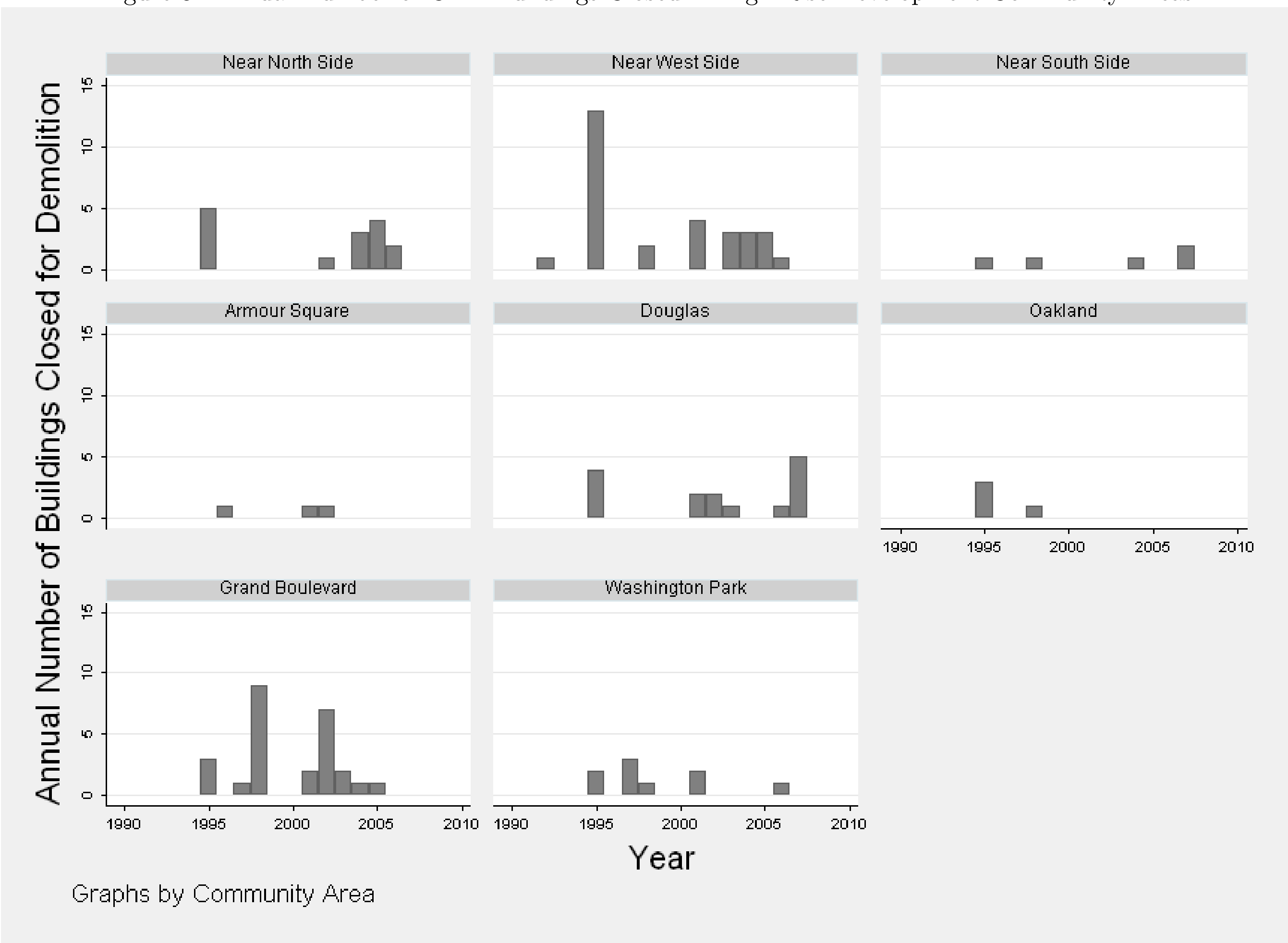


Figure 4: Lead and Lagged Effect of Building Closure on the Square-root of Murder in High Rise Development Community Areas

Figure 5: Lead and Lagged Effect of Building Closure on the Fourth-root of Crimes Other than Murder in High Rise Development Community Areas

Figure 6: Lead and Lagged Effect of Building Closure on the log of Median Home Prices and New Residential Units

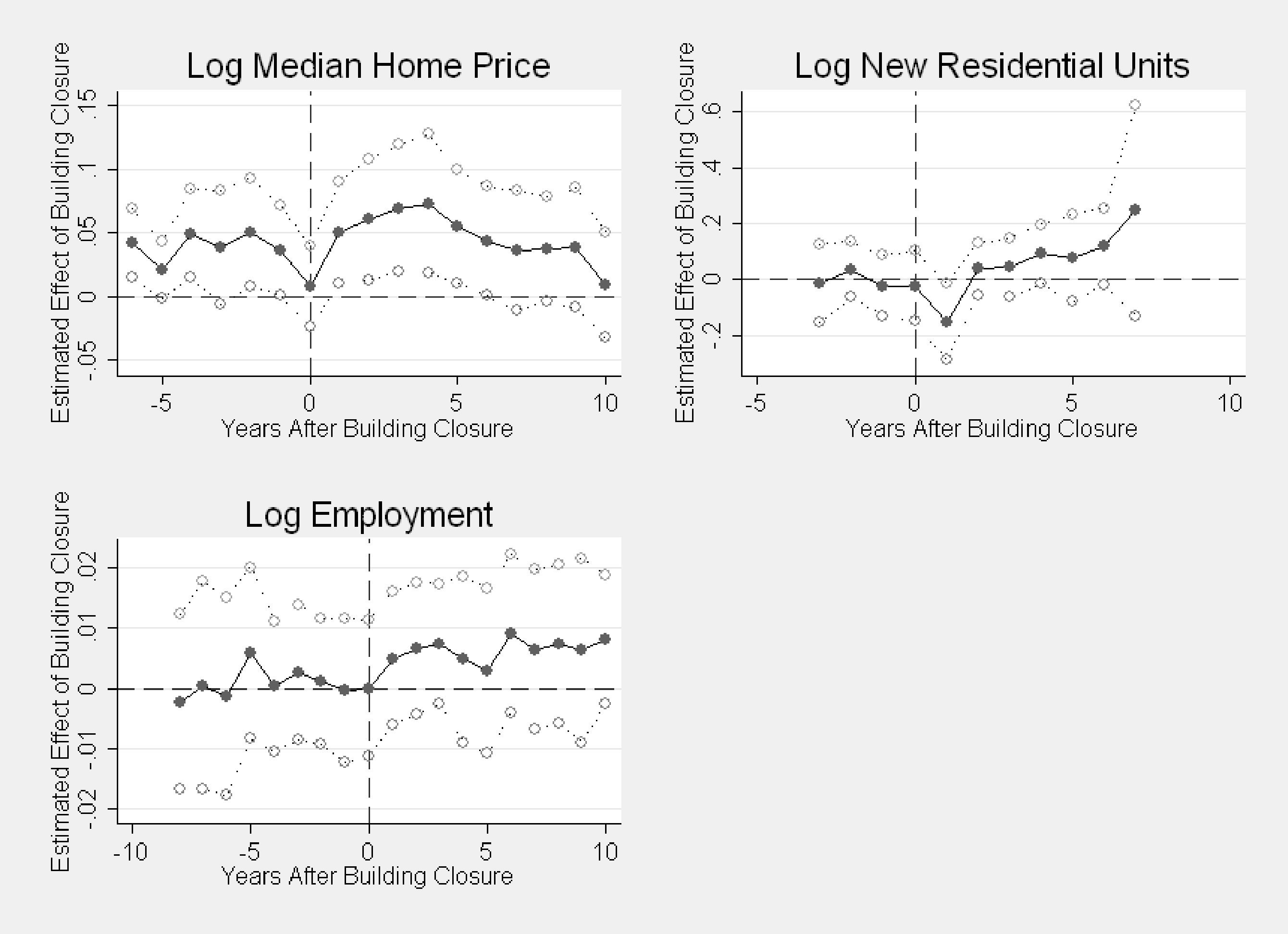


Figure 7: Kernel-Weighted Local Polynomial Regression Plots of Housing Price Gradient

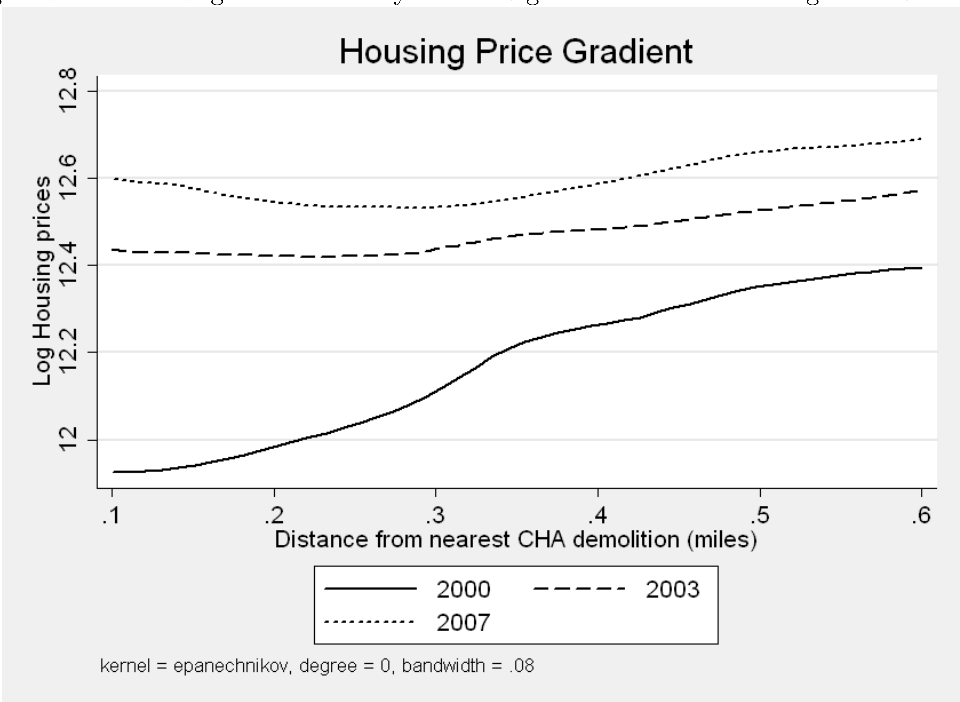


Figure 8: Number of Relocatees by Community Area

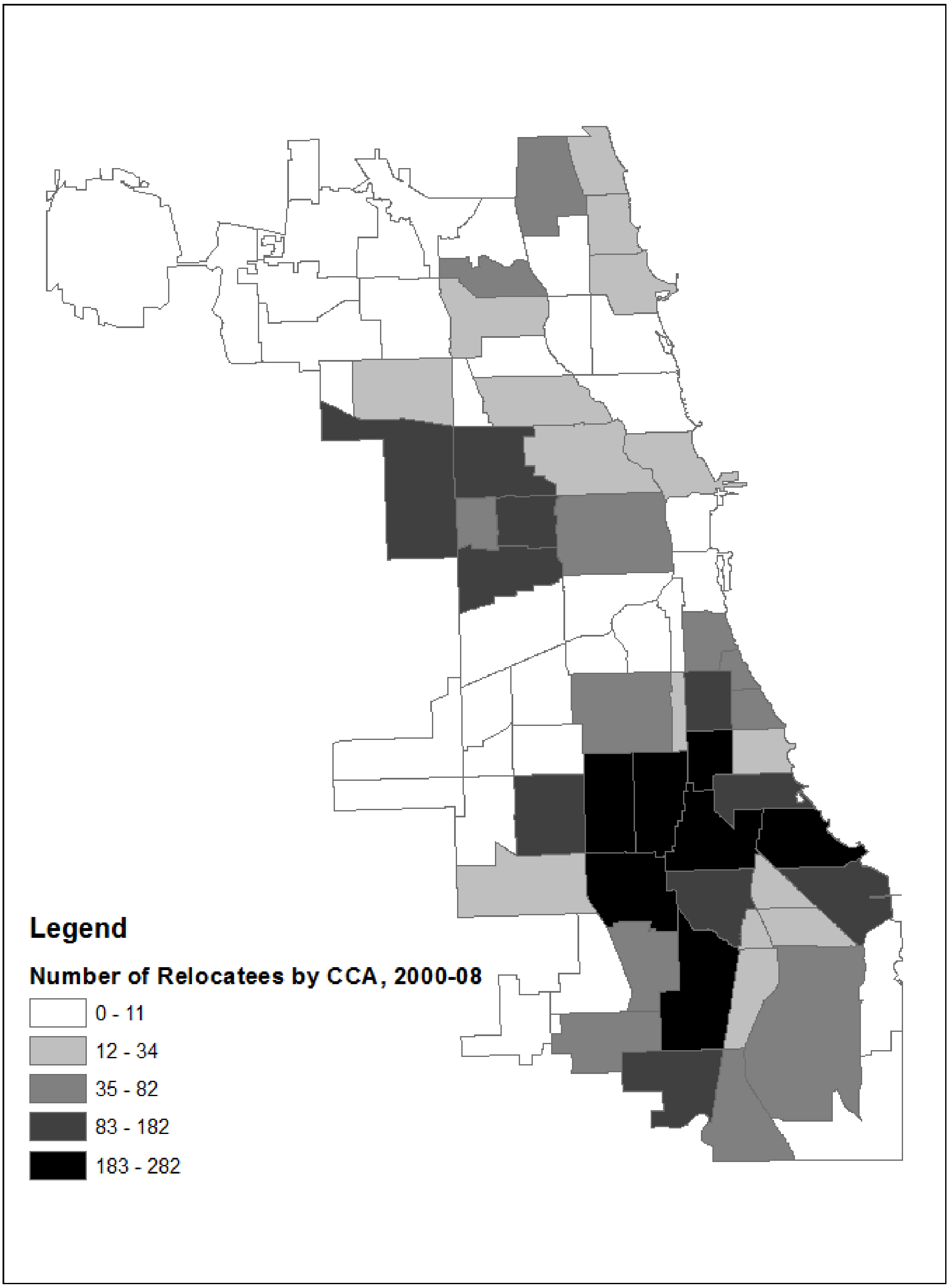


Figure 9: Lead and Lagged Effect of Effect of Demolition Grant on City-Wide Murder Square-Root Specification and Falsification Test

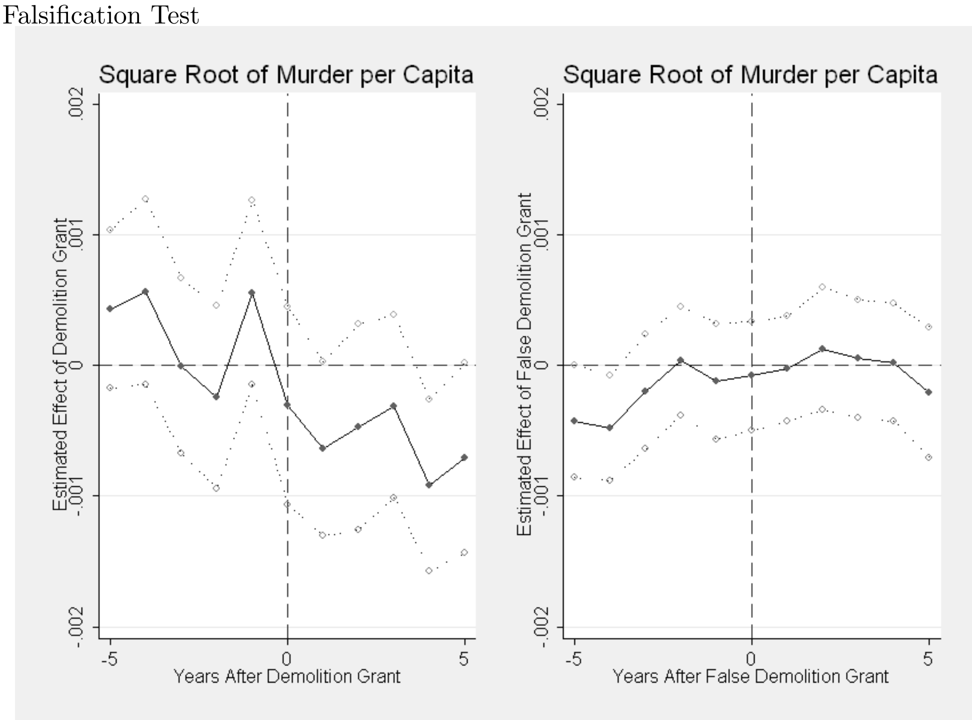


Table 1: CHA Family Housing Developments

Development Name	High-Rise	Year Completed	Community Area (Number)	Units
ABLA Homes	Yes	1961	Near West Side (28)	3,699
Altgeld-Murray Homes	No	1945/1954	Riverdale (54)	1,996
Bridgeport Homes	No	1943	Bridgeport (60)	141
Cabrini-Green Homes	Yes	1942/1962	Near North Side (8)	3,211
Dearborn Homes	Yes	1950	Armour Square (34)	48
			Douglas (35)	752
Henry Horner Homes	Yes	1957/1961	Near West Side (28)	1,933
Hilliard Homes	Yes	1966	Near South Side (33)	345
Ickes Homes	Yes	1955	Near South Side (33)	803
			Douglas (35)	203
Lakefront Homes	Yes	1963	Oakland (36)	923
Lathrop Homes	No	1937	North Center (5)	408
			Lincoln Park (7)	468
Lawndale Gardens	No	1942	North Lawndale (29)	187
			South Lawndale (30)	128
LeClaire Courts	No	1954	Garfield Ridge (56)	612
Lowden Homes	No	1953	Roseland (49)	127
Robert Taylor Homes	Yes	1962	Grand Boulevard (38)	3,312
			Washington Park (40)	1,103
Rockwell Gardens	Yes	1961	Near West Side (28)	1,136
Stateway Gardens	Yes	1958	Armour Square (34)	920
			Douglas (35)	724
Trumball Park Homes	No	1938	South Deering (51)	486
Washington Park Homes	Yes	1962	Grand Boulevard (38)	911
			Washington Park (40)	546
Wells-Darrow-Madden Homes	Yes	1941/1961/1970	Douglas (35)	1,520
			Oakland (36)	1,268
			Grand Boulevard (38)	289
Wentworth Gardens	No	1945	Armour Square (34)	422

Note: Total number of units as of 1990 for each non scattered-site, non city-state family development broken down by community area. High-rise indicates whether the development contained any high-rise buildings.

Table 2: Descriptive Statistics

	(1) Highrise 1990	(2) Highrise 2000	(3) Whole City 1990	(4) Whole City 2000
Median Income	36.2K	37.3K	47.0K	41.1K
Median Home Value	-	212K	155K	174K
Median Rent	572	627	613	642
Population	27.6K	26.9K	36.8K	38.3K
Households	12.0K	12.6K	13.6K	14.1K
Housing Units	14.9K	15.0K	15.0K	15.2K
HH Size	2.53	2.54	3.04	2.96
% Owner Occupied	17.6	29.1	41.0	43.7
% Units Vacant	19.9	15.8	9.4	7.8
% African-American	65.9	54.8	38.4	36.2
% Under 18	40.0	22.6	37.4	26.2
% Over 65	12.2	11.2	11.9	10.4
% Female Head	43.0	28.4	29.4	18.5
% Employed	41.2	51.1	55.7	54.3
% Public Asst.	26.4	9.5	14.2	6.8
% Under Poverty Line	41.9	29.2	20.4	18.6
% HS Grad.	60.9	74.0	64.1	70.0
% College Grad.	23.6	36.1	17.5	22.9
Murder	23.5	9.9	11.9	7.7
Rape	72.3	30.5	43.2	25.5
Assault	790	472	457	344
Robbery	1,018	306	561	250
Gun	891	271	519	244
Street	1,694	1,082	1,117	882
Burglary	646	286	669	367
Res. Burglary	368	170	486	286
Theft	3,113	2,233	1,672	1,355
Auto Theft	660	364	605	383
Commercial	1,468	1,373	893	764
Median Home Price	-	171K	-	143K
New Res. Units	26.8	61.9	23.0	53

Note: Population/Housing Unit weighted mean community area demographic data from 1990 and 2000 Census. All dollar amounts are in terms of year 2000 dollars. Highrise denotes 8 community areas with public housing developments that include high-rises. Income, rent, and home values are measured in year 2000 dollars. Median home values are not reported for 47 of the 121 census tracts in high-rise neighborhoods in 1990. In 2000, median home value data are missing for 13 high-rise census tracts. Similarly, there are too few home transactions in my data set to report median home prices for 1990. Crime means listed in columns (1) and (3) are for 1991. New Residential units listed in columns (1) and (3) are for 1993.

Table 3: Total Crime in 8 High-Rise Community Areas over Time

Total Crime in High Rise CAs	1991	1995	1999	2003	2007
Murder	188	87	84	56	33
Rape	578	430	291	177	137
Robbery	8,142	4,357	2,863	1,866	1,492
Assault	6,322	5,256	4,001	2,682	1,974
Burglary	5,171	3,584	2,705	1,948	1,590
Residential Burglary	2,940	2,160	1,550	1,115	949
Theft	24,907	21,912	19,541	14,719	12,330
Motor Vehicle Theft	5,280	3,715	3,138	2,167	1,661
Gun Involved	7,124	3,294	2,331	1,461	1,016
Street Crime	13,550	10,143	9,156	7,346	5,780
Commercial Location	11,740	10,443	10,712	9,407	7,721

Note: Total crime counts for 8 neighborhoods that contained high-rise public housing.

Table 4: 1950 Characteristics of Neighborhoods where High-Rise Public Housing was Proposed

	(1) Accepted Sites	(2) Rejected by CHA	(3) Rejected by City Council
% African-American	65.6	0.4	4.7
Median Income	14.5k	28.7k	24.5k
Population per Square Mile	3.03k	2.80k	1.47k
Distance to CBD (miles)	2.82	7.74	8.29

Note: Population weighted community area means calculated from 1950 census data. All dollar amounts are in terms of year 2000 dollars. Column (1) includes 8 community areas where high-rise public housing was built: Near North Side, Near West Side, Near South Side, Armour Square, Douglas, Oakland, Grand Boulevard, Washington Park. Column (2) includes 5 North Side community areas containing sites considered for high-rise public housing but ultimately rejected by the CHA due to high cost of obtaining land: Rogers Park, West Ridge, Uptown, Lincoln Square, and North Park. Column (3) includes 9 South Side community areas containing sites considered for high-rise public housing but ultimately rejected due to objections from the City Council: South Chicago, South Deering, East Side, West Pullman, Riverdale, Hegewisch, Garfield Ridge, McKinley Park, New City, Clearing. (Source: Bowly, Jr. [1978] and Brad Hunt's notes from CHA historical archives.)

Table 5: 20 Neighborhoods with the Highest Predicted Probability of Containing High-Rise Public Housing

Neighborhood	(1) High-Rise Public Housing	(2) P-Score	(3) % Under Poverty Line	(4) % African-American
Rogers Park	No	0.015	27.5	19.5
Near North Side	Yes	0.023	23.3	20.0
Albany Park	No	0.036	3.4	17.5
Woodlawn	No	0.038	96.0	37.0
Hermosa	No	0.038	2.0	17.4
Avondale	No	0.039	1.3	17.4
Uptown	No	0.074	22.3	24.2
Austin	No	0.085	99.2	40.8
Englewood	No	0.145	99.2	43.2
Humboldt Park	No	0.166	50.5	33.8
Logan Square	No	0.224	6.8	26.4
New City	No	0.245	41.3	34.1
East Garfield Park	No	0.333	98.9	48.1
Lower West Side	No	0.333	1.1	27.8
Fuller Park	No	0.387	98.6	49.2
West Town	No	0.439	10.6	31.9
Douglas	Yes	0.469	91.6	49.4
Armour Square	Yes	0.523	22.2	36.0
Washington Park	Yes	0.805	99.4	58.4
Near West Side	Yes	0.889	67.0	54.5
Near South Side	Yes	0.938	93.5	62.5
Grand Boulevard	Yes	0.952	99.4	64.7
Oakland	Yes	0.996	99.4	72.3

Note: 20 neighborhoods with the highest predicted probability of containing high-rise public housing estimated by probit using the percentage of households below the poverty line in 1990 and the percentage of African-American households in 1990 as explanatory variables on a sample of the 68 community areas that do not contain low-rise public housing. Marginal effects (confidence levels) are 0.321 (0.002) for percent under the poverty line and -0.067 (0.080) for percent African-American.

Table 6: Decennial Population and the Number of Households Displaced by Closures in Neighborhoods where High-Rises were Demolished

Community Area	(1) Pop. 1980	(2) Pop. 1990	(3) Pop. 2000	(4) HH Disp. in 1990's	(5) HH Disp. in 2000's
Near North Side	67,158	62,842	72,811	367	644
Near West Side	57,296	46,197	46,419	708	612
Near South Side	7,243	6,828	9,509	322	418
Armour Square	12,475	10,801	12,032	68	418
Douglas	35,700	30,652	26,470	311	136
Oakland	16,748	8,197	6,100	184	513
Grand Boulevard	53,741	35,897	28,006	542	495
Washington Park	31,935	19,425	14,146	279	260
Total	282,296	220,839	215,503	2,781	3,168

Note: Population numbers from the Decennial Census are presented in columns (1) through (3). Columns (4) and (5) show an estimate of the number of households that were displaced by building closures in the 1990's and from 2000 through 2007, respectively. NORC survey data show that 39% of households that were displaced by building closures in 2002 and 2003 were still living in the 8 neigborhoods listed above in 2006.

Table 7: Estimates of Effect of Closures on Murder

	(1) Murder	(2) log Murder	(3) Poisson	(4) $(\text{Murder})^{1/2}$
Buildings Closed	-1.396***	-0.0377***	-0.0173*	-0.111***
	(0.102)	(0.0101)	(0.0103)	(0.0174)
Observations	344	329	344	344
R-squared	0.885	0.879		0.893
bw	27	27		27
Approximate Change	-87.8%	-50.4%	-23.1%	-54.0%
Units Closed	-0.0103***	-0.000288***	-0.000141**	-0.000810***
	(0.000715)	(5.40e-05)	(7.04e-05)	(0.000116)
Observations	344	329	344	344
R-squared	0.884	0.880		0.891
bw	3	6		16
Approximate Change	-84.6%	-50.3%	-24.6%	-51.9%
1(Units Closed $>$ 500)	-11.39***	-0.269	-0.0510	-0.628**
	(2.027)	(0.199)	(0.215)	(0.286)
Observations	344	329	344	344
R-squared	0.828	0.869		0.863
bw	5	27		27
Approximate Change	-53.6%	-26.9%	-5.1%	-25.4%

Note: Unit of observation is community area - year. All specifications include community area-effects and year-effects. The mean number of murders per year per community area prior to 1995 was 21.26. The mean number of buildings and units closed per community area by the end of the sample are 13.38 and 1,746, respectively. Standard errors for all specifications are shown in parentheses. Newey-West Heteroskedasticity and Auto-Correlation consistent standard errors are presented for all specifications except Poisson. The bandwidth of the Bartlett window is displayed on the line labeled "bw". For Poisson specifications standard errors are clustered by community area.

Table 8: OLS Estimates of the Effect of Closures on Crime Fourth-root Specification

	(1) Rape	(2) Assault	(3) Robbery	(4) Gun	(5) Street
Buildings Closed	-0.0158***	-0.0329***	-0.0497***	-0.0414***	-0.0332***
	(0.00360)	(0.0104)	(0.00803)	(0.00610)	(0.00800)
Observations	136	136	136	136	136
R-squared	0.954	0.970	0.975	0.974	0.979
Approximate Change	-26.7%	-29.9%	-41.6%	-36.7%	-25.7%
Units Closed	-0.000118***	-0.000253***	-0.000337***	-0.000285***	-0.000242***
	(2.78e-05)	(6.76e-05)	(6.83e-05)	(5.29e-05)	(6.05e-05)
Observations	136	136	136	136	136
R-squared	0.954	0.971	0.971	0.972	0.979
Approximate Change	-26.1%	-30.0%	-37.6%	-33.6%	-24.6%
1(Units Closed > 500)	-0.0555	0.00406	-0.106	-0.123	-0.00206
	(0.0459)	(0.110)	(0.103)	(0.0917)	(0.112)
Observations	136	136	136	136	136
R-squared	0.945	0.956	0.946	0.954	0.968
Approximate Change	-7.6%	-0.3%	-7.8%	-9.2%	-0.1%
Pre 1995 Mean	64.69	717.5	782.0	688.2	1,491

	(6) Burglary	(7) Res. Burg.	(8) Theft	(9) Auto Theft	(10) Commercial
Buildings Closed	-0.0290***	-0.0258***	-0.0218***	-0.00956	-0.0126
	(0.00665)	(0.00742)	(0.00559)	(0.0101)	(0.0123)
Observations	136	136	136	136	136
R-squared	0.973	0.957	0.992	0.965	0.983
Approximate Change	-28.4%	-29.0%	-15.1%	-10.1%	-10.6%
Units Closed	-0.000190***	-0.000167***	-0.000130***	-2.90e-05	-8.79e-05
	(5.81e-05)	(6.37e-05)	(3.54e-05)	(7.18e-05)	(8.50e-05)
Observations	136	136	136	136	136
R-squared	0.970	0.954	0.992	0.963	0.983
Approximate Change	-24.7%	-24.9%	-11.9%	-4.1%	-9.7%
1(Units Closed >500)	-0.151*	-0.184**	0.00731	-0.0368	0.0686
	(0.0900)	(0.0916)	(0.0750)	(0.0759)	(0.148)
Observations	136	136	136	136	136
R-squared	0.961	0.946	0.990	0.963	0.983
Approximate Change	-11.9%	-16.4%	0.4%	-3.0%	4.6%
Pre 1995 Mean	549.8	315.1	2,810	571.0	1,371

Note: Unit of observation is community area - year. All specifications include community area effects and year effects. Newey-West Heteroskedasticity and Auto-Correlation consistent standard errors are shown in parentheses. The bandwidth of the Bartlett window is 17 for all specifications.

Table 9: OLS Estimates of the Effect of Closure on Housing Log-Linear Specification

	(1) log Median Home Prices	(2) log New Res. Units
Buildings Closed	0.0144	0.0323*
	(0.0144)	(0.0172)
Observations	116	93
R-squared	0.797	0.740
bw	16	12
Approximate Change	19.3%	43.2%
Units Closed	0.000152*	0.000178*
	(8.82e-05)	(0.000101)
Observations	116	93
R-squared	0.809	0.737
bw	16	5
Approximate Change	26.5%	31.1%
1(Units Closed > 500)	0.256**	-0.0772
	(0.113)	(0.189)
Observations	116	93
R-squared	0.802	0.734
bw	17	12
Approximate Change	25.6%	7.7%
Pre 1995 Mean		27.06
1990 Median Home Price	186.9k	

Note: Unit of observation is community area - year. All specifications include community area effects and year effects. Newey-West Heteroskedasticity and Auto-Correlation consistent standard errors are shown in parentheses. All dollar amount are in terms of year 2000 dollars. The bandwidth of the Bartlett window is shown in the rows titled "bw".

Table 10: OLS Estimates of the Housing Log Transaction Price Gradient Near High Rise Public Housing Developments

	(1) All CAs	(2) High Rise CAs
Distance in miles	0.617**	0.749*
	(0.279)	(0.379)
(year==2001)*dist	-0.389**	-0.422*
	(0.189)	(0.208)
(year==2002)*dist	-0.333	-0.496
	(0.256)	(0.268)
(year==2003)*dist	-0.610*	-0.766
	(0.356)	(0.431)
(year==2004)*dist	-0.660**	-0.901**
	(0.257)	(0.301)
(year==2005)*dist	-0.568**	-0.755**
	(0.245)	(0.303)
(year==2006)*dist	-0.706**	-0.934*
	(0.280)	(0.398)
(year==2007)*dist	-0.503*	-0.660
	(0.285)	(0.397)
Observations	49,559	39,158
R-squared	0.172	0.087
Transactions in 2000	4,416	3,502
Mean Reduction in 2000 Price	$25,500	$33,500
Gross Reduction in 2000	$113M	$117M

Note: Unit of observation is residential real estate transaction. All specifications include community area-effects and year-effects. Standard errors clustered on community area in parentheses. All dollar amounts are in terms of year 2000 dollars. Column (1) uses all housing transactions from 2000-2007 that were between 0.1 and 0.6 mile of a high-rise public housing development. Column (2) uses all housing transactions from 2000-2007 that were between 0.1 and 0.6 mile of a high-rise public housing development and were also located in a community area containing a high-rise public housing development. The variable dist is simply distance to the nearest high-rise public housing development.

Table 11: Poisson Regression Estimates of the Effect of Relocatees on Crime

	(1) Murder	(2) Rape	(3) Assault	(4) Robbery	(5) Gun	(6) Street
Relocatees	-0.000696	-0.000415	-0.000106	-0.00136	-0.000691	1.85e-05
	(0.00156)	(0.000564)	(0.000660)	(0.000867)	(0.000592)	(0.000469)
Observations	1247	493	493	493	493	493
Approximate Change	-8.1%	-48.6%	-1.2%	-15.9%	-8.1%	0.22%
Pre 1995 Mean	12.86	58.84	622.3	664.6	750.9	1,428
Relocatees	-0.00378*	-0.000857	-0.000966	-0.00188	-0.00102	-0.000509
	(0.00196)	(0.000748)	(0.000870)	(0.00159)	(0.00107)	(0.000727)
Observations	559	221	221	221	221	221
Approximate Change	-75.6%	-17.1%	-19.3%	-37.6%	-20.4%	-10.2%
Pre 1995 Mean	20.37	96.12	1,017	1,085	1,246	2,255

	(7) Burglary	(8) Res. Burg.	(9) Theft	(10) Auto Theft	(11) Commercial
Relocatees	0.000226	0.000540	0.000387	0.00100**	0.000753*
	(0.000741)	(0.000779)	(0.000424)	(0.000398)	(0.000431)
Observations	493	493	493	493	493
Approximate Change	2.6%	6.3%	4.5%	11.7%	8.8%
Pre 1995 Mean	740.1	551.8	1,498	655.2	783.4
Relocatees	-0.000495	-0.000205	-0.000865	-2.27e-05	-0.000598
	(0.00127)	(0.00132)	(0.000899)	(0.000411)	(0.00157)
Observations	221	221	221	221	221
Approximate Change	-9.9%	-4.1%	-17.3%	-0.45%	-12.0%
Pre 1995 Mean	1,098	818.7	1,963	942.1	1,001

Note: Unit of observation is community area - year. All specifications include community area-effects and year-effects. The top panel uses a sample of 29 community areas which did not have family public housing developments and which received more than one relocatee household displaced from building closure during the period from 2000 through 2008 according to the CHA August 2008 press release. The mean number of relocatees in these 29 community areas was 97 according to the CHA press release, and 117 according to my proxy variable computed from the NORC survey. The bottom three panels use a sample of 13 community areas which did not have family public housing developments and which received more than 100 relocatee households displaced from building closure during the period from 2000 through 2008 according to the CHA August 2008 press release. The mean number of relocatees in these 13 community areas was 179 according to the CHA press release, and 200 according to my proxy variable computed from the NORC survey.

Table 12: Effect of HOPE VI Demolition Grants on City-Wide Fiscal Year Murder Rate and Falsification Test

	(1) Murder Rate	(2) Log Murder Rate	(3) (Murder Rate)$^{1/2}$
Demolition Grant	-1.89e-05**	-0.109**	-0.000581
	(8.14e-06)	(0.0463)	(0.000398)
Observations	1886	1632	1886
R-squared	0.734	0.714	0.678
Approximate Change	-11.6%	-10.9%	-8.9%
Demolition Grant	-1.88e-05**	-0.117**	-0.000628
	(9.04e-06)	(0.0529)	(0.000447)
Observations	1596	1358	1596
R-squared	0.696	0.685	0.638
Approximate Change	-12.4%	-11.7%	-9.9%
False Demolition Grant	1.62e-05	0.0901	0.000373
	(1.16e-05)	(0.0568)	(0.000245)
Observations	1689	1598	1689
R-squared	0.339	0.781	0.767

Note: Unit of observation is city - fiscal year. All specifications include city-effects and fiscal year effects. The sample runs from 1988 - 2004. Demolition grant is a dummy variable which is set equal to one in the year in which a city receives its first HOPE VI demolition grant. However, since I only know the fiscal year in which the demolition grant was awarded, it may be the case that the grant was awarded in the second half of the calendar year prior to the year in which the demolition grant variable indicates. The sample in the top panel includes all 121 cities which received HOPE VI demolition grants for which Uniform Crime Reporting data is available (Only St. Thomas, Virgin Islands, Petersburg, IL, and East Saint Louis, IL are omitted due to lack of crime data). The sample in the middle panel includes only the 101 cities which received all demolition grants in a single fiscal year. Newey-West heteroskedasticity and auto-correlation consistent standard errors are shown in parentheses. Bartlett kernel Bandwidth is 17. Approximate reductions are calculated based upon a mean pre-demolition murder rate for the sample of all cities which received demolition grants of 0.000163 murders per capita per year and a mean of 0.000151 for cities which received demolition grants in only a single year. The bottom panel contains estimates of a falsification test in which I randomly assign the actual grant years of the cities that received grants to the 121 largest cities that did not receive demolition grants.

A Appendix of Tables

Table 13: Demolition City Summary Statistics and Falsification Test City Summary Statistics

	(1)	(2)
Year	1992	2007
Murders	79.1	48.8
	(236)	(94.2)
Population	307k	349k
	(808k)	(906k)
Murders per 100,000 Residents	18.1	15.0
	(14.9)	(14.3)
Murders	35.4	29.0
	(57.2)	(46.5)
Population	256k	317k
	(224k)	(299k)
Murders per 100,000 Residents	11.8	8.0
	(11.4)	(7.2)

Note: Means (standard deviations) for cities that received HOPE VI demolition grants in upper panel. Means (standard deviations) for 121 highest population cities that report UCR statistics but did not receive HOPE VI demolition grants in lower panel.

Table 14: Cities that Received Hope VI Demolition Grants

City	State	Units	Grant Amount	Fiscal Year
CHICAGO	IL	5233	2.95e+07	1998
NEW ORLEANS	LA	1762	6906000	1998
NEWARK	NJ	1458	9010400	1996
DETROIT	MI	1428	1.00e+07	1996
ATLANTA	GA	990	9720520	1996
PHILADELPHIA	PA	954	5460890	1998
PITTSBURGH	PA	852	8140000	1996
SAINT LOUIS	MO	718	3590000	1999
LOS ANGELES	CA	685	3241600	1999
BUFFALO	NY	666	6304000	1996
SAN ANTONIO	TX	660	4252500	1996
MEMPHIS	TN	644	4542867	1996
ELIZABETH	NJ	592	4508000	1999
SEATTLE	WA	578	4231400	1996
CAMDEN	NJ	514	3138500	1998
BALTIMORE	MD	429	2500000	1996
COLUMBUS	OH	420	3268000	1998
PONTIAC	MI	364	2153000	1998
HARTFORD	CT	335	5025000	1996
WASHINGTON	NC	328	1826000	1998
DAYTON	OH	312	1998000	1998
WASHINGTON	DC	308	2020707	1996
JACKSON	TN	306	1987830	2003
MINNEAPOLIS	MN	306	1825500	1998
COLUMBIA	SC	300	1938250	1999
RALEIGH	NC	296	2602877	1998
YOUNGSTOWN	OH	289	1503880	1999
CLEARWATER	FL	284	2529000	2003
CHATTANOOGA	TN	279	2375172	2003
LEXINGTON	KY	279	1973000	2000
WILMINGTON	NC	276	2325500	2002
SHREVEPORT	LA	269	2463650	2003
NEW HAVEN	CT	259	1540000	1996
UNIONTOWN	PA	255	1574100	2002
INDIANAPOLIS	IN	250	1898900	2001
ALEXANDRIA	LA	247	1347870	2003
CLEVELAND	OH	243	2201997	1998
LITTLE ROCK	AR	233	1669261	2000
CHARLESTON	WV	230	922684	1998
SAN FRANCISCO	CA	229	3205325	2001

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Table 14: Cities that Received Hope VI Demolition Grants - continued

City	State	Units	Grant Amount	Fiscal Year
GALVESTON	TX	228	1215000	2003
KNOXVILLE	TN	217	1686000	2003
EAST ORANGE	NJ	212	2185000	2002
CORPUS CHRISTI	TX	200	1165000	1998
DELAND	FL	200	1803344	2003
HIGH POINT	NC	198	1058650	1998
MIDDLETOWN	CT	190	986000	1998
JERSEY CITY	NJ	188	1277000	1999
JACKSON	MS	184	1194922	2003
WILMINGTON	DE	180	1323000	2003
MILWAUKEE	WI	170	976000	1998
CHARLOTTE	NC	166	1455144	2003
CHAMPAIGN	IL	165	1490800	2003
PORTSMOUTH	VA	160	1588700	2001
PATERSON	NJ	160	2047000	1996
CHESTER	PA	152	839860	1996
MERIDIAN	MS	148	1112000	2001
MOBILE	AL	144	642000	1999
CINCINNATI	OH	144	720000	1997
TROY	NY	144	720000	1999
ALBANY	NY	142	710000	1998
SAGINAW	MI	142	1413200	1996
LAS VEGAS	NV	141	810000	1998
ORANGE	NJ	140	1010000	2002
AKRON	OH	134	844000	1998
OCALA	FL	130	1642957	1996
TAMPA	FL	127	873000	1996
KANSAS CITY	KS	125	972000	2001
BRADENTON	FL	125	1572500	2001
MARIETTA	GA	124	1050311	2003
ROCHESTER	NY	111	639940	2002
LUBBOCK	TX	108	606000	1999
TACOMA	WA	106	639500	1996
DECATUR	AL	105	979025	2003
TALLAHASSEE	FL	102	753000	2003
NEW YORK	NY	102	731688	1999
LAKE WALES	FL	100	805917	2003
BROWNSVILLE	TX	86	774000	2003
HUNTSVILLE	AL	86	430000	1999
LAS VEGAS	NM	82	679680	2003
NEWNAN	GA	81	672000	2001
FORT LAUDERDALE	FL	78	690975	2003

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Table 14: Cities that Received Hope VI Demolition Grants - continued

City	State	Units	Grant Amount	Fiscal Year
FORT WAYNE	IN	75	834200	1999
PHARR	TX	75	487500	1998
LOUISVILLE	KY	72	540000	2002
AMERICUS	GA	62	567523	2003
FORREST CITY	AR	50	450000	2002
LARGO	FL	50	327870	2003
UTICA	NY	45	243000	1998
SALISBURY	NC	44	220000	2001
SALEM	NJ	44	324000	2002
WEYMOUTH	MA	43	215000	1999
LEBANON	TN	42	271500	1998
SPARTANBURG	SC	42	330000	2003
MONTEZUMA	GA	40	270000	2003
GADSDEN	AL	40	200000	2001
FAYETTEVILLE	TN	40	253851	2002
FRESNO	CA	36	290000	2001
BRIDGETON	NJ	36	674000	2002
LAUREL	MS	36	216000	2002
FRANKLIN	TN	36	225110	1998
MERCEDES	TX	34	170000	1998
DOUGLAS	GA	30	160000	2001
COOKEVILLE	TN	30	166500	1999
HONOLULU	HI	27	135000	2001
BRISTOL	VA	25	125000	1999
JASPER	AL	24	120000	1997
COLUMBIA	MO	22	169200	1996
SYRACUSE	NY	20	100000	2001
WASHINGTON	PA	20	181000	1999
DANBURY	CT	18	117000	1998
ASHLAND	KY	16	80000	1999
WINONA	MN	16	96500	1998
ROCKFORD	IL	14	76000	1999
SANFORD	NC	13	65000	1997
PUEBLO	CO	12	109550	1996
JEFFERSONVILLE	IN	12	100000	2002
SACRAMENTO	CA	10	50000	1997
WINONA	MS	10	60000	2002
HUMBOLDT	TN	10	64880	2002
SOUTH BEND	IN	8	64000	2001

Table 15: Box-Cox Curvature Parameter Estimates

	(1) Panel of Cities	(2) High-Rise Neighborhoods	(3) Relocatee Neighborhoods
Murder per Capita	0.524		
95% Conf. Interval	[0.464, 0.515]		
Murder		0.484	0.362
95% Conf. Interval		[0.431, 0.537]	[0.334, 0.390]
Rape		0.336	0.396
95% Conf. Interval		[0.243, 0.428]	[0.346, 0.446]
Assault		0.355	0.203
95% Conf. Interval		[0.251, 0.459]	[0.139, 0.267]
Robbery		0.245	0.051
95% Conf. Interval		[0.181, 0.309]	[0.006, 0.095]
Gun		0.194	0.136
95% Conf. Interval		[0.120, 0.269]	[0.093, 0.179]
Street		0.483	0.102
95% Conf. Interval		[0.383, 0.583]	[0.036, 0.168]
Burglary		0.125	0.065
95% Conf. Interval		[0.027, 0.223]	[0.005, 0.124]
Res. Burglary		0.168	0.109
95% Conf. Interval		[0.052, 0.283]	[0.050, 0.168]
Theft		0.205	0.137
95% Conf. Interval		[0.152, 0.258]	[0.065, 0.208]
Auto Theft		0.032	0.199
95% Conf. Interval		[-0.057, 0.122]	[0.141, 0.256]
Commercial		0.406	0.152
95% Conf. Interval		[0.342, 0.470]	[0.090, 0.214]

Table 16: Poisson Regression Estimates of the Effect of Closures on Crime

	(1) Rape	(2) Assault	(3) Robbery	(4) Gun	(5) Street
Buildings Closed	-0.0174**	-0.0177*	-0.0279***	-0.0172***	-0.0193***
	(0.00820)	(0.00999)	(0.00616)	(0.00537)	(0.00550)
Observations	136	136	136	136	136
Approximate Change	-23.3%	-23.7%	-37.3%	-23.0%	-25.8%
Units Closed	-0.000131**	-0.000149**	-0.000198***	-0.000123***	-0.000147***
	(6.60e-05)	(6.41e-05)	(5.51e-05)	(4.30e-05)	(3.98e-05)
Observations	136	136	136	136	136
Approximate Change	-22.9%	-26.0%	-34.6%	-21.5%	-25.7%
1(Units Closed > 500)	-0.0544	-0.0312	-0.0302	0.0146	-0.0245
	(0.0831)	(0.0706)	(0.0652)	(0.0872)	(0.0596)
Observations	136	136	136	136	136
Approximate Change	-5.4%	-3.1%	-3.0%	-1.5%	-2.5%
Pre 1995 Mean	64.69	717.5	782.0	688.2	1,491

	(6) Burglary	(7) Res. Burg.	(8) Theft	(9) Auto Theft	(10) Commercial
Buildings Closed	-0.0137**	-0.0125	-0.00482	-0.00200	-0.00793
	(0.00624)	(0.00905)	(0.00332)	(0.00875)	(0.00925)
Observations	136	136	136	136	136
Approximate Change	-18.3%	-16.7%	-6.4%	-2.7%	-10.6%
Units Closed	-8.51e-05	-6.78e-05	-4.03e-05*	1.52e-05	-7.09e-05
	(5.41e-05)	(6.93e-05)	(2.07e-05)	(6.93e-05)	(6.07e-05)
Observations	136	136	136	136	136
Approximate Change	-14.9%	-11.8%	-6.4%	2.7%	-12.4%
1(Units Closed >500)	-0.0849	-0.131*	0.00115	-0.0109	-0.0334
	(0.0587)	(0.0698)	(0.0446)	(0.0542)	(0.0578)
Observations	136	136	136	136	136
Approximate Change	-8.5%	-13.1%	0.12%	1.1%	-3.3%
Pre 1995 Mean	549.8	315.1	2,810	571.0	1,371

Note: Unit of observation is community area - year. All specifications include community area effects and year effects. Standard errors are clustered by community area and presented in parentheses.