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Does Federally Subsidized Rental Housing Depress Neighborhood Property Values?

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ABSTRACT

Few communities welcome federally subsidized housing, with one of the most commonly voiced fears being reductions in property values. Yet there is little empirical evidence that subsidized housing depresses neighborhood property values. This paper estimates and compares the neighborhood impacts of a broad range of federally-subsidized, rental housing programs, using rich data for New York City and a difference-in-difference specification of a hedonic regression model.

We find that federally-subsidized developments have not typically led to reductions in property values and have in fact led to increases in many cases. Impacts are highly sensitive to scale, though patterns vary across programs.

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I. INTRODUCTION

Few communities welcome federally subsidized housing. Indeed, community opposition to such housing projects can be fierce, with one of the most commonly voiced fears being reductions in property values. Yet there is little empirical support for the notion that subsidized housing depresses neighborhood property values, and economic theory offers uncertain predictions about whether subsidized housing should trigger increases or decreases in surrounding property values.

In this paper, we examine the neighborhood spillover effects of housing units built under four different federally subsidized rental housing programs – the Public Housing Program, the Section 8 New and Substantial Rehabilitation Program, the Section 202 Program for the Elderly, and the Low Income Housing Tax Credit (LIHTC) – using the case of New York City. New York is a particularly appropriate site in which to study the relationship between rental housing programs and neighborhood outcomes both because it has many more federally subsidized housing units than any other American city and because the diversity of its neighborhoods allows us to examine the effects of subsidized housing in a variety of different contexts.

To our knowledge, this is the first paper that estimates and compares the neighborhood impacts of a broad range of federally-subsidized housing programs, using very rich data and a methodology that allow a credible identification of these impacts. The only papers that come close to ours in terms of the covered range of programs are Lyons and Loveridge [1993] and Lee, Culhane, and Wachter [1999], however the cross-sectional nature of their data makes it difficult to assess whether subsidized housing is systematically located in weak (strong) neighborhoods, or whether subsidized housing leads to neighborhood decline (improvement). Meanwhile, the few studies employing data and methods that permit them to address causality [Briggs, Darden, and Aidala, 1999,

and Santiago, Galster and Tatian, 2001] focus on only one very unusual federal program -- scattered-site, public housing. Moreover, these studies examine the impacts of a very small set of subsidized housing units (fewer than 200) compared to the 77,000 considered in this analysis, which raises questions about generalizability.

As detailed below, our empirical work relies on a unique, geo-coded administrative data set that includes detailed information on 430,000 sales of apartment buildings, condominium apartments and single-family homes in New York City between 1974 and 2002. We link these data to information on 77,000 federally subsidized rental housing units that were built in the city's five boroughs between 1977 and 2000.

We use a difference-in-differences specification of a hedonic regression model. Census tract fixed effects control for idiosyncratic characteristics of the micro-neighborhoods in which subsidized housing is sited. Intuitively, impact estimates are formed as the difference between price-changes of properties within 2,000 feet of new subsidized housing following the completion of the housing and price-changes of comparable properties in the same neighborhood, but beyond the vicinity of the new housing. We allow effects to change over time and to vary with housing type and scale.

We find that these subsidized, rental housing programs had very different effects on surrounding communities. While the evidence points to negative impacts for certain kinds of developments, at least in the short-term, we find positive impacts for others. The magnitudes of the impacts depend upon scale (typically suggesting diminishing marginal impacts), with patterns differing markedly between the programs.

The rest of this paper is organized as follows. Section II provides an overview of the features

of the four federal housing programs we study, both nationally and in New York City in particular. Section III offers theoretical background and a review of relevant literature. Section IV describes the model and empirical strategy and provides a description of the data. Section V presents results. The paper ends with a summary of the key findings and implications for public policy.

II. FEDERAL HOUSING PROGRAMS IN NEW YORK CITY

New York City has long been a pioneer in the area of housing policy. New York City built the nation's first public housing development, First Houses, in 1935, two years before Congress passed the Wagner-Steagall Housing Act of 1937. The 1937 Housing Act, which established the Public Housing Program, also adopted the mechanism New York State had created to get the housing built—the local public housing authority. The close relationship between New York City and Washington, D.C. did not end there. Later programs such as the Section 221(d)(3) and 236 Below Market Interest Rate Programs were inspired by New York's Mitchell-Lama Middle Income Housing and the first secretary of HUD, Robert Weaver, was a former New York State housing official.

No city in the country has as much federally subsidized housing as New York City [Ellen and O'Flaherty 2004]. Close to 300,000 housing units in the city receive some form of federal assistance. The number of tenants living in public housing in New York, alone, outnumbers the entire populations of cities such as St. Paul, Minnesota and Buffalo, New York.

During the period of our study (1977 to 2002), New York City's housing policy was in transition. While federal programs still dominated the city's subsidized housing production landscape in the first decade of this period, the number of units built each year was only a fraction of the units produced in the preceding two decades. By the mid-1980s, two of the biggest federal

programs-- the Public Housing Program and the Section 8 New and Substantial Rehabilitation Program-- were winding down although new construction of units already in the pipeline continued. In place of these programs, the City began its own capital program, the Ten Year Plan for Housing, which would fund the construction or rehabilitation of over 200,000 units of housing by 2002. Although the effort enjoyed an unprecedented level of municipal support, not all of the construction under the city's Ten Year Plan for Housing [Schill et al 2002] was financed by city funds alone. Beginning in the early 1990s, much of this housing was also supported by the LIHTC.

A. A Description of Four Federal Housing Programs

The four federal programs that we examine in this paper differ from one another in several respects. The paragraphs below offer a brief description of each program:

- **The Public Housing Program**. Congress authorized the Public Housing Program in 1937. Under the Program, participating jurisdictions would create a public housing authority pursuant to state law, which would build housing for low income households. The federal government paid for all of the capital costs of public housing. In return, the local government was required to follow federal rules governing admissions and rents. Beginning in 1969, tenant rents were capped at 25% of income (later increased to 30%). Shortly thereafter, Congress authorized the payment of operating subsidies to cover PHA shortfalls in rental income and later provided limited modernization funds. According to Table I, during the period of our study (1977 to 2000), 14,105 units of public housing were produced in New York City. The bulk of these units were targeted to families, but roughly 30 percent were set aside for the elderly.[1]

- **The Section 202 Program**. The Section 202 Program was created by Congress in the Housing Act of 1959. Under the Act, housing for the elderly and disabled was financed by direct government loans. These loans were typically made at favorable interest rates tied to 30-year Treasury bonds. Only nonprofit corporations or cooperatives were eligible to participate in the program, which funded both the construction and substantial rehabilitation of housing. In the late 1970s, most Section 202 loans were linked to Section 8 subsidies to make the housing affordable to low- and moderate-income households. In 1990, Congress changed the Section 202 Program to focus exclusively on the elderly. This housing is designed to meet the special physical needs of the elderly and is typically accompanied by supportive services. Instead of direct loans, HUD began funding projects with capital advances and rental assistance. During the period of our study, 2,900 units of Section 202 housing were produced in New York City.

- **The Section 8 New Construction and Substantial Rehabilitation Programs**. These two programs were authorized by Congress as part of the Housing and Community Development Act of 1974, the same law that created Section 8 housing certificates (vouchers). Unlike housing vouchers, the Section 8 New Construction and Substantial Rehabilitation Programs are project-based and subsidize private developers who build or rehabilitate housing for low- and moderate-income households. The subsidy is typically the difference between 30% of a tenant's income and a fair market rent for the housing unit. The fact that the owner was, in effect, guaranteed a flow of income by the government provided a strong incentive to construct housing. Appropriations for new units under these two programs were, for the most part, ended in 1984, at least partly because of their expense. Nevertheless, housing construction and rehabilitation on units in the pipeline continued through 1990. During the period of our study, 32,223 units of project-based Section 8 housing were produced in New York City.

- **The Low Income Housing Tax Credit (LIHTC)**. The LIHTC was authorized by Congress in 1986 as part of the Tax Reform Act of 1986. In that law, Congress removed many of the accelerated depreciation and tax credit provisions that favored housing production and substituted in their place a tax credit that is allocated to states based upon population. Taxpayers who invest in LIHTCs are typically entitled to credits of approximately 9% of the capital costs of housing to be applied against their income tax liability each year for ten years. Only housing that is affordable to low- and moderate-income housing is eligible for the tax credit although some developments mix low- and moderate-income housing with market-rate housing. Housing may be built by nonprofit or profit-motivated developers. In the case of nonprofit developers, the tax credits are typically syndicated to for-profit investors through partnerships created by two intermediaries—the Local Initiatives Support Corporation (LISC) and the Enterprise Foundation. In New York City, tax credits are allocated by both New York State and New York City. In addition, any development that receives tax exempt financing from the New York City Housing Development Corporation (HDC) or the New York State Housing Finance Agency (HFA) is entitled, as of right, to 4% tax credits for ten years. During the period of this study 22,998 units of housing subsidized with LIHTCs were built or rehabilitated in New York City.

B. The Siting of Federally Assisted Housing in New York City (1977 to 2000)

Table I shows the distribution of federally assisted housing units built in New York City between 1977 and 2000. These housing units were most often sited on land owned by the City of New York. This land typically came into city ownership in one of two ways. First, the city would create an urban renewal plan, which would designate certain parts of neighborhoods as blighted. Then, using its power of eminent domain, the city's housing agency—the New York City Department

of Housing Preservation and Development (HPD)—would condemn the land, compensate its owners and transfer the land to city ownership. In some instances, urban renewal land would languish in city ownership for years; in others it was taken specifically for use in a housing development.

The second way that land would come into city ownership was as a result of tax foreclosure. During the 1970s and early 1980s, New York City experienced a wave of housing abandonment as many of its neighborhoods lost population and the remaining residents became increasingly impoverished. Owners would stop paying property taxes and begin a process of disinvestment that would eventually lead to the deterioration of the building and sometimes arson. In 1979, three years after the city had passed a law shortening the period during which a building could be tax delinquent before the city would be eligible to vest it through an *in rem* proceeding, New York had already taken title to over 100,000 units of housing and countless parcels of land. During the course of the late 1980s and 1990s, the city would ultimately rehabilitate these properties, using a combination of city capital dollars and Low Income Housing Tax Credits.

From 1977 to 2000, public housing typically was built on urban renewal land in New York. Unlike the case of developments built during the height of the program in the 1950s and 1960s, most buildings were low scale (3 to 4 stories) and had moderate densities. Although some housing that came into the ownership of the New York City Housing Authority (NYCHA) during this period was rehabilitated housing (typically transferred by HPD as a result of *in rem* vestings), the vast majority was composed of newly constructed units. As Table II indicates, most public housing built in the period after 1977 was located in the Bronx, Manhattan and Brooklyn. Queens and Staten Island received less than 5 percent of the total units, all of which were targeted to the elderly.

Like public housing, Section 202 housing was typically composed of newly constructed buildings located on city-owned property. City-wide nonprofit groups as well as local churches and synagogues would identify sites that they wanted to build on, get site control from HPD and then apply to HUD for funding. If the funding request was granted, HPD would sell the property to the groups for nominal amounts. In evaluating the proposals it received, HUD would typically take into consideration whether the project was in an area that was otherwise undergoing HPD redevelopment activity. Section 202 housing was also predominantly built in the Bronx, Brooklyn and Manhattan. Nevertheless, a substantial amount of housing (almost 1,700 units) was eventually constructed in Queens.

The decision as to where to site Section 8 housing was, in most instances, also dependent upon the decisions of private developers. They would either identify city-owned parcels that they would like to develop or come to HUD with their own land. On at least one occasion, however, the city itself initiated Section 8 housing in twelve Neighborhood Strategy Areas. This was accomplished through a special allocation of Section 8 authority from the federal government. The distribution of Section 8 housing among the city's boroughs roughly follows the same pattern as the other two housing programs.

Housing subsidized through the LIHTC was sited in different ways depending upon the entity that allocated the credits. New York City used its allocation of tax credits almost exclusively to subsidize the gut rehabilitation of *in rem* housing. This housing was typically located in the Bronx, central Brooklyn and Harlem. Developers included nonprofit community development corporations as well as small profit-motivated neighborhood entrepreneurs.

New York State-allocated credits were often used by profit-motivated developers, sometimes

on privately owned land. For-profit developers were also typically beneficiaries of the 4% tax credits that were utilized in a variety of mixed-income developments financed by tax-exempt bonds. These developments were often located in some of the city's most desirable neighborhoods. As Table II indicates, the majority of tax credits were utilized in the borough of Manhattan with substantial numbers used in the Bronx and Brooklyn. Very few were used in Queens and Staten Island.

C. Comparing the Characteristics of Neighborhoods of Federally Subsidized Housing

Table III shows the average characteristics of census tracts in which units under each of the four programs were built or rehabilitated during the period 1977 and 2000 and compare those figures with averages for the city as a whole. (We divide public housing into developments reserved for the elderly and those targeted to families.) We use 1980 tract characteristics in the case of the public housing, Section 202, and Section 8 developments, since Table I shows that the vast majority of these units were built during the 1980s. We use 1990 tract characteristics in the case of LIHTC developments, since these were built during the 1990s. Thus, the table largely captures characteristics of the tracts *before* the housing developments were built.

Overall, public housing developments for families were located in neighborhoods with the lowest mean family incomes, the highest poverty rates and the highest proportion of non-Hispanic Black and Hispanic populations. The differences from the city-wide averages are striking. The mean income in 1980 for tracts in which family public housing tracts would be built was only half the mean income of tracts in the entire city; the difference in poverty rates (46.8% vs. 19.5%) is even more striking.

Section 8 housing developments were located in the second-most distressed set of

neighborhoods. The mean income for tracts with Section 8 housing ($12,541) was higher than tracts with public housing for families but 40 percent below the citywide mean in 1980. Poverty rates for tracts with Section 8 housing were far above citywide rates, as were proportions of racial and ethnic minorities.

Interestingly, public housing developments for the elderly were sited in neighborhoods that while still very depressed relative to the rest of the city, were less distressed than those of both family public housing and Section 8 developments. The differences between the neighborhood indicators for the two types of public housing are significant. The neighborhood mean income for elderly public housing is 35 percent higher than that for its family counterpart, and the poverty rate is lower by almost 14 percentage points. Mean proportions of non-Hispanic blacks and Hispanics are also lower.

Section 202 Housing appears to have been located in somewhat more prosperous neighborhoods than public housing for the elderly, although these communities were still disadvantaged relative to the rest of the city. The mean income of neighborhoods with Section 202 housing ($16,902) was 20 percent higher than neighborhoods with public housing for the elderly and 19 percent lower than the city-wide average. Proportions of racial and ethnic minorities were also lower than neighborhoods with Section 8 housing or public housing (of either type).

Finally, neighborhoods in which LIHTC developments were built exhibit the highest mean income of any of the four programs. Indeed, the mean income for these neighborhoods ($27,805) was virtually identical to the city-wide average.[2] Nevertheless, poverty rates in LIHTC neighborhoods were much higher than the city as a whole as were the proportions of racial and ethnic minorities.

III. BACKGROUND: THEORY AND LITERATURE

One of the key justifications of the 1937 Act that established the public housing program was to eliminate slums and substandard housing and replace them with decent, safe, and sanitary dwellings. There was much optimism about the potential of the program, both for tenants and their neighbors [Fisher 1959]. At a 1948 Congressional hearing, Congressman A.S. Mike Monroney made the case that communities benefit from the construction of public housing, specifically arguing that "the establishment of a modern housing project in a city raises the assessed valuation for blocks around it" [Fisher 1959, p. 195].

More than fifty years later, it is hard to imagine a member of Congress making a similar argument. The conventional view today is that federally subsidized housing developments, if anything, help to accelerate neighborhood decline. Given this view, it is perhaps not surprising that the papers on this subject have virtually all been framed to ask whether these subsidized housing developments reduce surrounding property values.[3]

In fact, however, there are theoretical reasons to expect positive as well as negative effects on the value of surrounding properties, depending on the circumstances. At the most general level, because housing is immobile, any changes generated by the new subsidized housing (shifts in population, changes in physical landscape, etc.) should be capitalized into local property values and these capitalization effects may be positive or negative. This section describes the various ways in which subsidized rental housing might influence its surrounding neighborhood and summarizes previous research.

A. Understanding the Spillover Effects of Subsidized Housing

We identify five general mechanisms through which subsidized housing might affect the

value of neighboring properties: the removal effect; the physical structure effect; market effects; the population growth effect; and population mix effects. Each of these is explained briefly below.

- **Removal Effect.** Subsidized housing investment can affect property values simply because of what it removes. If subsidized housing replaces a disamenity, such as an abandoned boarded-up building or a littered vacant lot, then the removal effect would likely be positive. If instead the new housing replaces a desirable use, like a park or an attractive set of older buildings, then removal effects would be negative.

- **Physical Structure Effect.** The physical design of the new housing may affect the value of neighboring homes. If a subsidized project is viewed as unsightly or out of context with the existing character of a community (e.g., the project may be a high rise or built at higher densities than surrounding housing), then physical structure effects may be negative. Alternatively, an attractive, high-quality, new building that fits in nicely with the design of existing properties might increase the value of surrounding homes.

- **Market Effects.** Subsidized housing investment may yield spillover effects because it captures the benefits of collective action in large-scale investments. While small investments in a blighted neighborhood may not have been profitable, public subsidies may serve to spur simultaneous investments by multiple investors at a scale sufficient to overcome the threshold necessary for neighborhood revitalization. Moreover, if market rate units are included, developments may also attract additional investment by signaling to developers that area is viable. On the other hand, the creation of new subsidized housing may also have a depressing effect on neighboring properties by glutting the local market with low-rent housing.

- **Population Growth Effect.** Programs that create new housing are likely to lead to some growth in the local population. Such growth might lead to increases in property values through the promotion of new commercial activity, a greater sense of safety, and general economic growth. At the same time, growth might lead to congestion and therefore depress surrounding values.

- **Population Mix Effects.** People seem to care a great deal about who lives near to them and generally voice a preference for higher-income neighbors. Thus, the effects of rental housing may depend crucially on who is moving into the new housing. The key may be how the incomes of new occupants compare to existing residents; people may simply resist incoming residents whose incomes fall below existing neighborhood averages. Alternatively, the critical issue may be the concentration of poverty. Below a certain threshold, changes in poverty rate may have a negligible effect. But very high concentrations of poverty and joblessness may be detrimental to a neighborhood's quality of life.

Timing of Impacts

If all impacts are immediately and accurately capitalized into property values, we should see

all impacts felt at the time of project announcement. But there is of course a great deal of uncertainty, perhaps especially in the case of subsidized housing. Thus, while we might expect to see an initial increase or decrease in local property values at the time that the project is announced, a further jump or decline in values may occur when the construction actually starts on the project. At this point, the prior use will be removed or sealed-off and people can see the project is actually happening. Property values might then increase or decrease upon project completion when neighbors see the finished project and new occupants begin to move in. Finally, property values may continue to rise or fall in the years after completion, as the new population spurs further neighborhood changes, or perhaps as the project either exceeds or fails to live up to initial expectations.

Differences across Programs

The discussion above suggests that the effects of subsidized rental housing are likely to vary across programs and even particular projects, depending on what the housing replaces, the size and design of the new development, the characteristics of the tenants, and the characteristics of the surrounding neighborhood. As noted above, we examine four main types of federal rental housing in this paper. While effects may vary across neighborhoods and developments, we expect some general patterns to hold across programs. For example, given that all of these programs typically used city-owned properties that had been taken over through urban renewal designation or tax foreclosure proceedings, most of these new housing developments were replacing undesirable uses, such as abandoned or dilapidated buildings or vacant lots. Therefore, we expect removal effects to be positive in all cases.

As for the physical structure effect, these programs differed in terms of scope and design.

While Section 8 and LIHTC developments were more typically built out of existing structures and facades, public housing and Section 202 developments were typically new construction projects, and as such, represented a more radical change in the architectural fabric in the community, which could be either welcomed or disliked. In addition, public housing is the one program in which housing developments are owned and operated by the public sector, which means that incentives for construction and maintenance differ.

As for market effects, developments built through the tax credit program probably hold the greatest potential to attract additional investment since many developments include some mix of market rate units. Thus, developers were probably more likely to view these projects as indicators that the local area could sustain projects with market rents. Note, however, that the impact of this market effect on the price per unit of housing is, in the long run, ambiguous. To the extent that new LIHTC units spur private developers to invest in the neighborhood, increasing the supply of housing units, a new equilibrium price of housing per unit in the neighborhood might emerge which is lower than the pre-completion price – although property values would still be higher. Alternatively, it may lead developers to upgrade the existing housing stock, raising prices. Although outside the scope of this paper, future research could attempt to examine this effect directly by investigating the impact of LIHTC investments on building permits, new construction, etc.

In terms of population effects, larger projects clearly brought in more new residents to a community. We would therefore expect larger projects to have more dramatic effects (either positive or negative) on a community. However, because scale effects may be non-linear, it is possible that effects would be moderated or magnified for larger projects. That is, marginal impacts may diminish or increase in magnitude with the number of units.

Finally, these programs housed somewhat different tenants. Most obviously, Section 202 developments, as well as 30 percent of the public housing developments, were targeted to elderly tenants, who typically engender less fear and anxiety among existing community residents. There were racial differences too. Roughly 90 percent of Section 8 and public housing residents were minorities, as compared to just two thirds of those living in Section 202 housing. Among the family programs, there were differences in incomes. In New York City, public housing serves the lowest income tenants on average, followed by the Section 8 program.[4] Although there is little data on actual tenant incomes for the LIHTC program, rent levels suggest that the program tends to serve a more moderate income population [Cummings and DiPasquale 1999; GAO 1997; Stegman 1991].[5] The subsidies provided by the program are simply not deep enough to house very low income families. In many cases, moreover, additional units were included in the LIHTC developments that rented at market rents.[6]

B. Prior Evidence on the Externalities of Housing Investment

Contrary to the conventional wisdom, empirical research yields inconclusive evidence about the nature of spillover effects generated by federally subsidized rental housing. Goetz, Lam, and Heitlinger [1996] find that the presence of such housing is negatively associated with nearby property values, though effects are modest. Lyons and Loveridge [1993] and Lee, Culhane, and Wachter [1999] also find a negative association, at least in the case of certain types of subsidized housing (see below). But other studies suggest negligible or even positive associations. Nourse [1963] and Rabiega, Lin, and Robinson [1984] find that newly developed public housing has neutral or positive impacts on neighboring property values, while Lyons and Loveridge [1993] and Lee, Culhane, and Wachter [1999] find that some federally–subsidized rental housing programs are

positively associated with nearby property values (again, see below). Finally, examining LIHTC developments in four counties in Wisconsin, Green, Malpezzi and Seah [2003] find no association between the presence of LIHTC developments and property value appreciation in two counties, positive association in a third county, and negative association in a fourth.

Data limitations further cloud the interpretation of past literature, making it difficult to pinpoint the direction of causality. Most of these past studies do not have access to project completion dates and therefore cannot determine whether subsidized housing is systematically located in weak (strong) neighborhoods, or whether subsidized housing leads to neighborhood decline (improvement).[7]

Recently, several studies have attempted to disentangle the causality problem by estimating impacts based upon a comparison of price changes of properties within the vicinity of new housing to price changes citywide, while controlling for neighborhood (typically census tract) fixed effects. Briggs, Darden, and Aidala [1999], for instance, use a census tract fixed effects model to examine price changes surrounding seven scattered-site public housing developments on property values in neighborhoods in Yonkers, New York. They find little effect on the surrounding area. Santiago, Galster and Tatian [2001] use a similar model to estimate the impact of the Denver Housing Authority's scattered site public housing program on the sales prices of surrounding single-family homes. Testing for both changes in price levels and trends after completion, they find that proximity to dispersed public housing units is, if anything, associated with an increase in the prices of single-family homes.

These two recent studies provide strong evidence that scattered-site public housing has negligible or even positive effects on surrounding communities. They do not tell us, however, about

the neighborhood impacts of the more traditional, subsidized housing developments that we focus on in this paper. Focusing on a single program, they also reveal little about differences in impacts across different types of programs.

Three earlier studies do consider differences across federally subsidized housing programs, and all arrive at different conclusions. Lyons and Loveridge [1993] find that public housing is associated with higher property values within a half-mile radius, while Section 8 new construction projects and (surprisingly, perhaps) Section 202 elderly developments are linked to lower property values. Lee, Culhane, and Wachter [1999] meanwhile find just the opposite, at least with respect to Section 8 and public housing; they find that proximity to public housing is associated with lower property values while proximity to Section 8 developments is associated with higher property values. They do not examine Section 202 housing, and their results for the Low-Income Housing Tax Credit developments are mixed. Finally, Goetz, Lam, and Heitlinger [1996] find that proximity to both public housing and federally-subsidized, privately-owned rental housing is associated with lower property values. (Interestingly, they find that proximity to rental housing developed by not-for-profit organizations is associated with significantly higher property values.)

It is possible that these differences in results reflect underlying differences in program impacts across the three locations they study (Philadelphia, Minneapolis, and suburban Minneapolis). But note that none of these three studies examine housing prices in the vicinity of subsidized developments *before* their selected developments were built. Thus, their conflicting results may say more about differences in siting practices across the three locations they study, than about differences in actual program impacts. In sum, we think there is still much to be learned about the neighborhood impacts of federally-subsidized rental housing developments.

IV. DATA AND METHODOLOGY

A. Methodology

Our analysis centers on a hedonic regression model that explains the sales price of a property as a function of its structural characteristics (such as lot size and age of the building) and its neighborhood surroundings. We use this hedonic analysis to compare the prices of properties that are within 2,000 feet of subsidized housing sites to prices of comparable properties that are outside this 2,000-foot ring, but still located in the same neighborhood. Then we examine whether the magnitude of this difference has changed over time, and if so, if the change is associated with the completion of a new housing unit. This approach should weed out any systematic differences between the neighborhoods chosen for these housing investments and other areas around the city. In addition, this approach allows us to disentangle the specific effects of the housing investments from the many other changes occurring in the same neighborhoods.

More formally, we estimate a regression model of the sales price of a property that can be expressed as follows:

$$(1)\ \ln P_{icdt} = \alpha + \beta X_{it} + \delta_c W_c + \gamma^{PHs} R_{it}^{PHs} + \gamma^{PHf} R_{it}^{PHf} + \gamma^{S8} R_{it}^{S8} + \gamma^{S202} R_{it}^{S202} + \gamma^{LIHTC} R_{it}^{LIHTC} + \gamma^{O} R_{it}^{O} + \rho_{dt} I_{dt} + \varepsilon_{it},$$

where $\ln P_{icdt}$ is the log of the sales price of property i in census tract c, in community district d, and in quarter t, X_{it} is a vector of property-related characteristics, including age and structural characteristics, W_c are a series of census tract fixed effects, R_{it} are vectors of ring variables (described below), and I_{dt} are a series of dummy variables indicating the quarter and community district of the sale. The coefficients to be estimated are α, β, δ, γ, and ρ, and ε is an error term. Since housing prices are entered as logarithms, the coefficients are interpreted as the percentage change in price resulting from an additional unit of the independent variable. In the case of a dummy variable, the coefficient can be interpreted approximately as the percentage difference in price between properties

that have the attribute and those that do not (at least when coefficients are relatively small, as they are in this paper).[8]

Property related characteristics, X_{it}, include structural characteristics of the properties, including building age, square footage, the number of buildings on the lot, and a set of dummy variables distinguishing eighteen different building classifications such as 'single-family detached' or 'two family home,' and so on. Census tract fixed effects (W_c) control for unobserved, time-invariant features of different neighborhoods.

For each federal program, we include a set of ring variables (R_{it}) that capture the impact of proximity to the subsidized housing units of that program. For public housing, given that different tenant populations may lead to different spillover effects, we distinguish between developments that are targeted to elderly residents and those that house families by including two sets of ring variables, one for each tenant type.

We begin by including dummy variables that indicate whether the sale occurred within 2,000 feet of a particular kind of subsidized site between zero and two years prior to project completion and between two and five years pre-completion respectively.[9] We divide up the pre-completion period into these two windows in order to distinguish the baseline or pre-announcement period, which we proxy by the window of time between 2 and 5 years before project completion, and the construction period, which we proxy by the two years before project completion. The definition of the construction period follows from discussions with city officials and developers suggesting that community residents typically knew about impending projects about two years in advance of completion; moreover, construction would take place within this window. The coefficient on the Pre Ring, 2-5 years variable provides an estimate of price levels in the ring of subsidized housing prior to project announcement and construction relative to prices of comparable properties in the same neighborhood that will not have subsidized housing built so nearby.

We limit the specification of our Pre Ring variables to a five-year period before completion because of the large number of property sales that were within 2,000 feet of sites that would hold different types of subsidized housing at some point in the distant future. Reducing the pre-completion period to a five-year window greatly reduces the overlaps across programs, while leaving a sufficient number of years to estimate a baseline relative price, which is relevant to our impact calculations.[10] Moreover, we believe that this five-year window (particularly the 2-5 years before window) should provide an accurate picture of baseline price levels in the vicinity of subsidized housing sites before the housing is built.[11]

We include a set of 'Post Ring' dummy variables that take on a value of one if the sale is within the ring of some number of *completed* subsidized units produced through a particular program. The differences between the coefficient on 'Post Ring' and the coefficients of the 'Pre Ring' variables provide the simplest impact estimates.[12] We interpret the difference between the Post Ring and 'Pre Ring, 2-5 years' coefficients as the total project impact; we view the difference between the Post Ring and 'Pre Ring, 0-2 years' coefficients as the effects that the actual completion and occupancy of the new housing generate *above and beyond* any pre-completion impacts.

Note that because we control for the number of completed units within the ring of a sale, the difference between Post Ring and Pre Ring coefficients should be viewed as the fixed impact of a housing development subsidized through a particular program (independent of project size). The coefficients on the number of completed units within the ring of the sale and its square show the marginal effects of additional subsidized units. Finally, to allow the impact to vary over time, we include a post-completion trend variable, 'Tpost,' and its square. Specifically, 'Tpost' equals the number of years between the date of sale and the project completion date for properties in the 2,000-foot ring.[13]

We also include similar sets of ring variables (R_{it}^{O}) that control for proximity to other types of

subsidized housing since it is possible that the location of these other types of units is correlated with that of the federally subsidized units that we focus on. These include city-sponsored projects and housing units sponsored through older federal programs (such as Section 236, BMIR, and public housing and Section 8 units completed prior to 1977).

The final set of variables (I_{dt}) is a separate series of time dummies (one for each quarter in each year of the study period) for each of the 48 community districts used in the analysis.[14] While previous research by other authors has assumed that price changes were constant across the city, this seems particularly inappropriate in a city as large and diverse as New York. Schwartz, Susin, and Voicu [2002], for instance, find considerable variation in price trends across community districts in New York City.

While specifying the time dummies using a smaller geographic area – say a city block or a census tract – may seem preferable to the community districts, doing so comes at a considerable cost and adds little explanatory power. Put simply, census-tract specific time dummies would add approximately 180,000 dummy variables to the specification, significantly increasing the number of parameters to be estimated, and greatly reducing degrees of freedom.[15]

B. Summary of Data

To undertake our analysis, we utilized data on the location and characteristics of most federally- and city-assisted housing in New York City from a variety of sources. We obtained address-specific data from HUD USER on the number of units created through the Section 8 project-based, Section 202, and the Low Income Housing Tax Credit (LIHTC) programs.[16] These data cover completions through 2000 for LIHTC developments and completions through 1995 for the other programs. The data set indicated the actual year of completion for the LIHTC projects but not for the other types of developments. For these other projects, we identified completion year by matching the subsidized housing addresses to the building characteristics (including year built and year of major

alteration) provided by the RPAD file described below.

As for public housing, we secured address-specific data on all public housing developments from the New York City Housing Authority (NYCHA). The data include the number of units, whether units are slated for families or elderly tenants and completion year. Finally, New York City's Department of Housing Preservation and Development (HPD) provided data describing all of the city-assisted housing built between 1977 and 2000, which we include as controls in our regressions. For each housing project, this data set indicates its precise location (to the tax lot level), the date the project was completed, the type of building structure, the number of units that were built or rehabilitated, the type of work (new construction or rehabilitation), and whether units are rental or owner-occupied.

We supplemented these data on housing investments with data from two other city sources. First, through an arrangement with the New York City Department of Finance, we obtained a confidential database that contains sales transaction prices for all apartment buildings, condominium apartments and single-family homes over the period 1974-2002.[17] In order to insure that we did not include the sales of the subsidized developments themselves, we attempted to exclude any sales that could potentially be part of a development. Unfortunately, the RPAD and homes sales data do not identify whether a particular property received city subsidies, so we excluded any sale that occurred on the same block as a subsidized development if the sale was of a building that was constructed after the subsidized units had been completed.[18] Our final sample includes 432,984 property sales, spread across 1,639 census tracts, which is considerably larger than the samples used in previous literature.[19]

Second, we have data on building characteristics from an administrative data set gathered for the purpose of computing property tax assessments (the RPAD file). The RPAD data contain little information about the characteristics of individual units in apartment buildings (except in the case of condominiums), but these building characteristics explain variations in prices surprisingly well.[20]

Identifying whether properties are in the vicinity of subsidized housing sites is critical to our analyses. We used GIS techniques to measure the distance from each sale in our database to all subsidized housing sites and, from these distance measures, we created a variable that identified properties within 2,000 feet of housing investments of different types.[21]

Table IV shows summary statistics. The first column shows the characteristics of our full sample of property sales; the subsequent columns show the characteristics of transacting properties that were located or would be located in the next five years within 2,000 feet of a unit that received federal subsidies under a given program.[22] As shown, most of the sales in our sample were located in Brooklyn and Queens, largely because those boroughs include a relatively large share of smaller properties, which sell more frequently than apartment buildings. Two thirds of all buildings sold were either one- or two-family homes, and 83 percent were single-family homes, two-family homes, or small apartments. Nearly one third of the transacting properties had garages and more than three quarters were built before the Second World War. Only a handful of buildings were vandalized or otherwise abandoned. Finally, more than one third of the transacting properties were located within 2,000 feet of a federally-assisted housing site, while 27 percent of the properties sold were within 2,000 feet of a *completed* federal unit.

Columns 2-5 of the table reveal some systematic differences between the transacting properties located close to federally-assisted housing sites and those that are not. Properties located within the 2,000-foot ring are much more likely to be in Brooklyn, Manhattan or the Bronx than in Staten Island or Queens. They are also older, less likely to be single-family homes, more likely to be walk-up apartments, and consistent with these differences, less likely to have garages. On the other hand, there seem to be few differences in property characteristics across rings with different programs. Just a few notable differences stand out: (1) properties in rings with family public housing are more likely to be walk-up apartments; (2) those in rings with Section 8 and Section 202 housing

are more likely to be single-family homes and to have garages; (3) those in rings with Section 202 and elderly public housing are somewhat newer; (4) those in rings with tax credit housing and public housing for the elderly are more likely to be condominiums – probably because they are more likely to be located in Manhattan.

Table V shows the distribution of property sales by proximity to type of federally-assisted housing and time relative to project completion. The table shows that the rings around Section 8 or Section 202 sites account for most of the properties sold within 2,000 feet of federal housing. By contrast, the rings around public housing contain the fewest sales. This is in part because we have relatively few public housing developments in our data set, since most of the public housing in New York City was built before 1977. In addition, public housing tends to be built in high density neighborhoods where few properties turnover. Finally, public housing developments usually consist of relatively large buildings concentrated in the same area and thus, there are typically fewer other properties in their immediate vicinity. The table also makes clear that the share of properties in the ring that were sold after project completion is larger for the older programs.

V. RESULTS

Before presenting the results from our model in equation (1), it is useful to examine estimates from a simple model that does not distinguish between the different programs, and, thus, provides an estimate of the average impact of the federally-subsidized rental housing. Key coefficients and their standard errors for this model are shown in Table VI. The Appendix shows the full set of results, which include coefficients on structural characteristics and proximity to other forms of subsidized housing. The relatively high R^2 (0.86), together with the fact that the estimated coefficients on the structural variables are consistent with both expectations and prior research, suggest that these variables provide adequate controls for the characteristics of the houses sold.

Several results are worth noting here. First, the small negative and significant Pre Ring coefficients suggest that subsidized housing sites were located in areas which were, on average, slightly more depressed than the already distressed census tracts encompassing them. Two to five years prior to completion, properties located within 2,000 feet of subsidized sites sold for 1.9 percent less than comparable properties located elsewhere in the census tract. As discussed above, the difference between the two 'Pre Ring' coefficients yield an estimate of the extent to which impacts emerge prior to completion (that is, after announcement and during construction). Perhaps surprisingly, the estimates suggest pre-completion impacts are non-existent.

The differences between the Post Ring and Pre Ring coefficients provide estimates of the fixed component of the project effect - that is, the portion of the impact that is independent of the number of completed units- immediately after completion. This effect is positive and statistically significant, although its magnitude is small – the gap between prices in the ring and in the census tract after completion is only 1.1 percentage points lower than the two to five years pre-completion baseline. Interestingly, this impact appears to grow over time, albeit at a slow pace (0.2 percentage points per year), as indicated by the positive and significant TPost coefficient. Project size seems to make little difference, on average.

These results suggest that the widespread belief that federally subsidized housing investments diminish the value of surrounding properties is unjustified. On average, federally subsidized housing is constructed on distressed sites located in distressed neighborhoods. But the evidence suggests that the creation of new federally subsidized housing is, if anything, associated with small increases in the value of surrounding properties. Of course, these average impact estimates may mask significant variation of external effects across programs.

To investigate the impacts of individual programs, we turn to the model described by equation (1). The key coefficients and their standard errors for this model are shown in Table VII.[23] The first

point to make here is that the Pre Ring coefficients are negative and significant for all programs except LIHTC. Thus, before completion of the development, the prices of properties located within 2,000 feet of public housing, Section 8, or Section 202 sites were lower than the prices of comparable properties located outside the 2,000-foot ring (but still in the same census tract). This 'ring-tract price gap' is particularly large for family-oriented public housing – 13.1 percentage points, in the two to five year period before completion. In other words, our estimates imply that these investments – and especially public housing – were made in the more distressed areas of already distressed neighborhoods (census tracts). In contrast, prices in the rings around LIHTC sites are slightly higher than those outside of the rings prior to the project completion.

Consistent with our findings from the simple model, the estimates by program suggest that announcement or construction start effects (the difference between prices 2-5 years before completion and prices within a two-year window before completion) are small or non-existent. These impacts are statistically significant only for Section 8 and, even then, the magnitude of the effect is rather small; the ring-tract price gap increases by 1.8 percentage points between the two pre-construction periods. The implication is that for public housing, section 202 and LIHTC projects, there was little, if any, impact on property values prior to completion–because the market anticipated no effect even at completion, because of market imperfections that limited 'market foresight,' or because removal effects were small.

The coefficient on Post Ring is not statistically significant for family public housing and Section 202, suggesting that the completion of small projects had a negligible effect. By contrast, the Post Ring coefficient for Section 8 is negative and significantly larger in magnitude than both Pre Ring coefficients. In other words, the completion of a Section 8 project is associated with an immediate negative and statistically significant fixed effect, over and above the drop in prices in the two-year window before completion. The magnitude of this effect (i.e., the post-completion increase

in the ring-tract gap relative to the 0-2 years pre-completion baseline) is 1.1 percentage points, which, when added to the impact felt in the two year window prior to completion, results in a total effect of 2.9 percentage points.

Results are nearly the opposite for LIHTC projects. The completion of LIHTC projects is associated with an immediate positive and significant (fixed) effect, indicating that prices surrounding the tax credit housing rise more than prices in the larger neighborhood. After completion, the degree to which prices in the vicinity of tax credit housing exceed those in the larger neighborhood rises by 3.8 percentage points. An even larger, fixed positive effect (11.6 percentage points) is felt after the completion of public housing reserved for elderly tenants.

Forming a complete picture of the project impacts requires looking beyond the single fixed effect since the estimated marginal effects of additional units are relatively large and most of these projects consist of either large buildings or several smaller, but spatially concentrated, buildings. The implication is that the fixed component of the impact may be substantively offset – or magnified – by the scale effects.[24] Our results suggest the scale effects differ by program -- building more public housing or Section 8 units generally appears to be detrimental to neighborhood property values, while building more Section 202 or tax credit units seems to be beneficial. However, for each of the programs, the marginal effect of another unit declines as the total number of units increases.

As for changes in impacts over time, the positive, significant coefficient on Tpost for family public housing and Section 8 implies that the impacts of these housing programs become more positive (or less negative) over time. The opposite is true for Section 202 and LIHTC housing (though coefficient is quite small in the case of Section 202). Further, for each program except public housing for the elderly, the coefficient on Tpost-squared is statistically significant and opposite in sign from the Tpost coefficient, suggesting that the impact of another year diminishes (and may even reverse) as time goes by. As for public housing for the elderly, its impact is sustained over time, as

indicated by the statistically insignificant Tpost and Tpost-squared coefficients.

Given the large number of coefficients estimated, simulations are helpful to summarize results. Figures IA – IE show the ring-tract price gap by year relative to project completion for the average-sized project in each program, which ranges from 121 units for Section 202 to 276 units for the tax credit program.[25]

The figures suggest that the average public housing development for the elderly has almost no effect on surrounding property values, while the typical family public housing development leads to a significant decrease in the value of surrounding property values immediately after completion. In particular, prices within 2,000 feet of family public housing sites start out 13.1 percent lower than prices in the surrounding tract. After completion of the public housing, this initial ring-tract gap grows by 2.8 percentage points to 15.9 percent. The gap declines with time, however, and less than three years after completion, it falls back to its pre-completion level.

We see a similar, but even more dramatic, story for the Section 8 program. Two to five years before the completion of a Section 8 project of average size (259 units) prices inside and outside the 2,000-foot ring around the site are almost the same; prices in the ring then start to fall relative to larger neighborhood and end up 2.6 percent lower than prices in the larger neighborhood in the two years prior to completion and 8 percent lower immediately after completion. As with public housing, however, the gap starts shrinking in the years following completion. Because of the larger immediate impact, however, the gap doesn't approach its 2-5 years pre-completion level until nine years after completion.

Turning to Section 202, we see that prices within 2,000 feet of the future site are on average 2.8 percent lower than prices in the surrounding neighborhood two to five years before completion. Prices appear to rise slightly before completion, but this jump up is not statistically significant. Immediately after the completion of an average project (121 units), the prices in the ring rise and

become 1.3 percent *higher* than those outside of the ring. Thus, the total change in the gap due to the project completion is 4.1 percentage-points. This positive effect diminishes somewhat over time, but even after five years, prices in the ring of the Section 202 developments remain higher relative to the larger neighborhood than they were before completion.

Finally, in contrast to the other programs, prices in the ring of LIHTC developments start out 1.7 percent *higher* than prices in the surrounding neighborhood. Immediately after the completion of a tax credit project of average size (276 units), this gap grows by 5.3 percentage points, to reach seven percent. As in the case of Section 202, this positive effect diminishes somewhat with time, but again, even five years after completion, the price gap remains significantly higher than it was at baseline.

Figure II shows, for each program, how impacts vary with scale. The impacts are computed three years after completion, using the two-to-five years pre-completion price gap as a baseline.[26] We show how impacts vary for the full range of project sizes in our sample. For each program, we set the upper limit of the number of units equal to the 95th percentile of project size, to avoid out-of-sample predictions and to eliminate potential project size outliers.[27]

It is worth noting the similarity of the general shape of the scale function between the two types of public housing on the one hand and between Section 202 and the Low Income Housing Tax Credit program on the other. For public housing, the impact of small projects is positive, and, in the case of developments set aside for the elderly, quite large. As scale increases, however, the positive impact of public housing for the elderly vanishes (at around 140 units) and is transformed into an increasingly negative effect; this negative effect reaches a maximum at around 240 units, after which it starts diminishing. (Recall that our average public housing development for the elderly is 172 units.) The variation of family public housing impact with scale has a similar U-shape; however, this variation is less pronounced, and the impact remains positive over the whole scale range (it reaches a

minimum of approximately 0 at 400 units).

For the second pair of programs, the impacts are positive for the whole size range, and they appear to increase with scale, although only up to some point; beyond 220 units for Section 202, and beyond 770 units for LIHTC, the marginal impact of an additional unit becomes negative.[28] As for section 8 housing, its impact varies almost linearly with scale; it is close to 0 for very small projects but becomes negative and increases in magnitude as more units are built.

VI. CONCLUSION

These results challenge the conventional wisdom about the spillover effects of federally subsidized housing in some ways and confirm it in others. On the one hand, the results show that the effect of these housing developments on nearby property values is not consistently negative. Indeed, with respect to two programs – Section 202 and LIHTC – the impacts are positive and persist over time for the full range of project sizes in our sample. Additionally, small public housing projects reserved for the elderly have a significant positive effect which remains stable over time. Even in the case of Section 8 and public housing for families, the impacts are not significant for small projects, and for larger projects, the initially negative effects appear to decline with time and in the case of public housing, dissipate within three years of completion. Further, while the results clearly point to negative marginal impacts of public and section 8 housing, it is interesting that the marginal impacts diminish with scale, at least for public housing.

On the other hand, the results do confirm some conventional assumptions, especially about tenant mix. First, housing for elderly residents appears, in general, to be more welcomed in neighborhoods than housing for low-income families – although too large a number of senior units may also be detrimental to the neighborhood, perhaps because the larger housing developments are viewed to be out-of-scale with the existing community. Second, the two family programs that house

the lowest income tenants (Section 8 and Public Housing for families) appear to have the most negative effects.

Given that our study focuses exclusively on New York City, we are cautious in generalizing to other settings. Still, we think these results should provide some reassurance to community residents about the neighborhood impacts of federally-subsidized rental housing. We find that at least in New York City, these developments have not typically led to reductions in property values and have in fact led to increases in many cases. Impacts are highly sensitive to scale, though patterns vary across programs. Perhaps the most hopeful finding here from a policy perspective is that housing units built through the Low Income Housing Tax Credit program – currently the largest producer of federally-subsidized rental housing – appear to have positive impacts on their surrounding neighborhoods.

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NOTES

1. Five percent of New York City's elderly public housing units are set aside for disabled tenants.

2. Income for the LIHTC neighborhoods is computed from the 1990 Census. It is represented in 1979 dollars to facilitate comparison with the neighborhood income for the other programs, which comes from the 1980 Census. However, given the general increase in real income during the inter-census period, a more accurate comparison of neighborhood income across programs is achieved by relating it to the city average for the corresponding period.

3. The only paper we found that actually considers whether federally-subsidized housing might deliver *benefits* to the surrounding neighborhood is Hugh Nourse's paper, which was published way back in 1963, almost 10 years before the demolition of Pruitt Igoe, when attitudes about subsidized housing differed.

4. We use data on household incomes from HUD's Picture of Subsidized Households, which provides income on all tenants living in Public Housing in New York City. It is possible that tenants living in developments constructed since 1977 had even lower incomes than other public housing residents, given the shift in occupancy policy post 1980. It is also possible that per capita incomes were relatively lower in public housing than in Section 8 housing, since household sizes may be greater in public housing program. Olsen [2003] found this to be true in national data.

5. Evidence from one study of community development corporations in New York City suggests that very few LIHTC tenants in New York City receive TANF. Indeed, CDC staff complained that even people working full time couldn't afford to pay LIHTC rents [Wright et al., 2001].

6. Over 80 percent of LIHTC units in our data set were targeted explicitly to low-income tenants.

7. Green, Malpezzi and Seah [2003] estimate a repeat sales model and utilize an interesting gravity measure of distance to LIHTC development sites. Nonetheless, they do not have access to project completion dates, which makes it impossible to interpret their coefficients on distance as impact measures. To do so, one has to assume that the coefficient on distance to LIHTC sites was zero *before* project completion.

8. The coefficient on a dummy variable should in fact be interpreted as the difference in log price between properties that have the attribute and those that do not. Because the difference in log price closely approximates the percentage difference in price when the difference is small enough and because differences discussed in this paper are generally smaller than 10 percent, we use this more intuitive interpretation throughout the paper. The exact percentage effect of a difference in logs, b, is given by $100(e^b - 1)$, although this formula is itself an approximation when b is a regression coefficient; see Halvorsen and Palmquist [1980] and Kennedy [1981].

9. Initially, we estimated a specification with separate dummies for each of the 5 pre-completion years; however, for most programs, F-tests indicated that the years could be grouped into two sub-periods (0-2 and 2-5 years prior to completion) with little loss of explanatory power.

10. Since limiting the pre-completion period does not completely eliminate the overlaps, we also estimated our model using a sample that excluded all sales that were in a ring with two or more types of federally-subsidized housing. We obtained similar results, which are available upon request from the authors. Because this approach resulted in a significant reduction in the number of sales in ring with public housing, and, consequently, imprecise impact estimates for public housing, we opted for the alternative based on the full sample.

11. Note that there was no discernible trend in prices in the ring relative to the surrounding neighborhood during the pre-completion time period. As a result, we do not attempt to control for pre-completion price trends as done in Santiago, Galster, and Tatian [2001].

12. If a sale was within 2,000 feet of more than one project, we use the completion date of the first completed.

13. Specifically, Tpost equals 1/365 if a sale is located within the ring of a subsidized unit and occurs the day after its completion; it equals one if the sale occurs one year after the unit completion; and so on. We should note that the environmental disamenities literature has explored alternative ways to specify the decay or acceleration of impacts over time. See Kiel and Zabel [2002] for a useful discussion.

14. The boundaries of community districts are intended by the city to follow large neighborhoods. Each of the 59 community districts has a Community Board whose members are appointed by the Borough President and by the City Council members who represent the district. The Community Boards review applications for zoning changes and make recommendations for budget priorities

15. A joint test of the significance of the additional dummy variables indicated that they contributed little explanatory power over and above the community district based fixed effects. An F-test indicated the difference was statistically insignificant.

16. We also obtained information on units created through some older programs – Section 236 and the BMIR programs – which we used as control variables in our regressions.

17. Sales of cooperative apartments are not considered to be sales of real property and are not included in the data set. Note also that most of the apartment buildings in our sample are rent stabilized. Given that legally allowable rents were typically *above* market rents outside of affluent neighborhoods in Manhattan and Brooklyn during the period of our study, we do not believe that their inclusion biases our results [see Pollakowski 1997].

18. To provide a margin of error with respect to the construction dates in RPAD, we also excluded sales of buildings on the same block as a subsidized unit that were built up to two years before the subsidized units.

19. We limited the analysis to properties that are located within the 48 community districts (of the total 59) where there were more than 100 subsidized rental new units developed that were either public housing Section 8, Section 202, LIHTC, or 10 Year Plan.

20. Note that we use RPAD data from 1999. While it is possible that some building characteristics may have changed between the time of sale and 1999, most of the characteristics that we use in the regressions are fairly immutable (e.g., corner location, square feet, presence of garage). When merging RPAD data from 1990 and 1999, we identified very few differences, and even among these apparent differences, we suspect that a majority are corrections, rather than actual changes.

21. Since all buildings in New York City have been geocoded by the New York City Department of City Planning we used a "cross-walk" (the "Geosupport File") which associates each tax lot with an x,y coordinate (i.e. latitude, longitude using the US State Plane 1927 projection), police precinct, community district and census tract. A tax lot is usually a building and is an identifier available to the homes sales and RPAD data. We are able to assign x,y coordinates and other geographic variables to over 98 percent of the sales using this method. For most of the HPD units, we had both tax block and tax lot. If the tax lot was unavailable, then we collapsed the Geosupport file to the tax block level (i.e. calculating the center of each block) in order to assign x.y coordinates. For federal housing units, we used a coordinate conversion software (PROLAT) to convert the latitude and longitude coordinates - available from HUD - into x,y coordinates.

22. For the reasons discussed above, sales that occurred within 2,000 feet of a subsidized site but more than 5 years prior to project completion are excluded from the 2000 ft. ring statistics.

23. Full results are available from the authors upon request.

24. The average number of subsidized units within 2000 feet of a sale varies between 121 for Section 202 and 276 for LIHTC.

25. The "average-size" is computed as the average number of subsidized units (in a given program) within 2000 feet of a sale

26. Specifically, we set the upper limit of the size range equal to the 95th percentile of the distribution of ring sales with respect to project size.

27. The exact values of the 95^{th} percentile are available from the authors upon request.

28. Note that 93 percent of our sales in the rings of tax credit developments are in rings with fewer than 770 units, and 88 percent of sales in the rings of Section 202 developments are in rings with fewer than 220 units.

Table I. Distribution of subsidized units by program and completion year

Completion Year	Program				
	Public Housing		Section 8 NC/SR	Section 202	LIHTC
	for elderly	for families			
1977-1980	1,298	1,700	9,839	778	
1981-1985	1,701	2,714	20,971	5,592	
1986-1990	993	3,685	1,413	2,563	
1991-1995	87	1,543		2,900	6,504
1996-2000		384			16,494
Total	4,079	10,026	32,223	11,833	22,998

Table II. Distribution of subsidized units by borough

Borough	Program				
	Public Housing		Section 8 NC/SR	Section 202	LIHTC
	for elderly	for families			
Manhattan	1,522	2,602	9,869	3,156	13,140
Bronx	1,087	4,336	11,997	3,383	4,648
Brooklyn	884	3,088	8,613	3,424	4,804
Queens	308		1,502	1,692	87
Staten Island	278		242	178	319
Total	4,079	10,026	32,223	11,833	22,998

Table III. Characteristics of Census Tracts in which Assisted Housing Units are Located

	Mean Family Income[1]	Mean Poverty Rate	Mean Percentage Non-Hispanic Black	Mean Percentage Hispanic	Number of Tracts[2]
All tracts in New York City, 1980	$20,889	19.5%	24.3%	18.8%	2114
All tracts in New York City, 1990	$27,848	18.4%	26.2%	21.9%	2138
Public Housing - for elderly	$14,074	32.3%	41.3%	33.3%	22
- for families	$10,445	46.8%	53.2%	39.6%	69
Section 8 NC/SR	$12,541	37.5%	46.0%	36.7%	207
Section 202	$16,902	28.3%	29.6%	26.9%	126
LIHTC	$27,805	30.3%	36.8%	29.9%	232

Notes:

The statistics for all programs except LIHTC are based on the 1980 Census; the statistics for LIHTC are based on the 1990 Census since LIHTC units were built during the 1990s.

The statistics in this table, except those for all New York City tracts, are weighted by the number of tract level units.

Tracts with less than 200 persons are excluded from the samples on which these statistics are based.

Subsidized units with missing completion year or location are excluded from these statistics.

Only subsidized units completed post 1976 are included in these statistics

1) 1990 Census - based income for all NYC and for LIHTC was transformed in 1979 dollars to adjust for the inflation in the inter-census period

2) The number of tracts on which the NYC mean family income and poverty rate are based is somewhat smaller since some tracts have missing values for these variables.

Table IV. Characteristics of properties sold

	Percentage of all property sales	Percentage of sales within 2000 feet of:[1]				
		Public housing site[3]		Section 8 NC/SR site[3]	Section 202 site	LIHTC site
		for seniors	for families			
Borough						
Manhattan	12.6	40.2	28.1	22.4	21.8	36.9
Bronx	13.5	12.9	21.5	12.4	23.1	10.3
Brooklyn	42.5	32.5	50.4	56.2	42.4	48.5
Queens	19.5	9.6	0.0	5.9	10.1	0.9
Staten Island	11.8	4.8	0.0	3.0	2.6	3.5
Building Class						
Single-family detached	20.9	6.1	1.9	9.7	10.9	4.9
Single-family attached	12.9	5.7	3.8	6.5	7.6	4.2
Two-family	30.9	23.8	26.1	29.0	28.7	23.3
Walk-up apartments	18.1	33.1	43.0	31.9	29.8	28.7
Elevator apartments	1.2	2.7	2.9	2.8	2.1	1.3
Loft buildings	0.1	0.2	0.1	0.2	0.3	0.1
Condominiums	12.0	23.8	16.1	13.6	15.8	31.3
Mixed-use, multifamily (includes store or office plus residential units)	0.4	0.6	0.7	0.8	0.7	0.8
Built pre-World War II	77.3	92.4	96.6	94.0	90.4	94.7
Vandalized	0.0	0.3	0.3	0.1	0.1	0.2
Other abandoned	0.1	0.5	0.5	0.3	0.3	0.3
Garage	29.2	8.9	8.7	13.4	16.6	6.5
Corner location	6.8	6.0	6.7	7.3	6.6	4.7
Major alteration prior to sale	3.1	9.6	8.8	7.0	6.4	5.2
within 2000 feet of[1,2]						
Any federally-subsidized site	147,249					
Any completed federal project	117,137					
N	432,984	14,246	25,831	85,441	77,843	46,071

Notes: Universe=all sales in community districts with at least 100 units in federal and 10 Year Plan rental categories combined

1) Sales which occur more than 5 years prior to project completion are excluded.

2) Only sales in ring with public housing, Section 8 NC/SR, Section 202, or LIHTC units are included here.

3) Excludes projects completed prior to 1977.

Table V. Distribution of sales by ring type and time relative to project completion

	N	% or ring type total
Sales in ring with		
Public Housing units for elderly	**14,246**	**100.0**
0-5 years pre-completion	1,919	13.5
Post-completion	12,327	86.5
Public Housing units for families	**25,831**	**100.0**
0-5 years pre-completion	4,078	15.8
Post-completion	21,753	84.2
Section 8 NC/SR units	**85,441**	**100.0**
0-5 years pre-completion	13,803	16.2
Post-completion	71,638	83.8
Section 202 units	**77,843**	**100.0**
0-5 years pre-completion	16,716	21.5
Post-completion	61,127	78.5
LIHTC units	**46,071**	**100.0**
0-5 years pre-completion	16,957	36.8
Post-completion	29,114	63.2

Note : Ring types are not mutually-exclusive (i.e., a sale can be within 2000 feet of two or more program categories)

Table VI. Selected regression results - average impacts

Federally-subsidized rental housing	
Pre Ring, 2-5 yrs	-0.0193 ***
	(0.0034)
Pre Ring, 0-2 yr	-0.0156 ***
	(0.0039)
Post Ring	-0.0083 **
	(0.0039)
TPost	0.0020 ***
	(0.0008)
$TPost^2$	4.2E-05
	(3.6E-05)
Number of units at the time of sale	-1.1E-05
	(1.2E-05)
Number of units at the time of $sale^2$	-1.8E-08 ***
	(6.3E-09)
R^2	0.8589
N	432,984

Note: This table shows only the ring variables for the federal rental housing projects completed after 1976. The regression includes ring variables for other types of subsidized housing, census tract and CD-quarter dummies and the full set of building controls, as in the appendix. Standard errors in parentheses. *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

Table VII. Selected regression results - impacts by program

Public Housing for seniors	
Pre Ring, 2-5 yrs	-0.0567 ***
	(0.0125)
Pre Ring, 0-2 yr	-0.0569 ***
	(0.0141)
Post Ring	0.0594 **
	(0.0270)
TPost	-0.0011
	(0.0020)
$TPost^2$	-5.8E-05
	(8.4E-05)
Number of units at the time of sale	-1.2E-03 ***
	(2.7E-04)
Number of units at the time of $sale^2$	2.4E-06 ***
	(6.3E-07)
Public Housing for families	
Pre Ring, 2-5 yrs	-0.1314 ***
	(0.0095)
Pre Ring, 0-2 yr	-0.1218 ***
	(0.0100)
Post Ring	-0.1223 ***
	(0.0096)
TPost	0.0126 ***
	(0.0017)
$TPost^2$	-3.1E-04 ***
	(7.3E-05)
Number of units at the time of sale	-2.2E-04 ***
	(5.0E-05)
Number of units at the time of $sale^2$	2.8E-07 ***
	(6.0E-08)
Section 8 NC/SR	
Pre Ring, 2-5 yrs	-0.0079
	(0.0052)
Pre Ring, 0-2 yr	-0.0263 ***
	(0.0060)
Post Ring	-0.0370 ***
	(0.0062)
TPost	0.0116 ***
	(0.0011)
$TPost^2$	-4.1E-04 ***
	(4.9E-05)
Number of units at the time of sale	-1.8E-04 ***
	(2.4E-05)
Number of units at the time of $sale^2$	4.9E-08 **
	(2.4E-08)
Section 202	
Pre Ring, 2-5 yrs	-0.0276 ***
	(0.0043)
Pre Ring, 0-2 yr	-0.0167 ***
	(0.0052)
Post Ring	-0.0245 ***
	(0.0062)
TPost	-0.0024 **
	(0.0011)
$TPost^2$	2.7E-04 ***
	(5.5E-05)
Number of units at the time of sale	4.3E-04 ***
	(6.1E-05)
Number of units at the time of $sale^2$	-9.6E-07 ***
	(1.9E-07)
LIHTC	
Pre Ring, 2-5 yrs	0.0170 ***
	(0.0049)
Pre Ring, 0-2 yr	0.0105 *
	(0.0054)
Post Ring	0.0489 ***
	(0.0073)
TPost	-0.0115 ***
	(0.0034)
$TPost^2$	0.0015 ***
	(3.9E-04)
Number of units at the time of sale	9.3E-05 ***
	(2.3E-05)
Number of units at the time of $sale^2$	-6.0E-08 ***
	(1.7E-08)
R^2	0.8593
N	432,984

Note: This table shows only the ring variables for the federal rental housing projects completed after 1976. The regression includes ring variables for other types of subsidized housing, census tract and CD-quarter dummies and the full set of building controls, as in the appendix. Standard errors in parentheses. *** denotes 1% significance level; denotes 5% significance level; * denotes 10% significance level.

Figure IA
Price trends within 2000 ft. of the average Public Housing project for elderly (172 units)

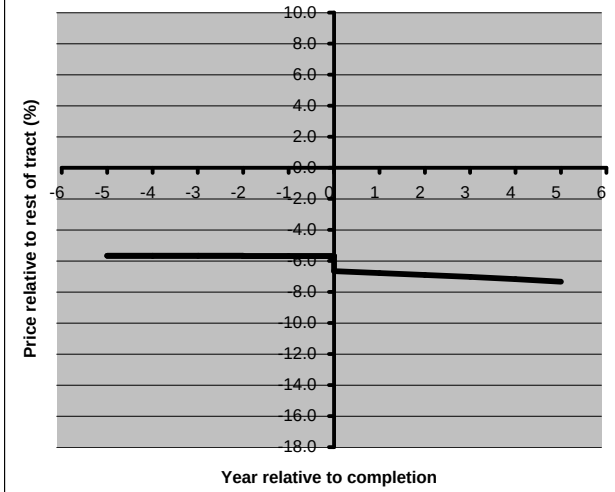


Figure IB
Price trends within 2000 ft. of the average Public Housing project for elderly (232 units)

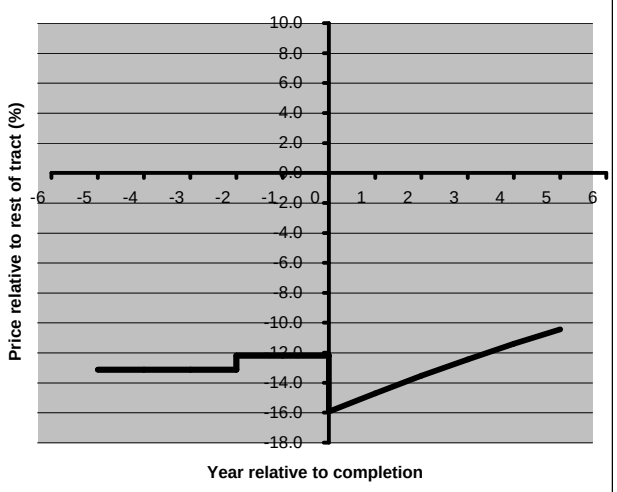


Figure IC
Price trends within 2000 ft. of the average Section 8 NC/SR project (259 units)

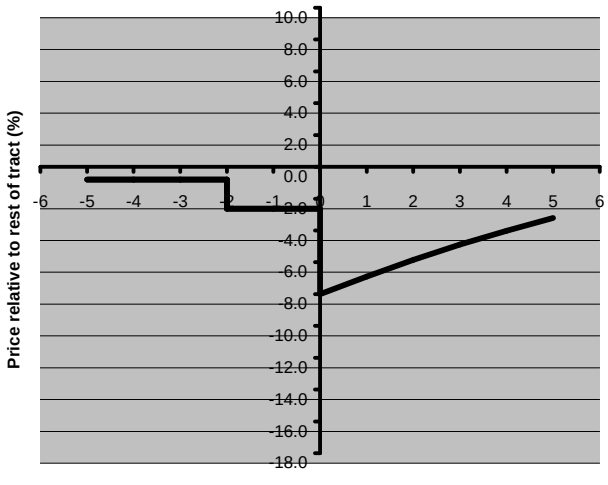


Figure ID
Price trends within 2000 ft. of the average Section 202 project (121 units)

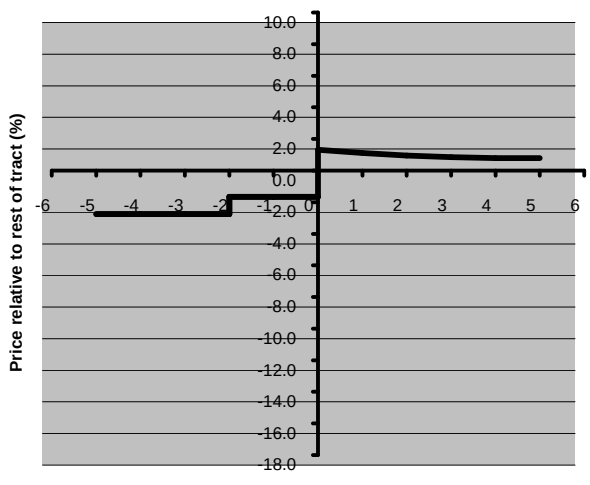


Figure IE
Price trends within 2000 ft. of the average LIHTC project (276 units)

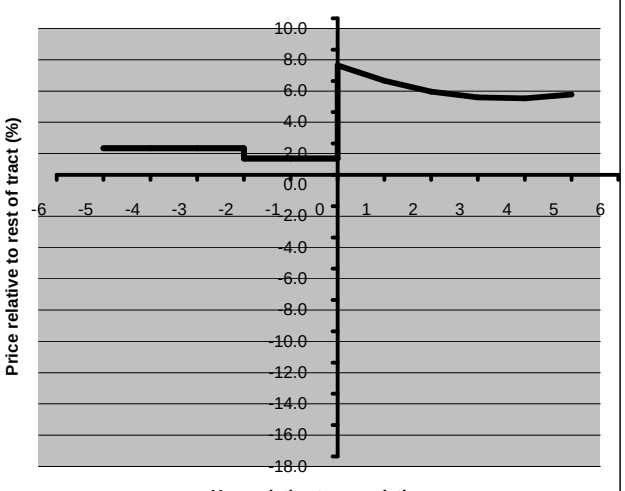
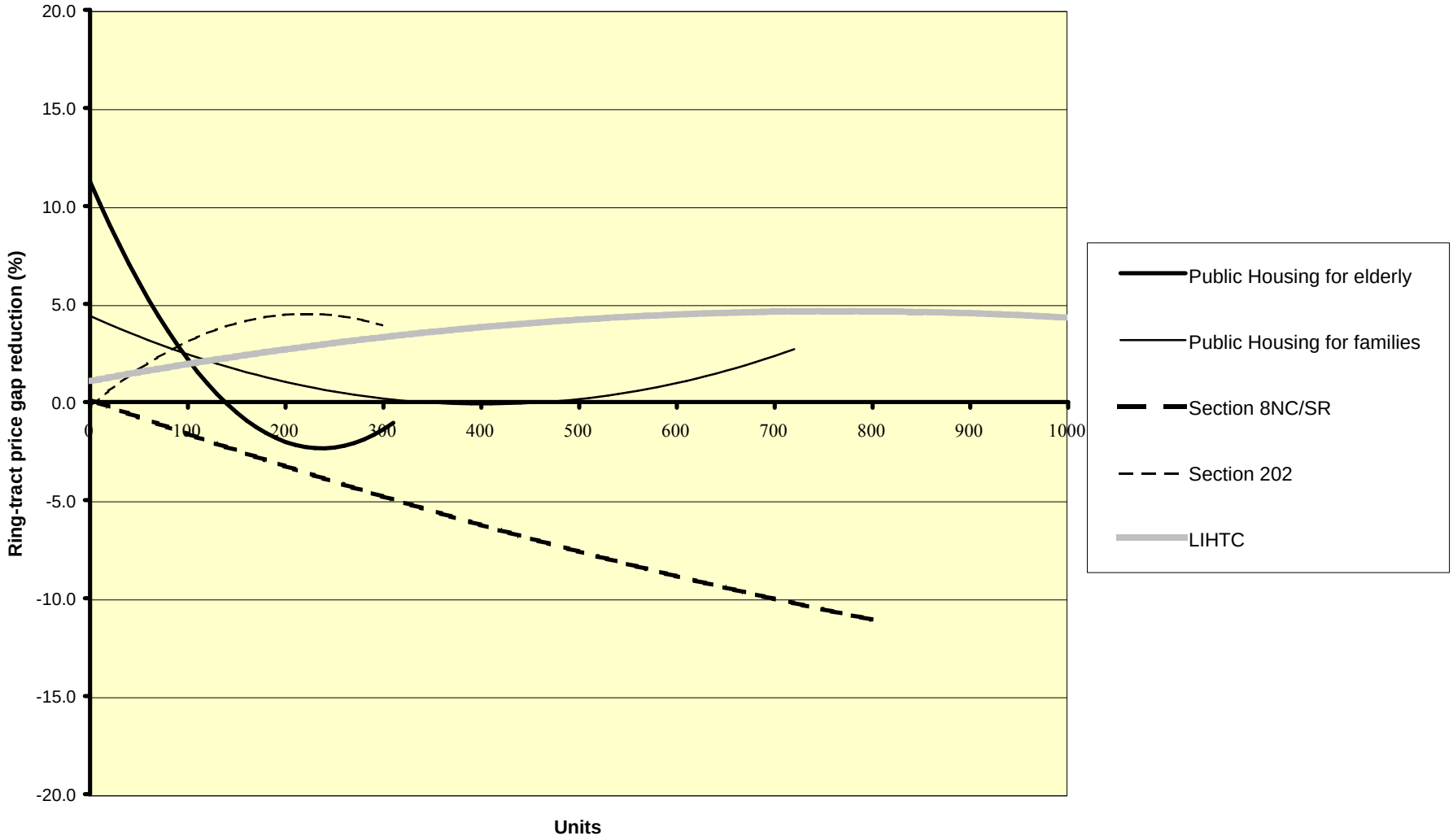


Figure II
Impacts by program and scale

(3 years post-completion vs. 2-5 years pre-completion)



APPENDIX

Complete regression results - average impacts

Federally-subsidized rental housing		Age of unit	-0.0088 ***
Pre Ring, 2-5 yrs	-0.0193 ***		(1.1E-04)
	(0.0034)	(Age of unit)2	5.9E-05 ***
Pre Ring, 0-2 yr	-0.0156 ***		(1.0E-06)
	(0.0039)	Age of unit missing	-0.3166 ***
Post Ring	-0.0083 **		(0.0077)
	(0.0039)	Log square feet per unit	0.5200 ***
TPost	0.0020 ***		(0.0018)
	(0.0008)	Number of buildings on same lot	-0.0153 ***
$TPost^2$	4.2E-05		(0.0041)
	(3.6E-05)	Includes commercial space	-0.0030
Number of units at the time of sale	-1.1E-05		(0.0045)
	(1.2E-05)	Square feet missing	3.6648 ***
Number of units at the time of $sale^2$	-1.8E-08 ***		(0.0197)
	(6.3E-09)	Condo and square feet missing	-0.1635 ***
10 Year Plan Rental New Housing			(0.0156)
Pre Ring, 2-5 yrs	-0.0575 ***	Single-family detached	0.0958 ***
	(0.0042)		(0.0021)
Pre Ring, 0-2 yr	-0.0136 ***	Two-family home	-0.2878 ***
	(0.0047)		(0.0020)
Post Ring	-0.0077	Three-family home	-0.5082 ***
	(0.0061)		(0.0027)
TPost	-0.0073 ***	Four-family home	-0.6465 ***
	(0.0020)		(0.0042)
$TPost^2$	5.8E-04 ***	Five/six-family home	-0.9654 ***
	(1.4E-04)		(0.0044)
Number of units at the time of sale	2.3E-04 ***	More than six families, no elevator	-1.3518 ***
	(2.1E-05)		(0.0045)
Number of units at the time of $sale^2$	-9.8E-08 ***	Walkup, units not specified	-1.0550 ***
	(1.1E-08)		(0.0051)
Other Subsidized Housing		Elevator apartment building, cooperatives	-1.2306 ***
Pre Ring, 0-5 yrs	-0.0259 ***		(0.0119)
	(0.0025)	Elevator apartment building, not cooperativ	-1.3468 ***
Post Ring	-0.0358 ***		(0.0066)
	(2.5E-03)	Loft building	-0.7340 ***
Tpost	1.2E-04		(0.0189)
	(9.5E-05)	Condominium, single-family attached	0.2154 ***
Number of units at the time of sale	-1.6E-05 ***		(0.0126)
	(2.0E-06)	Condominium, walk-up apartments	-0.0508 ***
Characteristics of properties sold			(0.0098)
Vandalized	-0.1304 ***	Condominium, elevator building	-0.2260 ***
	(0.0288)		(0.0098)
Other abandoned	-0.0768 ***	Condominium, miscellaneous	-0.2432 ***
	(0.0166)		(0.0115)
Odd shape	0.0147 ***	Multi-use, single family with store	-0.0809 ***
	(0.0021)		(0.0076)
Garage	0.0529 ***	Multi-use, two-family with store	-0.4894 ***
	(0.0015)		(0.0063)
Extension	0.0533 ***	Multi-use, three-family with store	-0.6878 ***
	(0.0021)		(0.0097)
Corner	0.0340 ***	Multi-use, four or more family with store	-0.8521 ***
	(0.0022)		(0.0070)
Major alteration prior to sale	-0.0584 ***	R^2	0.8589
	(0.0037)	N	432,984

Note: The regression includes census tract and CD-quarter dummies. Standard errors in parentheses.

*** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.