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Building Homes, Reviving Neighborhoods: Spillovers from Subsidized Construction of Owner-Occupied Housing in New York City

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Abstract

This article examines the impact of two New York City homeownership programs on surrounding property values. Both programs, the Nehemiah Program and the Partnership New Homes program, subsidize the construction of affordable owner-occupied homes in distressed neighborhoods. We use a geocoded data set that includes every property transaction in the City from 1980 to 1999.

Our analysis relies on a difference-in-difference approach. Specifically, we compare the prices of properties in small rings surrounding the Partnership and Nehemiah sites with prices of comparable properties that are in the same ZIP code but outside the ring. We then examine whether the magnitude of this difference changes after the completion of a homeownership development. Our results show that during the past two decades prices of properties in the rings surrounding the homeownership projects have risen relative to their ZIP codes. Results suggest that part of that rise is attributable to the affordable homeownership programs.

Keywords: Homeownership; Housing prices; Neighborhood

Promoting homeownership has always been a central aim of housing policy in the United States. The federal tax code gives generous tax benefits to homeowners; the Federal Housing Administration (FHA) provides insurance on high loan-to-value mortgages; a variety of other FHA and state programs have offered below-market interest rates; and the Community Reinvestment Act of 1977 provides incentives for financial institutions to make mortgage loans in low- and moderate-income communities. As cities have become more centrally involved in implementing housing policy, local officials have begun to sponsor a large number of homeownership programs in distressed communities.

Although, typically, these efforts do not reach the poorest households, they are justified in large part by the positive spillovers that many argue will result from the development of new homes

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and by homeownership itself.[1] There is little empirical evidence, however, about the effect that home building and homeownership have on local communities. In this article we examine and compare the effect that two of New York City's major homeownership programs have had on property values in surrounding communities. Both of these programs, the Nehemiah Program and the New Homes program of the New York City Housing Partnership, subsidize the construction of affordable owner-occupied homes in distressed urban neighborhoods.

Several sections comprise this article; in the following section we discuss the channels through which this type of subsidized construction could raise property values in the surrounding neighborhood, and we review the existing literature. In the methodology section we discuss our hedonic-based "difference-in-difference" approach to identifying the effect of the homeownership programs, controlling for structural features of the properties, neighborhood amenities, and local housing market trends. In the summary of data section we describe the rich data set analyzed here, which contains the sales prices and many structural characteristics of all properties sold in New York City during a period of almost 20 years. This study's major findings, the effect of the programs on neighborhood property values, are presented in the results section. In the heterogeneity of effects section we break down these results, examining the (potentially) varying effects of the two different programs, large versus small developments, and developments built during boom or bust periods. In the conclusion we summarize the key results and discuss policy implications.

Spillover Effects of Homeownership and Housing Redevelopment

There are several reasons why the Nehemiah and the Partnership New Homes programs might be expected to raise the value of surrounding properties. First, both replace blighted properties or land with new structures. Unlike most commodities, housing is fixed in space, and the value of a home is therefore influenced not only by its structural features and quality but also by its surroundings. The appearance of neighboring homes, the level of noise and disorder in a community, and the quality of local public services are all likely to contribute to the value of a particular home. Thus, housing investments in blighted areas should, in principle, generate spillover benefits that could be capitalized into the value of surrounding properties.

Second, these housing programs may have bolstered the number of homeowners in their communities, which may, in itself, lead to higher property values if, for example, homeowners' greater financial stake leads them to take better care of their homes than renters do.[2] Similarly, homeowners may be more involved in local organizations and activities because of their financial stake and/or because they tend to stay in their homes for a longer period of time. This involvement, again, may improve the quality of life in a community and raise property values.[3]

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[1] Some cities may also support homeownership programs as an attempt to retain the middle class.

[2] Absentee landlords have a financial stake in the property similar to homeowners.' But the argument is that because absentee landlords do not live in the property, they are not able to control the day-to-day upkeep in the same way that homeowners can.

[3] There is, in fact, little empirical evidence demonstrating that homeowners do make such social and economic investments. (See Dietz and Haurin 2001; DiPasquale and Glaeser 1999; and Rohe, Van Zandt, and McCarthy 2000 for evidence and discussion.)

These programs may also affect property values because of population change. Typically, homeowners earn higher incomes than renters and, thus, programs to increase homeownership in a neighborhood may also raise the community's socioeconomic status. In addition, the programs may increase property values as a result of the growth of population that occurs as vacant land is transformed into housing. This population growth may, in turn, lead to new commercial activity and economic growth, making the neighborhood more desirable.

Finally, as Galster (1987, 19) explains, exogenous changes to the "physical demographic character of a neighborhood" may change expectations about the future of the community and influence individual mobility decisions and investments in upkeep. As vacant and derelict land is converted into habitable housing, nearby property owners may decide to remain in the community rather than move away. They may also be more likely to invest in maintaining their own homes, thereby generating additional positive neighborhood effects.[4]

There is little work that actually examines the neighborhood spillover effects generated by the subsidized construction of owner-occupied homes. More work has focused on the relationship between investments in publicly subsidized rental housing and neighborhood property values. These studies offer conflicting evidence. Nourse (1963) and Rabiega, Lin, and Robinson (1984) have found that newly developed public housing can have modest positive effects on neighboring property values, whereas Lyons and Loveridge (1993); Goetz, Lam, and Heitlinger (1996); and Lee, Culhane, and Wachter (1999) all found small, statistically significant negative effects on property values associated with the presence in a neighborhood of certain types of federally subsidized housing. Moreover, in all these studies, data limitations make it difficult to pinpoint the direction of causality. Are subsidized sites systematically located in weak (strong) neighborhoods, or does subsidized housing lead to neighborhood decline (improvement)? Typically, these studies compare price levels in neighborhoods with subsidized housing to price levels in neighborhoods without subsidized housing, but it is difficult to know whether the two groups of neighborhoods are truly comparable.

Two more recent studies of subsidized rental housing have made strides in overcoming this causality problem. Briggs, Darden, and Aidala (1999) examined the early effects that seven scattered-site public housing developments had on property values in neighborhoods in Yonkers, NY. Using a pre/post design with census tract fixed effects, they found little effect on the surrounding area. Santiago, Galster, and Tatian (2001) examined whether the acquisition and rehabilitation of property to create scattered-site public housing in Denver influenced the sales prices of surrounding single-family homes. These authors also used a pre/post design with localized fixed effects and found that, typically, proximity to dispersed public housing units is, if anything, associated with an increase in the prices of single-family homes.[5]

In short, there is no consensus about the effects that investments in subsidized rental housing have on surrounding property values, although recent research suggests negligible or small

[4] All these changes are also likely to increase the flow of capital into the neighborhood by decreasing risk. This increase in the availability of bank financing for home purchase and improvement loans is likely to increase the liquidity and price of housing in the neighborhood. It will also facilitate unsubsidized rehabilitation of housing (Galster 1987).

[5] Santiago, Galster, and Tatian (2001) also controlled for past trends in housing prices in the immediate vicinity of a project; therefore, they tested for changes both in price levels and trends after completion. (This methodology was shown first in Galster, Tatian, and Smith 1999.)

positive effects. As noted, research on the spillover effects of homeownership programs is far thinner. We found only two studies that examine the effect of publicly assisted homeownership programs.[6] Lee, Culhane, and Wachter (1999) found that FHA-insured units and units developed through the Philadelphia Housing Authority's homeownership program both have positive effects on surrounding house prices. That finding is precisely the opposite of the study's overall conclusions concerning rental housing (see above).[7] Cummings, DiPasquale, and Kahn (2000) studied the effect of two Nehemiah housing developments in Philadelphia. Using methods somewhat similar to ours, the authors compared price trends in the census tracts that contained these developments with trends in similarly distressed tracts elsewhere in the City.[8] They found no statistically significant spillover effects, but because they had only two developments in the City to evaluate, their confidence intervals are quite wide, and they can rule out neither large positive nor large negative effects.[9]

New York City Housing Programs

In 1986, New York City launched an unprecedented initiative to rebuild the housing stock that had been devastated in the 1970s. Between 1987 and mid-1999 the city's housing agency, the Department of Housing Preservation and Development (HPD), invested close to $5 billion in the construction of more than 22,000 homes, the gut rehabilitation of more than 43,000 units of formerly vacant housing, and the moderate rehabilitation of more than 97,000 units of occupied housing.[10] Most of these efforts have focused on low- and moderate-income rental housing, but a few programs sponsor ownership housing.

Nehemiah Program

The Nehemiah Program was launched in the early 1980s by East Brooklyn Congregations, a group of 36 churches in Brooklyn. Typically, the Nehemiah Program built projects consisting of 500 to 1,000 units each on large tracts of donated city-owned land. Generally, the units are quite modest, built in identical block-long rows of single-family, 18-foot-wide homes. The first house was completed in 1984; nearly 3,000 homes have been built in total. About 80 percent of these homes were built in Brooklyn; the rest of them, built by another group of churches, are in the South Bronx (Stuart 1997).

[6] Many argue that an increase in the proportion of homeowners should in itself bolster property values. Is the value of a property higher (or does it appreciate more rapidly) when it is located in a community with a greater share of homeowners? Few studies tackle that question, again perhaps because of concerns about endogeneity. In an analysis of 2,600 nonaffluent urban census tracts between 1980 and 1990, Rohe and Stewart (1996) found that housing prices appreciated more rapidly in neighborhoods with higher homeownership rates. They did not, however, analyze the root causes of that effect.

[7] The Section 8 New Construction Program is the only rental housing program that they found to be correlated with higher property values.

[8] The key difference between their approach and ours is that they did not control for previous trends in housing values near the developments and relied on census tract geocoding rather than measuring the actual distance between the sale and the homeownership development.

[9] Their article also provides an interesting analysis of the benefits delivered to individual homeowners.

[10] These figures are estimates of activity beginning in fiscal year 1987 and ending in fiscal year 1998.

The high-volume, mass-production approach has allowed the Nehemiah Program to deliver units at a very low cost. Units cost from $60,000 to $70,000 to build, and the purchase price was lowered by $10,000 to $15,000 through a non-interest-bearing second mortgage from the City, due only on resale (Donovan 1994; Orlebeke 1997). Estimates of the average incomes of the families who moved into the Nehemiah homes range from $27,000 to $31,000, which is somewhat higher than the 1990 average family income (under $25,000) of census tracts in which the homes were built.

Partnership New Homes Program

The New York City Housing Partnership is a not-for-profit intermediary organized in 1982 to help create and manage an affordable homeownership production program in the City (Wylde 1999). Its core program—the New Homes program—was launched soon after to develop new, affordable owner-occupied homes in distressed communities. Partnership homes were built by private, profit-motivated developers selected by the City and the Partnership. Most Partnership projects consist of fewer than 100 units, and many are located on small infill sites grouped together to make up a project (Orlebeke 1997). The typical Partnership development contains two- and three-family homes that include an owner's unit plus one or two rental units.

According to one 1988 study of 10 Partnership projects, per-unit costs during the 1980s ranged from $57,000 to $137,000 (Orlebeke 1997). On average, the income of the residents moving into Partnership homes in 1990 was $32,000, again somewhat higher than the mean income of their surrounding neighborhoods. In all Partnership projects the City provided the land at a nominal cost ($500 per lot) and gave a $10,000 subsidy per home; the State Affordable Housing Corporation provided an additional $15,000 per home (Donovan 1994).

By June 1999, the Partnership New Homes program had added 12,590 new homes, like the Nehemiah Program, primarily in Brooklyn and the Bronx. But roughly one-quarter of the homes have been built in New York City's three other boroughs.

Choosing Locations

In testing the effect of new housing on surrounding areas there is always some concern about site selection. Here, for example, the City may have tried to select "strong" sites for new housing, areas in which it believed property values were beginning to increase (or had promise in the near future). Even if the City had wanted to do so, however, there were considerable constraints limiting the choice of locations. First, the site had to be city-owned, which means it had been abandoned by its previous owner and vested in an *in rem* proceeding for delinquent property taxes. Because private owners were much less likely to have abandoned properties in more promising areas, the City's stock of abandoned properties was overwhelmingly concentrated in its poorest neighborhoods (Scafidi et al. 1998). Second, in the case of the Nehemiah Program, the land had to be a large, mostly vacant contiguous parcel.

Furthermore, as interviews with city officials suggest, the City did not give its best vacant sites to the Partnership and Nehemiah sponsors. In many instances the City was interested in realizing a high return from its land holdings and in minimizing the total subsidy required for redevelopment. As Anthony Gliedman, former HPD commissioner expressed it, "Why would we do market-rate sites with the Partnership?" (Orlebeke 1997). In other words, the process of selecting individual sites, although perhaps not fully random, was certainly far from one that sought to systematically pick winners. Rather, there is reason to believe that the City chose losers, suggesting that our spillover estimates would provide conservative estimates of the effect of randomly sited housing. Nonetheless, our research design includes various controls for systematic selection issues.

Methodology

The centerpiece of this research is a hedonic price function that views housing as a composite good or a bundle of services. Observed house prices are the product of the quantity of housing services attached to the property and the price of these housing services, summed over all structural and location characteristics of the property. The basic model takes the following form:

$$P_{it} = \alpha + \beta \boldsymbol{X}_{it} + \gamma \boldsymbol{Z}_{it} + \delta \boldsymbol{I}_{t} + \varepsilon_{it}, \qquad (1)$$

where P is the sales price of the property; $\boldsymbol{X}$ is a vector of property-related characteristics, including age and structural characteristics; $\boldsymbol{Z}$ is a vector of location attributes, such as local public services and neighborhood conditions; $\boldsymbol{I}$ is a vector of dummy variables indicating the year of the sale; i indexes properties; and t indexes time. As usual α represents an intercept and β, γ, and δ represent vectors of parameters to be estimated; ε represents an error term.[11] The derivative of the housing price function with respect to an individual attribute may then be interpreted as the implicit price of that attribute (Rosen 1974). In many cases housing prices are entered as logarithms (as we do below), so that 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 as the difference in log price between properties that have the attribute and those that do not. The difference in log price closely approximates the percentage difference in price when the difference is small enough. For the differences discussed in this article, which are generally smaller than 10 percent, the approximation is close, so we use this more intuitive interpretation.[12]

As suggested above, the price of housing is affected by a broad array of structural and neighborhood characteristics, and, therefore, estimating equation 1 requires a great deal of detailed data. Unfortunately, if some relevant variables cannot be included, either because they are unmeasured or because data are unavailable, the coefficients on the included variables may be biased. Thus, our challenge in trying to identify the independent effect of proximity to Partnership and Nehemiah homes is to control for a sufficient number of neighborhood attributes so that our impact estimates do not suffer from omitted variable bias.

[11] In principle, spatial autocorrelation in the error term, although not biasing the regression coefficients, could cause the standard errors we report to be underestimated (see e.g., Can and Megbolugbe 1997). However, we expect that after controlling for ZIP code–quarter effects and also detailed building characteristics, little spatial autocorrelation will be left. Basu and Thibodeau (1998) estimated a hedonic regression and found only modest spatial autocorrelation, even using less-fine-grained geographic controls than ours.

[12] 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).

Our basic approach is to adapt the Galster, Tatian, and Smith (1999) model, estimating the difference between prices of properties in the microneighborhoods (or rings) surrounding Nehemiah and Partnership sites and the prices of comparable properties that are outside the ring, but still located in the same general neighborhood. Then we examine whether the magnitude of this difference has changed over time and, if so, whether the change is associated with the completion of a Partnership or Nehemiah project.[13] This approach should yield an unbiased measure of impact if (1) sufficient data on the structural characteristics of the homes that sell are available and (2) other neighborhood influences that shaped the value of properties very near the Partnership and Nehemiah sites at about the time of project completion similarly influenced property values in the general neighborhood.

More specifically, we supplement the model above with variables identifying properties in the ring of the housing investments (variables that capture the price differential between properties inside and outside the ring) and by specifying those variables to allow the price differential to change over time. As always, there is no single best way to specify these variables. Instead, different specifications reflect different counterfactuals and offer distinct advantages.

As described in greater detail below, our response is to estimate several alternative specifications of the model, reflecting a range of choices and alternatives. More specifically, we estimate the model for three different ring sizes—a 500-foot ring, 1,000-foot ring, and 2,000-foot ring—that define properties in the vicinity of Nehemiah or Partnership sites. We also investigate three alternative ways of capturing differentials in price levels and trends between properties inside and outside the ring. Our first specification includes a different ring dummy for each of the 9 preceding years, with another dummy indicating 10 or more previous years. There is also a similar set of 10 dummies for the following years, and another for the year of completion. This parameterization provides estimates of the price differential between the inside and outside of the ring in each of 21 years (multiyear periods in the case of the two outer dummies). Our second, more parsimonious, specification generates an overall before-after comparison by replacing these 21 ring-year dummy variables with a single "ever in the ring" dummy variable, an in-ring postcompletion dummy variable, and a postcompletion trend variable. A third specification includes controls for previous trends in the price differential inside and outside the rings before the development of the new homes (using a spline specification to allow for different trends in different time periods). Thus, the third specification provides an estimate in which the counterfactual is that the price gap between the ring and the neighborhood would have continued to shrink (or grow) at the precompletion rate if no project had been completed.

As noted, we think each of these specifications offers distinct advantages and, therefore, we show the results from all three. The first is the most flexible, offering a detailed view of price changes over time, but the large number of coefficients makes it difficult to summarize the overall effect. The second is more parsimonious and straightforward, but it may be oversimplistic and fail to account for trends in the ring-neighborhood price gap before the completion of the project. The third specification controls for these previous trends and thereby helps to mitigate concerns about selection bias, but it may be overconservative. Because property values may begin to rise once a project is announced or started, the trends may also pick up some of the effects of the developments themselves, in anticipation of the effect the project

[13] Thus, we form a difference-in-difference impact estimate. The impact of the housing investment is identified as the difference between properties inside and outside the ring, before and after the housing investment.

will have on the surrounding community.[14] (According to HPD staff, community residents were involved in the planning process and often they knew about these projects years before the start of construction.) If so, including the splines means that we measure just the added effect a project's completion has on property values, above and beyond the effect of its completion or start, and that we understate its full effect.

Unfortunately, it is impossible to know whether, in fact, previous trends in prices in the ring relative to those in the ZIP code would have continued at the same rate if the project had not been constructed. In our third specification, we effectively assume that the trend in relative prices that occurred during the five years before project completion would have continued in the years after completion. In our second specification, we assume that prices in the rings would have increased at the same rate as prices in the ZIP code. It is likely that neither of those assumptions is fully accurate, but it is impossible to know what would have happened to prices in the rings in the absence of the newly built homes.[15]

Mathematically, our first model can be written as follows:

$$\text{LnP} = \alpha + \beta \boldsymbol{X} + \delta \boldsymbol{ZIPcode\text{–}Quarter} + \gamma \text{Ring\_Years\_From\_Sale} + \varepsilon, \tag{2}$$

where ***X*** is a vector of structural characteristics, as before, and ***ZIPcode–Quarter*** is a vector of dummy variables indicating the neighborhood in which the property is located (measured by ZIP code) and the year and quarter of sale (for example, first quarter 1980, second quarter 1980, and so on).[16] These ***ZIPcode–Quarter*** dummy variables enable us to control for ZIP code–specific levels and trends in prices, appropriately controlling for seasonality, and should therefore yield a more precise estimate of impact.[17]

As noted above, we test for differences in both price levels and trends for properties near homeownership units by including 21 dummy variables (denoted Ring_Years_From_Sale), indicating whether a sale is within a given distance of a homeownership site and the number of years between the sale and project completion (before or after).[18] As an example, for our 500-

[14] Another alternative is that the construction activity generated by the new homes may itself increase property values before completion.

[15] It is theoretically possible, of course, that in the absence of the project, the gap between prices in the rings and prices in their surrounding ZIP codes would have closed more rapidly than it had been closing before project completion.

[16] We effectively include a dummy variable for each ZIP code–quarter combination in the data set; therefore, for a ZIP code in which properties sold in each quarter from the first quarter of 1980 through the third quarter of 1999, we include 79 dummy variables.

[17] New York City is divided into 337 ZIP codes, but many of them are nonresidential. A total of 243 "non-unique" ZIP codes are shared by numerous businesses and residences. (The other ZIP codes are assigned to post office boxes or to single organizations.) On average, the residential ZIP codes included slightly more than 40,000 residents in 1997. The high density of New York City makes using census tracts undesirable. In many instances the 2,000-foot rings around developments included multiple census tracts, which would have significantly complicated the interpretation of results.

[18] In cases in which a sale was within 500 feet of more than one Nehemiah or Partnership project, we use the completion date of the first project completed. Note that we do not distinguish in this specification between sales that are within a certain distance of small developments and sales within a certain distance of large developments, nor do we distinguish between sales that are within a certain distance of one development and sales within a certain distance of several.

foot model, we include a dummy variable indicating whether the property is located within 500 feet of a Nehemiah or Partnership site and sold during the same calendar year in which the project was completed (year 0). We also include a dummy indicating whether the property is within 500 feet of a site and sold in the calendar year before completion (year –1), another indicating whether it is within 500 feet and sold in the calendar year immediately after the year of completion (year 1), and so on through year –10 and year 10.[19] We estimate similar models for a 1,000-foot ring and a 2,000-foot ring.[20]

The coefficients on these dummy variables can be interpreted as the percentage difference between the prices of properties in the rings surrounding the homeownership project and the prices of comparable properties that are outside that ring but inside the ZIP code. Thus, we can track how prices in the ring of a project change relative to prices in the larger ZIP code by examining how these coefficients change over time. We can see relative price levels both before and after completion of the homeownership project and observe whether there was any discontinuous shift after completion.

The second model (again estimated separately using 500-, 1,000-, and 2,000-foot rings) can be written as follows:

$$\text{LnP} = \alpha + \beta \boldsymbol{X} + \delta \boldsymbol{ZIPcode\text{–}Quarter} + \gamma \text{Ring} + \lambda \text{Postring} + \theta \text{Tpost} + \varepsilon, \quad (3)$$

Here, Ring indicates whether a sale is within the ring of a homeownership site, whether completed or not. Postring represents a set of dummy variables indicating whether the sale is within the specified distance of a completed homeownership project.[21] Again, α represents an intercept and β, δ, γ, λ, and θ are coefficients to be estimated; ε is an error term. The coefficients on these Postring variables are critical. They indicate the extent to which, after the completion of a homeownership development, sales prices rise in the vicinity, relative to the average increase in the larger ZIP code.

Finally, Tpost is a postcompletion trend variable, a continuous variable that indicates the number of years between the date of sale in the ring and the end of the completion year. Specifically, in our 500-foot ring model, Tpost equals 1/365 if a sale is located within 500 feet of a homeownership project and takes place on January 1 of the year following project completion; it equals one if the sale takes place on December 31 of the year following project completion; it equals two if the sale takes place on December 31 of the subsequent year, and so on. The Tpost coefficient will be positive if after completion, prices in the rings rise relative to prices in the ZIP code.

As noted, one drawback with this specification is that the gap between home prices in the rings and the surrounding ZIP codes might have been shrinking (or expanding) even before the advent of these projects, in which case the method above might overstate (or understate) the

[19] Year –10 indicates that a property is sold 10 or more years before completion, and year 10 indicates that a property is sold 10 or more years after completion.

[20] Specifically, these include 21 analogous dummy variables that correspond to properties within 1,000 feet and 2,000 feet of a homeownership site, respectively.

[21] Again, in cases in which a sale was within the ring of more than one Nehemiah or Partnership project, we use the completion date of the first unit to be completed.

magnitude of the effect. Thus, we adapt the methodology of Galster, Tatian, and Smith (1999) and estimate the following model for each of our three ring specifications: [22]

$$\text{LnP} = \alpha + \beta \boldsymbol{X} + \delta \boldsymbol{ZIPcode\text{–}Quarter} + \gamma \text{Ring} + \lambda \text{Postring} + \theta \text{Tpost} + \varphi \text{Spline} + \varepsilon, \quad (4)$$

This equation differs from equation 3 only in that here we add a ring-specific time trend—Spline—that measures the overall price trend in the ring (not simply the trend *after* completion). The Spline variable is defined in much the same way as Tpost is, with two key differences. First, unlike Tpost, Spline is also defined for properties sold before project completion. For example, if a property is sold exactly one year before the beginning of the calendar year of completion, the spline trend takes the value of –1. Second, we divide the ring-specific time trends into three linear segments (splines), with a knot-point at 10 years before completion and another knot-point at 5 years before completion. That is, the third segment starts at 5 years before development and extends through the entire after-period.

Including Tpost in the equation, which takes on non-zero values for sales after completion, means that the coefficient on this third segment of the Spline variable reflects the average growth in prices for the five years before completion. Thus, the coefficient on Tpost can be interpreted as the difference between the relative price appreciation that occurred in the ring after completion and the rate of relative appreciation that would have occurred if prices in the ring had continued to appreciate at the same rate relative to the ZIP code *after* completion as they did during the five years before completion.

Finally, we also explore the issue of heterogeneity in effects. Essentially, thus far we have assumed that the effects of all homeownership developments are identical, although it seems likely that effects will vary with the scale of a development, its type, and so on. We explore whether the effects differ depending on the number of homeownership units constructed, the sponsor (Nehemiah versus Partnership—which implies differences in characteristics), and the “tightness” of the housing market.

Summary of Data

We have obtained detailed data from a number of unique city data 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 for the period 1980 to 1999.[23] Limiting the analysis to

[22] The key difference between our methodology and the methodologies of Galster, Tatian, and Smith (1999) and Santiago, Galster, and Tatian (2001) is that we include ZIP code–quarter fixed effects, which allow for ZIP code–specific trends in prices. They used tract fixed effects instead, which use a finer level of geography but assume that neighborhood fixed effects are constant over time—an assumption that seems unrealistic over a time period as long as ours. As mentioned above, the high density of New York City makes using census tract–quarter fixed effects impractical. Another difference is that we measure time relative to the time of completion. Galster, Tatian, and Smith (1999) and Santiago, Galster, and Tatian (2001) used an absolute time trend in the ring. Finally, we use a spline for the time trend, so that we extrapolate what was happening to the gap between the rings and their surrounding ZIP codes during the five years before completion, not during the entire precompletion period. Given that only a small minority of sales in their data sets take place more than five years before occupancy, this last difference is fairly inconsequential.

[23] Because sales of cooperative apartments are not considered to be sales of real property, they are not recorded and are thus not included in this analysis. This is unlikely to have a major effect on our results because cooperative

properties located in the 34 community districts where Nehemiah or Partnership New Homes projects were developed, we obtained a sample that includes 234,591 sales spread across 137 ZIP codes.[24] Because of the long time span the data cover and New York City's size, this sample size is large compared with those of existing studies.

Second, we have supplemented these transactions data with building characteristics from an administrative data set gathered for the purpose of assessing property taxes—the Real Property Assessment Division (RPAD) data file. The RPAD data contain information about buildings but not much information about the characteristics of individual units in apartment buildings (except in the case of condominiums).[25] Nonetheless, these building characteristics explain variations in prices surprisingly well. Using all transactions in 1998; a regression of the log price per unit on building age and its square; log square-feet per unit; number of buildings on a lot; and dummies for the presence of a garage, abandonment, major alterations, commercial units, and location on a block corner yields an R^2 of 0.46. Adding a set of 18 building classifications to the regression (for example, "single-family detached," "single-family attached," "two-family home"), increases the R^2 to 0.68. Adding ZIP code dummy variables increases the R^2 to 0.81.

Third, HPD has provided us with data on the precise location (down to the block level) of all housing built through the Nehemiah and Partnership programs. Figure 1 shows the location of these projects in the City. As shown, most of the projects have been built in Brooklyn and the Bronx. We used geographic information systems techniques to measure the distance from each sale in our database to each Nehemiah and Partnership site and to create rings of a given distance around each project.[26] To give a sense of these rings, figure 2 shows an example of a Partnership development located on the Brooklyn/Queens border, and the development's surrounding rings. The innermost ring extends 500 feet (usually one to two blocks) from the project, the second ring extends 1,000 feet (one to four blocks), and the outermost ring extends 2,000 feet (three to eight blocks).

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apartments tend to be rare in the 34 community districts that have Nehemiah or Partnership New Homes developments. We should also note that most of the apartment buildings in our sample are rent stabilized. Given that, typically, legally allowable rents are above market rents outside affluent neighborhoods in Manhattan and Brooklyn, we do not think that their inclusion biases our results (see Pollakowski 1997).

[24] This area includes 3 community districts in Manhattan, 9 in the Bronx, 12 in Brooklyn, 9 in Queens, and 1 in Staten Island.

[25] Note that most of the RPAD data used in this study were collected in 1999. It is conceivable that some of the building characteristics may have changed between the time of sale and 1999; however, most of the characteristics that we use in the hedonic regressions are fairly immutable (e.g., corner location, square feet, presence of a garage). Furthermore, to examine whether the building characteristics tend to remain constant over time, we merged RPAD data from 1990 and 1999 and found that for 8 of the 10 variables examined, the characteristic remained unchanged in 97 percent or more of the cases. "Year built" and "number of units" remained unchanged in only 87 and 93 percent of the cases, respectively. We suspect that the majority of these changes are corrections, rather than true changes, because these characteristics change very rarely. Thus, the 1999 RPAD file may actually be a better estimate of 1990 characteristics than is the 1990 file. The abandonment variable was collected in 1980.

[26] Because all buildings in New York City have been geocoded by the New York City Department of City Planning, we used a "crosswalk" (the "geosupport file") that associates each tax lot with an *x, y* coordinate (that is, latitude, longitude using the U.S. State Plane 1927 projection), community district, and census tract. Usually, a tax lot is a building and is an identifier available to the homes sales and RPAD data. We were able to assign *x, y* coordinates and other geographic variables to more than 98 percent of the sales using this method. For the Nehemiah and Partnership data, only the tax block on which the property is located (which corresponds to a physical block) is available. After collapsing the geosupport file to the tax block level (i.e., calculating the center of each block), we were able to assign an *x, y* coordinate to 99.7 percent of these projects.

Figure 1. **Location of Partnership New Homes and Nehemiah Developments**

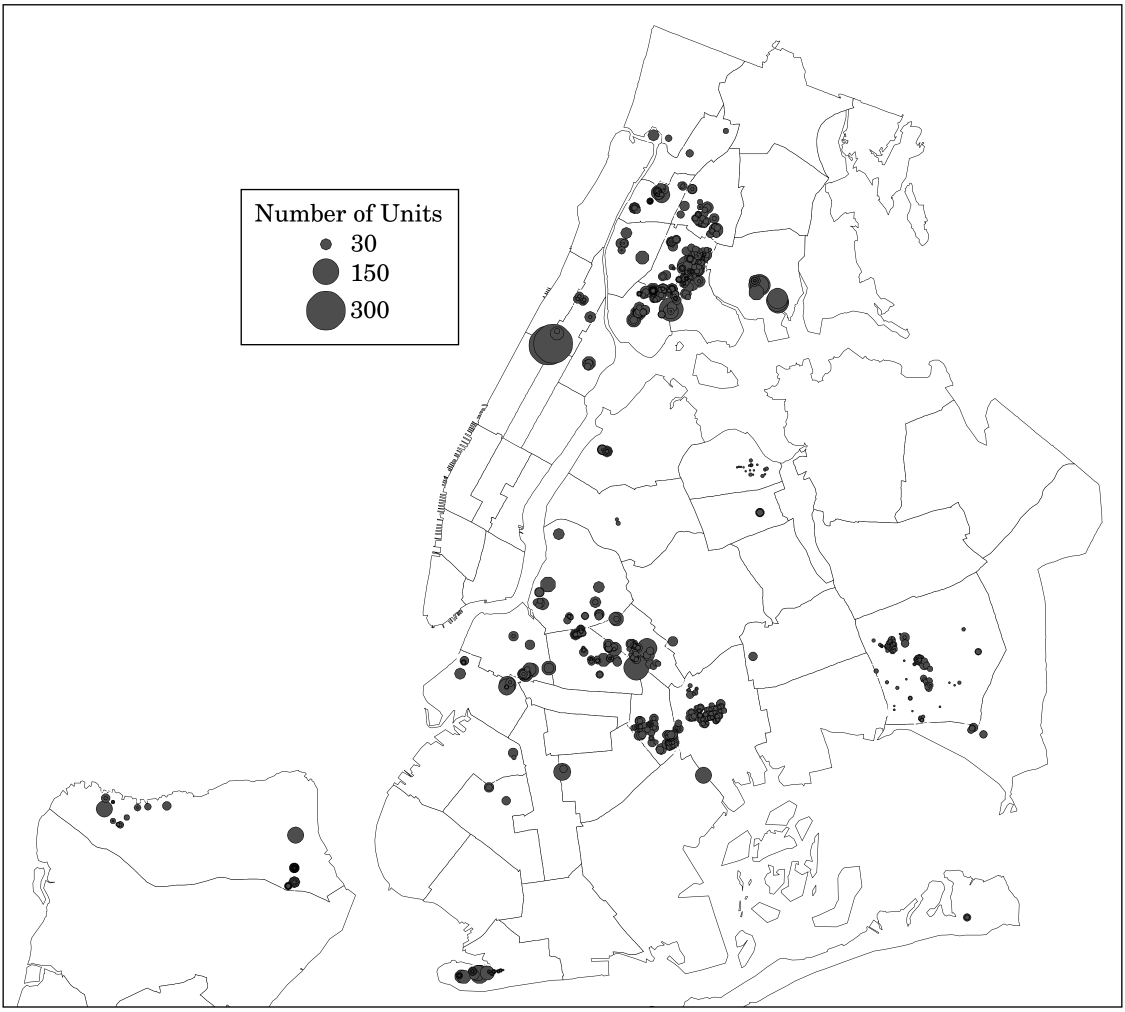
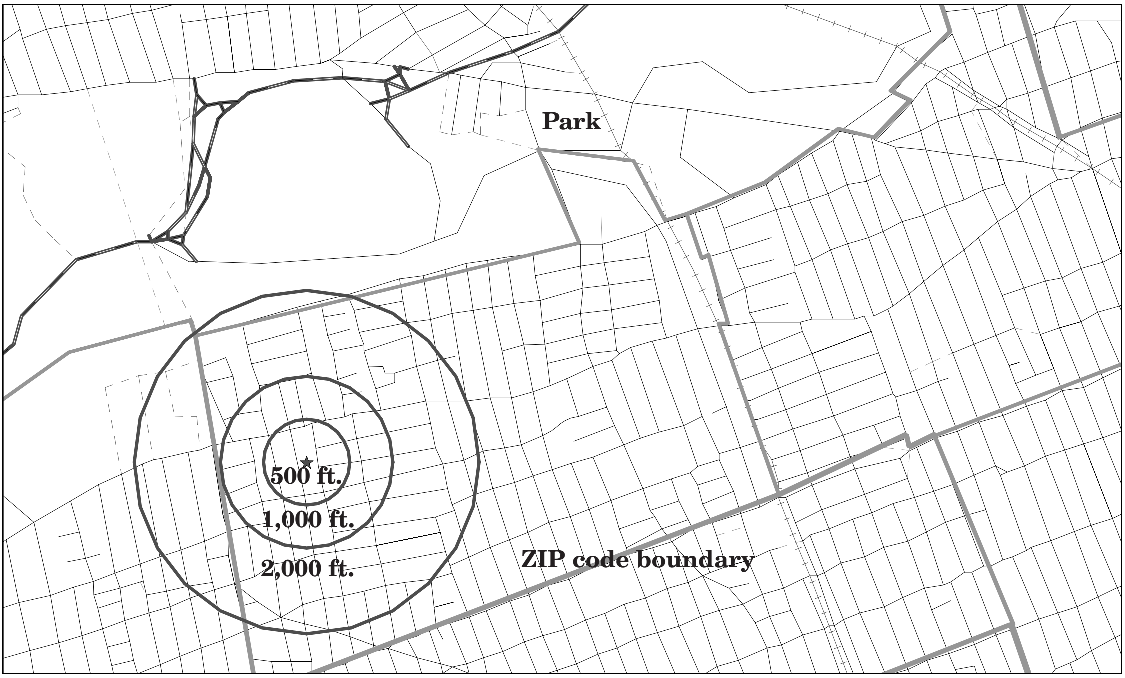


Table 1 shows summary statistics from the RPAD data. The first column shows the characteristics of our full sample; the second column shows the characteristics of sales located within 500 feet of a Nehemiah or Partnership site, whether completed or not. As shown, nearly three-quarters of all buildings sold were either one- or two-family homes, and 92 percent were one-family homes, two-family homes, or small apartments.[27] Most sales were located in Brooklyn and Queens, reflecting both the location of Nehemiah and Partnership developments and the large share of smaller properties in these boroughs, which sell more frequently than the apartment buildings more common in Manhattan and the Bronx. More than one-third of the transacting properties had garages, 80 percent were built before World War II, and only a handful were vandalized or abandoned but not vandalized. Finally, 4.8 percent of the properties in our sample are located within 500 feet of a Partnership or Nehemiah site, 11.4 percent are located within 1,000 feet, and 25.4 percent within 2,000 feet of a homeownership site.

[27] Note that we estimated our specifications using only one- to four-family dwellings, and the results were, in general, similar to those based on all dwellings.

Figure 2. **Partnership Development on Brooklyn/Queens Border**



The data reveal some systematic differences between properties that are located close to Nehemiah or Partnership sites and those that are not. Because of the location of these developments, properties that fall in the 500-foot ring are much more likely to be in Brooklyn, Manhattan, or the Bronx. They are also much older, less likely to be single-family homes, more likely to be walk-ups, and much less likely to have garages than properties that are not close to the developments.

Table 2, which deals with the Nehemiah and Partnership units themselves, indicates that 12,468 of the 15,528 units built (80 percent) are in Brooklyn or the Bronx and more than 13,000 (85 percent) were completed during the 1990s. As for building type, 90 percent of the Nehemiah units are single-family homes, compared with just 12 percent of the Partnership units, which are more likely to be two- and three-family homes.

Table 3 compares the average 1990 characteristics of census tracts that include Nehemiah and Partnership units in 1998 to all tracts in the City.[28] Notice that 2,938 Nehemiah units were built across 25 census tracts, averaging 118 units per tract; Partnership units were more dispersed—12,590 units were built across 179 tracts, averaging 70 per tract.

This table confirms that these projects were located in distressed neighborhoods and suggests that neighborhoods in which Nehemiah units have been located are somewhat more disadvantaged. For example, the average poverty rate in a tract with Nehemiah or Partnership units was 40.1 and 32.5 percent, respectively, compared with just 18.4 percent for tracts city-

[28] The census tract data are taken from the 1990 census. Tracts are characterized as including Nehemiah or Partnership projects even if these projects were not built until later in the decade.

Table 1. **Characteristics of Properties Sold**

	Percent of All Property Sales	Percent of Sales within 500 Feet of Nehemiah or Partnership Site
Borough		
Manhattan	1.5	3.3
Bronx	7.1	19.7
Brooklyn	37.2	44.1
Queens	46.4	29.1
Staten Island	7.8	3.7
Building class		
Single-family detached	25.1	14.1
Single-family attached	13.2	6.6
Two-family	34.5	35.3
Walk-up apartment	19.4	29.7
Elevator apartment	0.8	0.7
Loft building	0.0	0.0
Condominium	3.6	8.3
Mixed-use, multifamily (includes store or office plus residential units)	3.5	5.2
Built pre–World War II	79.8	91.3
Vandalized	0.0	0.2
Abandoned but not vandalized	0.2	0.5
Garage	36.1	15.8
Corner location	7.7	7.5
Major alteration before sale	1.9	3.1
In 500-foot ring	4.8	100
In 1,000-foot ring	11.4	100
In 2,000-foot ring	25.4	100
N	234,591	11,236

Note: The universe is all sales in community districts with at least one Nehemiah or Partnership unit.

wide. Similarly, although just 12.5 percent of census tracts in New York had poverty rates of 40 percent or more, 37 percent of those with Partnership units and 48 percent of those with Nehemiah units had poverty rates that high.

Other socioeconomic variables tell the same story. Mean family income was $24,579 in Nehemiah tracts, compared with $29,342 for Partnership tracts and $46,665 in all tracts citywide. The unemployment rate was almost twice as high in census tracts with Nehemiah units than it was in the average city census tract. As for racial and ethnic composition, the Nehemiah and Partnership tracts housed a greater share of Hispanic residents and a much larger share of black residents than the average tract. Finally, the Partnership and Nehemiah neighborhoods have relatively low rates of homeownership. Fewer than one-fourth of households on average own their homes in these communities, compared with an average of 35 percent in census tracts citywide.

Note that our data do not identify whether a particular property received City subsidies. To ensure that we analyzed only the sales prices of buildings neighboring Partnership and Ne-

Table 2. **Characteristics of Units Built through Nehemiah and Partnership New Homes Programs**

	Nehemiah	Partnership New Homes	Total
Borough			
Bronx	544	5,426	5,970
Manhattan	0	948	948
Brooklyn	2,394	4,104	6,498
Queens	0	1,226	1,226
Staten Island	0	886	886
Building type			
Single-family	2,632	1,572	4,204
Two-family	18	7,020	7,038
Three-family	0	1,659	1,659
Condominium	288	2,112	2,300
Cooperative	0	227	227
Year completed			
1984	194	0	194
1985	170	18	188
1986	235	232	467
1987	284	263	547
1988	240	260	500
1989	317	226	543
1990	460	1,918	2,378
1991	218	867	1,134
1992	140	1,555	1,695
1993	108	1,104	1,252
1994	120	1,567	1,687
1995	138	1,183	1,321
1996	30	1,018	1,048
1997	44	1,119	1,163
1998	126	664	790
1999	114	596	710
Total	2,938	12,590	15,528

hemiah developments, and not the sales prices of buildings in the developments themselves, we excluded any sales that could potentially be part of a development. Thus, we excluded 2,248 sales (representing less than 1 percent of the sample) that took place on the same block as a Nehemiah or Partnership development if the building sold was constructed after the Nehemiah or Partnership building had been completed.[29]

Results

Before we present regression results, it is useful to show how average prices of properties close to homeownership sites compare with average prices in our sample. Table 4 shows that in 1980, per-unit sales prices for buildings located within 500 feet of a soon-to-be-constructed

[29] To provide a margin of error with respect to the recordation of construction dates in RPAD, we also excluded sales of buildings on the same block as a Partnership and Nehemiah development if they were built up to five years before the Partnership or Nehemiah building. These exclusions are included in the total 2,248 figure.

Table 3. **1990 Characteristics of Partnership and Nehemiah Census Tracts**

	Tracts with Nehemiah Units	Tracts with Partnership Units	All Tracts in New York City
Mean poverty rate	40.1%	32.5%	18.4%
Percent of tracts with poverty rate >= 40%	48.0%	37.4%	12.5%
Mean percentage of households on public assistance	33.0%	27.3%	13.8%
Mean family income	$24,579	$29,342	$46,665
Mean unemployment rate	18.5%	14.8%	9.7%
Mean percentage of adult residents with some college education	23.4%	27.0%	39.7%
Mean percentage black	72.0%	51.5%	28.9%
Mean percentage Hispanic	32.3%	39.3%	21.9%
Mean homeownership rate	20.1%	24.2%	34.8%
N	25	179	2,131

Nehemiah or Partnership site were on average 43 percent lower than the prices of all buildings located in the 34 community districts; prices in the 1,000-foot ring were 34.9 percent lower, and prices in the 2,000-foot ring were 27.6 percent lower.

Clearly, these projects were located in neighborhoods with depressed housing prices.[30] Yet, the table also shows that over time, the differential has fallen. By 1999, prices of properties sold within 500 feet of a Nehemiah or Partnership site were on average only 23.8 percent lower than the mean price in our overall sample.

The real question, of course, is whether the construction of Partnership and Nehemiah projects in these rings contributes to that relative price rise in the rings. To isolate the influence of proximity to a completed homeownership project, we estimate the regressions discussed above, in which the dependent variable is the log of the sales price per unit, and which control for building and local neighborhood characteristics and include a full complement of ZIP code and quarter interaction effects (ZIP code–quarter fixed effects).

Table 5 reports the estimated regression coefficients for ring variables and their standard errors. Other variables in the regressions include age and its square; log of square footage; number of buildings on the same lot; dummy variables indicating whether the property was on the corner, had been vandalized, was of an odd shape, or included a garage; and 18 building classification variables such as two-family home or single-family detached. Overall, the model performs well—structural variables have the expected signs and the regressions explain more than 83 percent of the variation in log prices.[31] (See table A.1 in the appendix for the full set of parameter estimates.)

[30] Given the evidence shown in table 3 that the census tracts surrounding Nehemiah and Partnership sites are notably less affluent than those in the city at large, it is no doubt true that prices in the rings surrounding these sites are even lower in comparison with average prices in all community districts.

[31] Briefly, results indicate that sales price is higher if a building is larger or newer, located on a corner, or includes a garage. Sales price is lower if the building is vandalized or abandoned but not vandalized. The building class dum-

Table 4. **Percentage Difference between Average Housing Prices in Rings and Average Annual Price, by Year**

Year	Average per Unit Price in 34 Community Districts ($)	Prices in 500-Foot Ring Relative to Sample Mean (%)	Prices in 1,000-Foot Ring Relative to Sample Mean (%)	Prices in 2,000-Foot Ring Relative to Sample Mean (%)
1980	54,571	–43.4	–34.9	–27.6
1981	53,547	–43.1	–37.1	–29.1
1982	55,783	–35.9	–34.0	–30.3
1983	63,354	–45.8	–42.0	–33.5
1984	70,231	–50.0	–43.4	–34.9
1985	82,308	–50.5	–46.9	–39.3
1986	105,596	–53.8	–48.5	–39.9
1987	127,636	–52.0	–46.5	–39.0
1988	136,673	–48.7	–42.1	–34.8
1989	138,454	–42.6	–36.9	–29.7
1990	134,520	–42.2	–35.4	–29.8
1991	128,339	–40.5	–37.4	–30.7
1992	119,691	–36.6	–33.4	–28.9
1993	115,792	–35.0	–32.5	–27.5
1994	115,769	–28.3	–29.2	–24.3
1995	112,795	–26.0	–24.3	–21.9
1996	107,245	–32.8	–28.6	–23.1
1997	107,807	–30.3	–25.7	–21.4
1998	111,482	–26.7	–23.9	–21.5
1999	116,413	–23.8	–18.0	–17.1

Note: This table is based on the coefficients of simple bivariate regressions that regress logarithm of price on year in the given geographic area and are not adjusted for other covariates. Prices reported in 1999 dollars.

Turning to the ring dummies, recall that the coefficients can be interpreted as the percentage difference between the price of properties within the rings and comparable properties located outside the rings but in the same ZIP code. First, note that all coefficients are negative and most are statistically significant. Consistent with the uncontrolled results in table 4, parameter estimates indicate that prices of properties located in the rings tend to be lower than prices of comparable properties located in the ZIP code, both before and after project completion. Note that the estimated price differential between properties inside and outside the ring are considerably smaller than the uncontrolled price differentials shown in table 4. Once we control for quality, the price differentials diminish, suggesting that properties in the rings are of lower average quality than those outside. Second, in general, coefficients become smaller over time. Thus, prices in the rings rise over time relative to prices in their surrounding ZIP code,

mies are also consistent with expectations. Sales prices per unit for most of the building types are lower than those for single-family attached homes (the omitted category). Somewhat surprisingly, the coefficient on the dummy variable indicating that the building has undergone a major alteration before sale is negative, which may reflect the generally worse shape of buildings that have undergone such major alterations, in ways that are not captured by our data. Statistically significant coefficients on dummy variables indicating missing values for the age or size of a building indicate that the buildings missing age data are less valuable than others (perhaps because they are older), and buildings missing square-footage data are more valuable (perhaps because they are larger). However, condominiums missing square-footage data (representing 90 percent of the sales missing square-footage data) appear to be somewhat smaller. In total, just over 1 percent of property sales were missing square-footage data, and 3 percent were missing age data.

Table 5. **Selected Regression Coefficients, Full Set of Pre- and Postring Dummies (Dependent Variable = Log of Price per Unit)**

	500-Foot Ring	1,000-Foot Ring	2,000-Foot Ring
>=10yr_Pre_Ring[a]	–0.1690***	–0.1260***	–0.0857***
	(0.0077)	(0.0053)	(0.0044)
9yr_Pre_Ring	–0.2136***	–0.1531***	–0.1165***
	(0.0145)	(0.0100)	(0.0077)
8yr_Pre_Ring	–0.1692***	–0.1316***	–0.1048***
	(0.0142)	(0.0099)	(0.0076)
7yr_Pre_Ring	–0.1411***	–0.1317***	–0.1013***
	(0.0144)	(0.0095)	(0.0071)
6yr_Pre_Ring	–0.1057***	–0.1194***	–0.0885***
	(0.0136)	(0.0091)	(0.0066)
5yr_Pre_Ring	–0.1048***	–0.1021***	–0.0796***
	(0.0137)	(0.0091)	(0.0065)
4yr_Pre_Ring	–0.1360***	–0.1031***	–0.0729***
	(0.0139)	(0.0093)	(0.0067)
3yr_Pre_Ring	–0.0854***	–0.0973***	–0.0822***
	(0.0140)	(0.0093)	(0.0068)
2yr_Pre_Ring	–0.0968***	–0.1002***	–0.0879***
	(0.0142)	(0.0096)	(0.0069)
1yr_Pre_Ring	–0.0882***	–0.0915***	–0.0846***
	(0.0135)	(0.0090)	(0.0068)
Completion_yr_Ring[b]	–0.0853***	–0.0789***	–0.0807***
	(0.0127)	(0.0089)	(0.0070)
1yr_Post_Ring[c]	–0.0160	–0.0709***	–0.0614***
	(0.0140)	(0.0094)	(0.0071)
2yr_Post_Ring	–0.0476***	–0.0412***	–0.0586***
	(0.0159)	(0.0103)	(0.0076)
3yr_Post_Ring	–0.0372**	–0.0302***	–0.0225***
	(0.0149)	(0.0105)	(0.0077)
4yr_Post_Ring	–0.0055	–0.0428***	–0.0503***
	(0.0155)	(0.0104)	(0.0078)
5yr_Post_Ring	–0.0070	–0.0434***	–0.0272***
	(0.0160)	(0.0111)	(0.0081)
6yr_Post_Ring	–0.0673***	–0.0691***	–0.0462***
	(0.0187)	(0.0116)	(0.0082)
7yr_Post_Ring	–0.0526***	–0.0723***	–0.0449***
	(0.0195)	(0.0126)	(0.0086)
8yr_Post_Ring	–0.0318	–0.0708***	–0.0572***
	(0.0226)	(0.0145)	(0.0097)
9yr_Post_Ring	–0.0346	–0.0868***	–0.0491***
	(0.0279)	(0.0172)	(0.0114)
<=10yr_Post_Ring	–0.0909***	–0.0629***	–0.0349***
	(0.0213)	(0.0123)	(0.0082)
Adjusted R^2	0.8380	0.8383	0.8381
N	234,591	234,591	234,591

Note: Standard errors are in parentheses. All regressions include ZIP code–quarter dummies and the full set of building controls, as in the appendix. See appendix for full results.

[a] Within the specified distance of a homeownership site, the specified number of years before completion of the project.

[b] Within the specified distance of a homeownership site, during the year of completion.

[c] Within the specified distance of a homeownership site, the specified number of years after completion of the project.

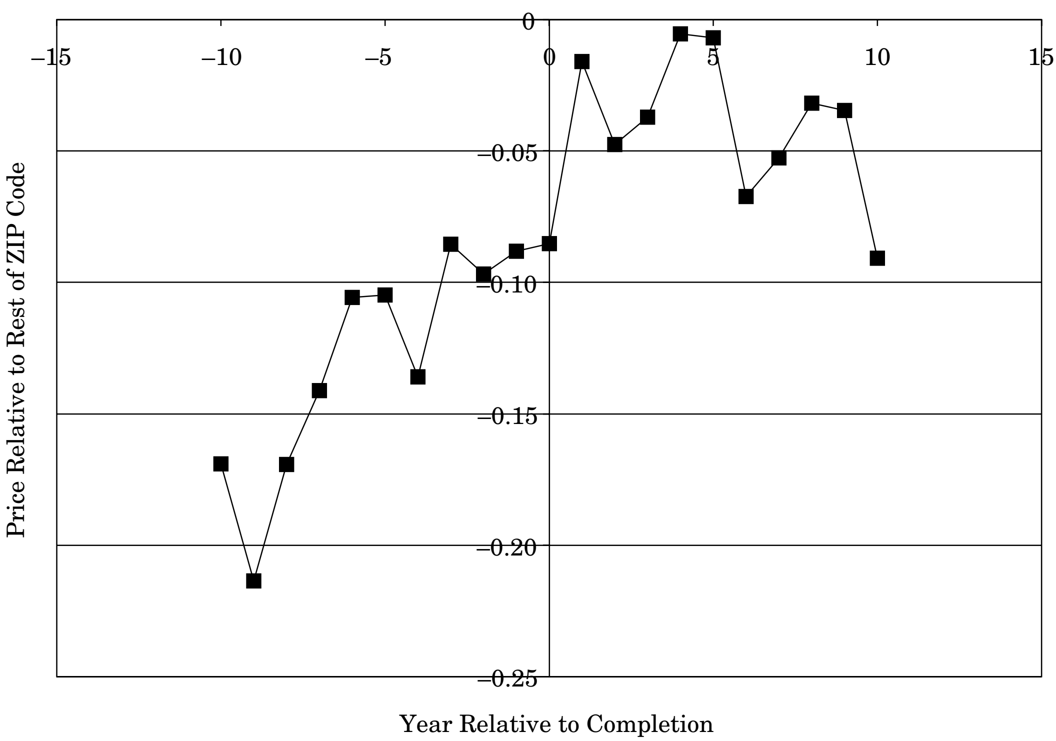
* $p < 0.1$. ** $p < 0.05$. *** $p < 0.01$.

both before and after completion. Third, results indicate a significant reduction in the gap at about the time of completion. Finally, although the gap between prices in the 500-foot ring and the ZIP code decreases immediately after completion, it appears to take longer for the effects to be felt in the more distant rings. More specifically, the major decline in the 1,000-foot ring occurs between one and two years after project completion. In the 2,000-foot ring the decline continues through year three. One plausible explanation is that the homeownership projects have a more immediate effect on their close surroundings, but over time they bring benefits to more distant areas as well. (This explanation is also consistent with the apparent dissipation of the effect in the 500-foot ring, discussed below, and the greater persistence of effects in the 2,000-foot ring.)

Figure 3 graphs the percentage differentials for the 500-foot ring by the year relative to project completion and indicates a decline in the gap over time. One year before the completion of a homeownership project (–1 on the graph) the per-unit sales price of a property within 500 feet of a future site is on average 8.8 percent lower than the price of a comparable property sold in the same year in the same ZIP code. After completion the gap immediately shrinks by 7.2 percentage points to just 1.6 percent lower than the price of a comparable property in the ZIP code, widening somewhat several years later.

Table 6 shows the impact estimates from our second specification (equation 3).[32] For the 500-foot ring, the coefficient on the ring dummy variable indicates that before completion of the

Figure 3. **Percent Difference between Prices in 500-Foot Ring and Surrounding ZIP Codes, by Time to Completion**



[32] Full results are available from the authors on request.

Table 6. **Selected Coefficients from Regression Results, Posttrend (Dependent Variable = Log of Price per Unit)**

	500-Foot Ring	1,000-Foot Ring	2,000-Foot Ring
Ring[a]	–0.1326***	–0.1133***	–0.0876***
	(0.0041)	(0.0029)	(0.0025)
Postring[b]	0.1141***	0.0626***	0.0350***
	(0.0105)	(0.0071)	(0.0054)
Tpost[c]	–0.0046**	–0.0019	0.0014
	(0.0019)	(0.0012)	(0.0009)
Adjusted R^2	0.8379	0.8383	0.8381
N	234,591	234,591	234,591

Note: Standard errors are in parentheses. All regressions include ZIP code–quarter dummies and the full set of building controls, as in the appendix. See appendix for full results.
[a] Within the specified distance of a homeownership site, whether the development is completed or not.
[b] Within the specified distance of a completed homeownership project.
[c] Years since completion of a homeownership project, for sales within the specified distance of a completed project.
* $p < 0.1$. ** $p < 0.05$. *** $p < 0.01$.

development, properties in the ring sold, on average, for 13.3 percent less than comparable properties in the same ZIP code but outside the ring. The coefficient on Postring indicates that immediately after completion this gap shrinks by 11.4 percentage points to just 1.9 percent. In the 1,000-foot ring our results suggest that before completion, prices of properties within 1,000 feet of an eventual site are 11.3 percentage points lower than prices for comparable properties in the same ZIP code but outside the ring. Immediately after completion this gap shrinks by 6.3 percentage points. Finally, in the 2,000-foot ring, the differential between prices in the ring and prices in the ZIP codes shrinks by 3.5 percentage points after completion.

The coefficient estimates on Tpost suggest that the effect on properties within 500 and 1,000 feet of the project declines over time. For the 500-foot ring, the initial impact estimate of 11.4 percentage points declines by 0.5 percentage points per year. In the 1,000-foot ring the estimated gap widens somewhat over time, but at a slower rate of 0.2 percentage points per year. The estimated gap in the 2,000-foot ring, by contrast, continues to shrink in the years following completion by 0.14 percentage points per year.

The reasons for this decline in the inner rings are not immediately apparent. One possibility is that homes in the development may be less well maintained than other properties in the neighborhood and thus the positive externality generated by the development declines over time. Or, it could be that the projects simply did not meet initial expectations (Poterba 1984). A more optimistic explanation is that the positive externalities created by the project spread outward over time, thereby reducing the disparity between prices within 500 feet (1,000 feet) and those outside the 500-foot (1,000-foot) radius. The observation that price effects appear more persistent in the 2,000-foot ring, possibly growing over time as indicated by the positive coefficient on Tpost, lends some support to this hypothesis. Finally, it might be that the larger neighborhoods (ZIP codes) in which projects were located were also improving at about the same time as a result of HPD-sponsored rental housing development and/or other community development efforts. If so, the price differential between the rings and their surrounding ZIP codes might even begin to expand.

As noted above and as shown in figure 3, the average price differential between the rings and their ZIP codes was already declining before project completion. Even without the homeownership projects, the differential might have continued to decline. Our third specification provides an estimate of impact above and beyond what would have been predicted by previous trends in prices in the ring–ZIP code price gap (see equation 4). As noted, essentially these impact estimates reflect the assumption that prices in the rings would have continued to rise at the same rate relative to the ZIP code as they had been in the previous five years.

As shown in table 7, results suggest that immediately after completion the gap between prices in the 500-foot rings and their surrounding ZIP codes falls by an average of 6.4 percentage points. A similar pattern obtains in the 1,000-foot and 2,000-foot rings, though changes are predictably smaller. After completion the gap between prices in the 1,000-foot ring and prices in the larger ZIP code is shown to shrink by 3.3 percentage points, and the gap between the 2,000-foot ring and the ZIP code falls by 2.9 percentage points.[33]

Table 7. **Selected Coefficients from Regression Results with Ring-Specific Time Trend (Dependent Variable = Log of Price per Unit)**

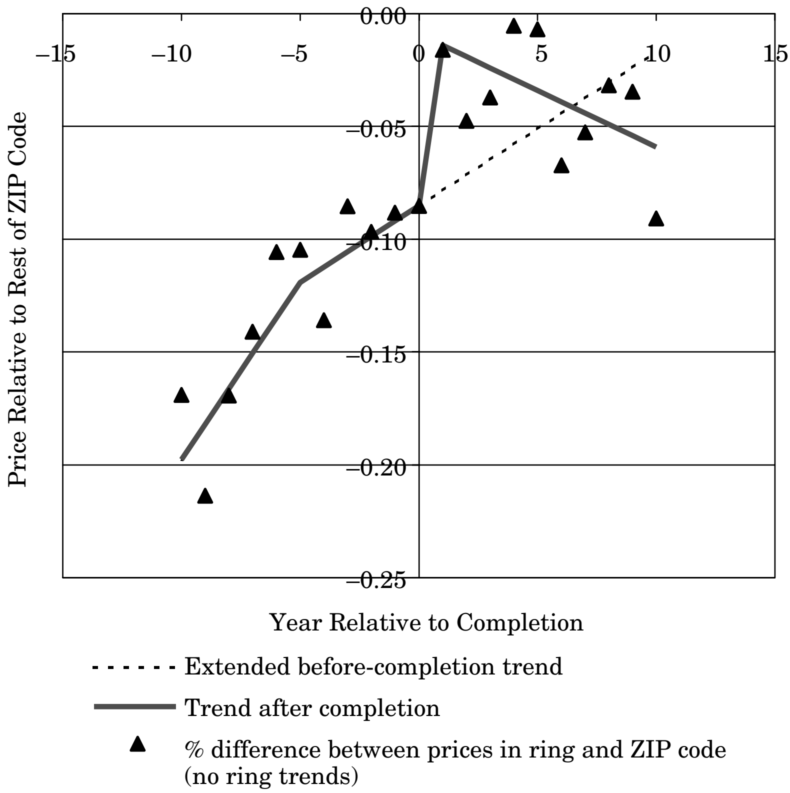
	500-Foot Ring	1,000-Foot Ring	2,000-Foot Ring
Ring[a]	–0.0851***	–0.0860***	–0.0816***
	(0.0082)	(0.0057)	(0.0045)
Postring[b]	0.0642***	0.0331***	0.0288***
	(0.0138)	(0.0093)	(0.0069)
Tpost[c]	–0.0118***	–0.0077***	0.0001
	(0.0032)	(0.0021)	(0.0016)
Adjusted R^2	0.8380	0.8383	0.8381
N	234,591	234,591	234,591

Note: All regressions include ring-specific time trends, modeled as a three-segment linear spline. Standard errors are in parentheses. All regressions include ZIP code–quarter dummies and the full set of building controls, as in the appendix.
[a] Within the specified distance of a homeownership site, whether the development is completed or not.
[b] Within the specified distance of a completed homeownership project.
[c] Years since completion of a homeownership project, for sales within the specified distance of a completed project.
* $p < 0.1$. ** $p < 0.05$. *** $p < 0.01$.

Figures 4 and 5 illustrate these results in the 500-foot and 2,000-foot rings, respectively. The dashed line labeled "extended before-completion trend" indicates the change in prices in the ring that would have occurred if predevelopment trends had continued. The continuous line plots the average change in prices after homeownership units were completed on the basis of estimated coefficients from the Postring and Tpost variables. The scattered triangle points show the annual ring coefficients from the specification in table 5, which can be interpreted as the average quality-controlled difference between prices in the ring and prices in the ZIP code in each year. Once again, the effect on properties close to the homeownership units appears to decline over time, but in this specification the decline is more rapid. This finding is unsurprising because here the effect is estimated relative to the quite rapid rate of growth that occurred during the five years before project completion. In the 500-foot ring, for example, the gap between prices in the 500-foot ring and prices in the ZIP code falls by 6.4 per-

[33] Full results are available from the authors on request.

Figure 4. **Percent Difference between Prices in 500-Foot Ring and Surrounding ZIP Codes, by Time to Completion (Controlling for Precompletion Trends)**

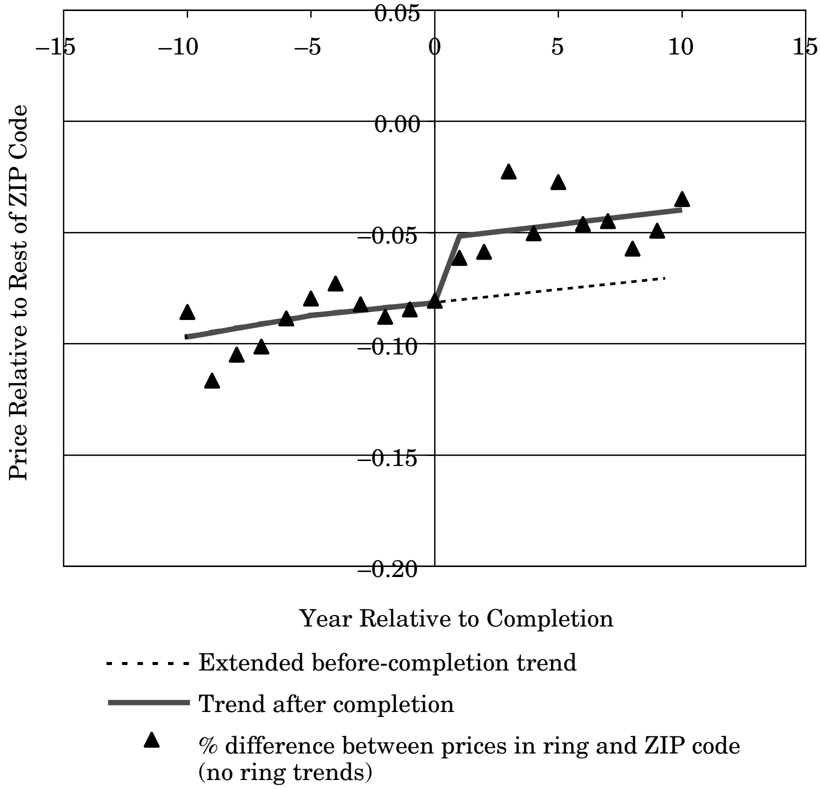


centage points immediately after completion, but the coefficient on Tpost indicates that this 6.4 percentage point differential declines by 1.2 percentage points per year. That is, immediately after completion, price levels in the 500-foot ring become much closer to price levels in the surrounding ZIP codes. Several years after completion, however, prices in the ring are *lower* relative to the ZIP code than they would have been in the absence of the development, had previous trends continued.

Note that this estimate of the effect is likely to be conservative. As noted, some of the run-up in prices in the ring relative to the ZIP code before completion may have been caused by the project itself. The figure makes clear that our impact estimates are sensitive to the length of the precompletion period that we use for extrapolation. Figure 4 shows that if, instead of extrapolating the rate of growth that occurred during the five years before completion, we extrapolated based on the three years before completion, we would find a much more sustained effect.

We see a similar although less dramatic story in the 1,000-foot ring, but a different pattern in the 2,000-foot ring. As shown in table 7, the coefficient on Tpost is not significantly different from zero in the 2,000-foot ring, indicating that after completion, prices in the ring rise at the same rate relative to their ZIP codes that they did before development. As shown in figure 5, the initial jump up in prices in the ring relative to the ZIP code is sustained over time. (The

Figure 5. **Percent Difference between Prices in 2,000-Foot Ring and Surrounding ZIP Codes, by Time to Completion (Controlling for Precompletion Trends)**



gap between the extended before-completion trend and the trend after completion is constant.) Again, this pattern may reflect a spread over time of spillover effects of the new housing units to larger areas.

Heterogeneity of Effects

In this section we explore potential differences across three sources of heterogeneity: project size (number of units), project type (Nehemiah vs. Partnership), and timing (i.e., housing market conditions). We do so by supplementing the model in equation 4 with variables capturing size, type, and housing market conditions.

Number of Units

The notion that effects depend on project size has broad intuitive appeal. It seems reasonable, for instance, to assume that the effect of 300 units will be greater than the effect of a single unit. In table 8 we examine the role of the scale, testing whether there are different effects for properties in the ring of 1 to 50 units, 51 to 100 units, 101 to 200 units, 201 to 400 units, and

Table 8. **Selected Coefficients from Regression Results with Ring-Specific Time Trend, Controlling for Project Size (Dependent Variable = Log of Price per Unit)**

	500-Foot Ring	1,000-Foot Ring	2,000-Foot Ring
Ring[a]	–0.0845***	–0.0870***	–0.0834***
	(0.0082)	(0.0057)	(0.0045)
Postring, 1–50 units[b]	0.0380**	0.0333***	0.0475***
	(0.0151)	(0.0104)	(0.0079)
Postring, 51–100 units	0.0953***	0.0115	0.0100
	(0.0234)	(0.0159)	(0.0114)
Postring, 101–200 units	0.1890***	0.0284	–0.0121
	(0.0319)	(0.0177)	(0.0121)
Postring, 201–400 units	—	0.1006***	–0.0618***
		(0.0311)	(0.0168)
Postring, 401+ units	—	—	0.0484*
			(0.0263)
Tpost, 1–50 units[c]	–0.0071**	–0.0041*	0.0007
	(0.0035)	(0.0023)	(0.0018)
Tpost, 51–100 units	–0.0231***	–0.0093***	0.0046**
	(0.0048)	(0.0032)	(0.0022)
Tpost, 101–200 units	–0.0218***	–0.0124***	0.0057**
	(0.0060)	(0.0035)	(0.0024)
Tpost, 201–400 units	—	–0.0170***	0.0045
		(0.0050)	(0.0029)
Tpost, 401+ units	—	—	–0.0078**
			(0.0037)
Adjusted R^2	0.8389	0.8392	0.8390
N	234,591	234,591	234,591

Note: All regressions include ring-specific time trends. Standard errors are in parentheses. All regressions include ZIP code–quarter dummies and the full set of building controls, as in the appendix.

[a] Within the specified distance of a homeownership site, whether the development is completed or not.

[b] Within the specified distance of a completed homeownership project of the specified size.

[c] Years since completion of a homeownership project, for sales within the specified distance of a completed project of the specified size.

* $p < 0.1$. ** $p < 0.05$. *** $p < 0.01$.

401+ units.[34] (In the 500-foot ring the latter three categories are collapsed into one; in the 1,000-foot ring the latter two categories are collapsed into one.)

In the 500-foot ring, larger scale indeed appears to imply significantly larger effects. The gap between the prices of properties in the ring and properties in the ZIP code falls by 3.8 percentage points after 50 or fewer homeownership units are completed, by 9.5 percentage points after 51 to 100 units are completed, and by nearly 19 percentage points after more than 100 units are completed.

[34] We experimented with several different ways to represent project size. We tested a linear model, and the coefficient on the number of units was consistently positive. A quadratic specification yielded less consistent results, but in all rings the coefficient on the quadratic term was positive and statistically significant in the 500- and 2,000-foot rings. Note that we do not distinguish between a sale that is within a certain distance of two 50-unit developments and another sale that is within the same distance of a single 100-unit development. Our specification controls just for the total number of units within a certain distance.

In the 1,000-foot and 2,000-foot rings, estimated effects inside the ring of the largest developments (more than 200 units in the 1,000-foot and more than 400 units in the 2,000-foot ring) are fairly large. At the same time, typically, the estimated effect on properties near smaller numbers of units is much smaller or, in two cases, actually negative. Interestingly, the estimated effect of proximity to 1 to 50 units is positive and statistically significant, whereas the effect of proximity to 51 to 200 units is negligible.

In summary, we find that overall, larger projects have a greater effect on property values.[35] This pattern would be predicted by any of the mechanisms that would generate positive externalities. For example, if city investments raise neighborhood property values because they remove dilapidated buildings and clean up vacant lots, larger projects should result in larger improvements. In contrast, this pattern would not be expected if the results were driven by sample selection bias—that is, the city's ability to "pick winners" by choosing sites likely to appreciate in value. If anything, this type of bias should be most important for the smallest projects because smaller tracts of land are much more readily available, giving HPD greater flexibility over site selection.

Project Type

As noted previously, the Nehemiah and the Partnership New Homes programs differ in potentially important ways. Typically, Nehemiah developments include large numbers of identical single-family row homes built on large, vacant tracts of city-owned land. Partnership developments include a greater variety of housing types and often they were built on much smaller parcels. In addition, Nehemiah units were considerably less costly to build and to buy; therefore, owner-occupants of these units have somewhat lower incomes. Thus, Partnership and Nehemiah developments may well have different effects on surrounding neighborhoods.

To explore such differences we supplemented the models in table 8 with variables capturing the proportion of Nehemiah units in each of the different size categories (1 to 50 units, 51 to 100 units, 101+ units) as well as a variable identifying whether the property sold was in the ring of a Nehemiah unit. Doing so allowed us to investigate the extent to which the proportion of Nehemiah units within a given distance of a property has an effect on the price of the property, after controlling for the total number of units.[36]

We found that before development, prices of properties within 500 feet of a future Partnership site were on average only 5.4 percent lower than prices of comparable properties in their ZIP codes. As expected, properties located within 500 feet of future Nehemiah units were considerably more distressed, with prices on average 29.5 percent (5.4 percent plus 24.1 percent) lower than prices of comparable properties in their ZIP codes.

We find somewhat mixed evidence about whether the effects differ with project sponsor or type. In the 500-foot ring, coefficients on the Postring-Share Nehemiah interaction terms are positive

[35] Santiago, Galster, and Tatian (2001) also found that having a larger number of projects within 1,001 to 2,000 feet of a sale magnifies the initial positive effect. However, they do not find similar scale effects for projects that are within 1,000 feet of a sale.

[36] Full results are available from the authors on request.

for the 1-to-50-unit and 101+–unit categories and, in the case of the 101+–unit category, statistically significant. In particular, results suggest that being located near more than 100 completed Partnership units increases the prices in the ring relative to the ZIP code by 15.8 percentage points; the effect of being near the same number of Nehemiah units is estimated to be a price increase of 23.6 percentage points.[37] In the 1,000-foot ring, by contrast, the type of unit has little effect on the magnitude of the effect. And in the 2,000-foot ring the effect of larger shares of Nehemiah units appears to be negative, at least in the case of large projects. In short, it appears that Nehemiah units may have somewhat larger effects on properties that are nearby, but the geographic reach of their effect appears to be more limited. We plan to explore those differences further in future work.

Timing

The 20-year period for which we examined housing prices covers two distinct periods in New York City's housing market. As shown in table 4, prices rose rapidly in our 34 community districts during the 1980s. Between 1982 and 1988, average housing prices rose by 145 percent, after controlling for inflation. That increase amounts to an average annual increase of roughly 16 percent in real terms. During the 1990s prices fell—albeit at a much slower rate—before rising again slowly at the very end of the decade.

It is possible that we might see different effects for these homeownership developments during these very different eras in the housing market. It may be, for example, that the private sector was willing to develop housing in our selected set of ZIP codes during boom times but was unwilling to do so when the housing market was less favorable. If so (and if the private sector was effectively never willing to develop housing inside the actual rings), we might find that Nehemiah and Partnership developments had a smaller effect during the 1980s when housing prices were rising so rapidly. It might also be that the housing market cycles are somewhat different in lower-priced areas—perhaps they lag slightly behind the more affluent areas. Finally, the small positive effects of these homeownership developments may simply be difficult to pick up in years in which housing prices are rapidly rising.

To test for differences in differing housing markets, we separately examined the effect on sales that took place during the 1980s and on sales that took place during the 1990s. In the interest of brevity we do not show the results here, but we found few significant differences in effects. Naturally, prices in the rings relative to the ZIP codes before completion were lower for properties selling in the 1980s. (Again, as shown in table 4, prices in the rings were lower relative to their ZIP codes during the 1980s.) But we see no significant differences in the immediate effect of the homeownership units. The one difference is that in the 500-foot ring the initial positive effect on prices appears to disappear almost immediately for sales in the 1980s, whereas for properties that sold during the 1990s, the positive effects appear to be more sustained.

[37] One possible explanation is that the Nehemiah developments in the 101+–unit category actually contain a larger number of units. But that is not the case. In fact, the Partnership developments in the 101+–unit category appear to be somewhat larger on average. For sales within 500 feet of a Nehemiah development of more than 100 units, the mean number of units within 500 feet of the sale is 158. For sales within 500 feet of a Partnership development of more than 100 units, the mean number of units within 500 feet of the sale is 182. More generally, the mean number of Partnership units and the mean number of Nehemiah units—in the given categories—are virtually identical.

Conclusion

With the benefit of data that are more precise than the data employed in previous studies, this article provides a more detailed portrait of what happens to property values following the development of affordable owner-occupied housing. We show that prices of properties in the rings surrounding the homeownership projects have risen relative to their ZIP codes during the past two decades, and our results suggest that part of this rise is attributable to two affordable homeownership programs in New York City: the Partnership New Homes program, administered by the New York City Housing Partnership, and the Nehemiah Plan programs, administered by South Bronx Churches and East Brooklyn Congregations. That is, these efforts appear to have had a positive effect on property values in their immediate neighborhoods.

The source of this positive externality is not clear. It may result from the transformation of vacant or derelict eyesores into well-maintained, pleasant homes. It may also be caused by the inmigration of relatively higher-income residents to the neighborhoods. Finally, a higher rate of homeownership in itself may generate positive effects for the community, ranging from greater neighborhood stability to better upkeep and more community activism.

In future work we hope to shed more light on the roots of the positive effect. In particular, we will compare the effects that the City's rental housing programs have on surrounding property values with the effects of homeownership programs. To the extent that owner-occupied housing appears to have larger effects, this might suggest that owner-occupied housing yields unique benefits, above and beyond the effects of removing blight and producing pleasant and attractive homes.

As for policy implications, this article suggests that owners of properties in the relevant communities will enjoy an increase in wealth that appears to be generated by the new housing. In addition, to the extent that the City reassesses properties in these communities, additional tax revenues will be generated. Of course, higher property values may not benefit everyone financially. Rents may also increase in these areas to reflect the increase in value attributable to the homeownership programs. For low- and moderate-income households already having difficulty paying their rents, an increase in homeownership in the community may be a mixed blessing.[38] Part of this potential increase in rents would likely be ameliorated by the existence of rent regulation in many of the neighborhoods in which Partnership and Nehemiah housing are located. Nevertheless, the question of how the improvement in property values surrounding new homeownership housing units compares with the costs of the program (both in terms of the actual subsidies and possible negative effects on renters) requires sharper estimates and more empirical investigation. Such a cost-benefit analysis may be critical to future decision making.

[38] In 1999, almost one-quarter of all renters in New York City paid more than half of their income in rent (New York University School of Law 2001).

Appendix

Table A.1. **Complete Regression Results Specification with Full Set of Pre- and Postring Dummies (Dependent Variable = Log of Price per Unit)**

	Model 1 (500-Foot Ring)	Model 2 (1,000-Foot Ring)	Model 3 (2,000-Foot Ring)
>=10yr_Pre_Ring[a]	–0.1690***	–0.1260***	–0.0857***
	(0.0077)	(0.0053)	(0.0044)
9yr_Pre_Ring	–0.2136***	–0.1531***	–0.1165***
	(0.0145)	(0.0100)	(0.0077)
8yr_Pre_Ring	–0.1692***	–0.1316***	–0.1048***
	(0.0142)	(0.0099)	(0.0076)
7yr_Pre_Ring	–0.1411***	–0.1317***	–0.1013***
	(0.0144)	(0.0095)	(0.0071)
6yr_Pre_Ring	–0.1057***	–0.1194***	–0.0885***
	(0.0136)	(0.0091)	(0.0066)
5yr_Pre_Ring	–0.1048***	–0.1021***	–0.0796***
	(0.0137)	(0.0091)	(0.0065)
4yr_Pre_Ring	–0.1360***	–0.1031***	–0.0729***
	(0.0139)	(0.0093)	(0.0067)
3yr_Pre_Ring	–0.0854***	–0.0973***	–0.0822***
	(0.0140)	(0.0093)	(0.0068)
2yr_Pre_Ring	–0.0968***	–0.1002***	–0.0879***
	(0.0142)	(0.0096)	(0.0069)
1yr_Pre_Ring	–0.0882***	–0.0915***	–0.0846***
	(0.0135)	(0.0090)	(0.0068)
Cmpl_yr_Ring[b]	–0.0853***	–0.0789***	–0.0807***
	(0.0127)	(0.0089)	(0.0070)
1yr_Post_Ring[c]	–0.0160	–0.0709***	–0.0614***
	(0.0140)	(0.0094)	(0.0071)
2yr_Post_Ring	–0.0476***	–0.0412***	–0.0586***
	(0.0159)	(0.0103)	(0.0076)
3yr_Post_Ring	–0.0372**	–0.0302***	–0.0225***
	(0.0149)	(0.0105)	(0.0077)
4yr_Post_Ring	–0.0055	–0.0428***	–0.0503***
	(0.0155)	(0.0104)	(0.0078)
5yr_Post_Ring	–0.0070	–0.0434***	–0.0272***
	(0.0160)	(0.0111)	(0.0081)
6yr_Post_Ring	–0.0673***	–0.0691***	–0.0462***
	(0.0187)	(0.0116)	(0.0082)
7yr_Post_Ring	–0.0526***	–0.0723***	–0.0449***
	(0.0195)	(0.0126)	(0.0086)
8yr_Post_Ring	–0.0318	–0.0708***	–0.0572***
	(0.0226)	(0.0145)	(0.0097)
9yr_Post_Ring	–0.0346	–0.0868***	–0.0491***
	(0.0279)	(0.0172)	(0.0114)
<=10yr_Post_Ring	–0.0909***	–0.0629***	–0.0349***
	(0.0213)	(0.0123)	(0.0082)
Vandalized	–0.1425***	–0.1426***	–0.1470***
	(0.0332)	(0.0331)	(0.0332)
Abandoned but not vandalized	–0.1114***	–0.1096***	–0.1106***
	(0.0160)	(0.0160)	(0.0160)
Odd shape	0.0203***	0.0198***	0.0207***
	(0.0025)	(0.0025)	(0.0025)

Table A.1. **Complete Regression Results Specification with Full Set of Pre- and Postring Dummies (Dependent Variable = Log of Price per Unit)** *(continued)*

	Model 1 (500-Foot Ring)	Model 2 (1,000-Foot Ring)	Model 3 (2,000-Foot Ring)
Garage	0.0678***	0.0671***	0.0682***
	(0.0016)	(0.0016)	(0.0016)
Extension	0.0518***	0.0510***	0.0517***
	(0.0023)	(0.0023)	(0.0023)
Corner	0.0377***	0.0374***	0.0366***
	(0.0025)	(0.0025)	(0.0025)
Major alteration before sale	–0.0393***	–0.0401***	–0.0397***
	(0.0053)	(0.0053)	(0.0053)
Age of unit	–0.0089***	–0.0089***	–0.0088***
	(0.0001)	(0.0001)	(0.0001)
(Age of unit)^2	0.0000***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)
Age of unit missing	–0.3220***	–0.3209***	–0.3177***
	(0.0177)	(0.0177)	(0.0177)
Log square feet per unit	0.4621***	0.4616***	0.4620***
	(0.0022)	(0.0022)	(0.0022)
Number of buildings on	–0.0099**	–0.0104**	–0.0112**
same lot	(0.0047)	(0.0047)	(0.0047)
Includes commercial space	0.0702***	0.0711***	0.0715***
	(0.0059)	(0.0059)	(0.0059)
Square footage missing	3.2799***	3.2758***	3.2793***
	(0.0266)	(0.0266)	(0.0266)
Condominium and square	–0.2942***	–0.2944***	–0.2907***
footage missing	(0.0228)	(0.0227)	(0.0228)
Single-family detached	0.0901***	0.0902***	0.0911***
	(0.0024)	(0.0024)	(0.0024)
Two-family home	–0.3202***	–0.3195***	–0.3188***
	(0.0023)	(0.0023)	(0.0023)
Three-family home	–0.5599***	–0.5592***	–0.5586***
	(0.0031)	(0.0031)	(0.0031)
Four-family home	–0.7502***	–0.7485***	–0.7446***
	(0.0046)	(0.0046)	(0.0046)
Five/six-family home	–1.1300***	–1.1306***	–1.1281***
	(0.0046)	(0.0046)	(0.0046)
More than six families,	–1.4466***	–1.4447***	–1.4421***
no elevator	(0.0053)	(0.0052)	(0.0053)
Walk-up, units not specified	–0.9971***	–0.9953***	–0.9911***
	(0.0070)	(0.0070)	(0.0070)
Elevator apartment building,	–1.1455***	–1.1492***	–1.1493***
cooperatives	(0.0219)	(0.0219)	(0.0219)
Elevator apartment building,	–1.3902***	–1.3912***	–1.3874***
not cooperatives	(0.0094)	(0.0094)	(0.0094)
Loft building	–0.8024***	–0.8097***	–0.8105***
	(0.0945)	(0.0944)	(0.0944)
Condominium, single-family	0.2432***	0.2385***	0.2309***
attached	(0.0247)	(0.0247)	(0.0247)
Condominium, walk-up	–0.0099	–0.0125	–0.0215
apartments	(0.0192)	(0.0192)	(0.0192)
Condominium, elevator	–0.2101***	–0.2114***	–0.2210***
building	(0.0196)	(0.0196)	(0.0196)

Table A.1. **Complete Regression Results Specification with Full Set of Pre- and Postring Dummies (Dependent Variable = Log of Price per Unit)** *(continued)*

	Model 1 (500-Foot Ring)	Model 2 (1,000-Foot Ring)	Model 3 (2,000-Foot Ring)
Condominium, miscellaneous	–0.3509***	–0.3518***	–0.3571***
	(0.0218)	(0.0218)	(0.0218)
Multiuse, single-family with store	–0.1518***	–0.1520***	–0.1527***
	(0.0101)	(0.0101)	(0.0101)
Multiuse, two-family with store	–0.5628***	–0.5626***	–0.5624***
	(0.0080)	(0.0080)	(0.0080)
Multiuse, three-family with store	–0.8218***	–0.8174***	–0.8197***
	(0.0119)	(0.0119)	(0.0119)
Multiuse, four-family or more with store	–1.0197***	–1.0196***	–1.0173***
	(0.0090)	(0.0090)	(0.0090)
Constant	8.8390**	8.8476***	8.8516***
	(0.0180)	(0.0179)	(0.0180)
Adjusted R^2	0.8380	0.8383	0.8381
N	234,591	234,591	234,591

Note: Standard errors are in parentheses. All regressions include ZIP code–quarter dummies.
[a] Within the specified distance of a homeownership site, the specified number of years before completion of the project.
[b] Within the specified distance of a homeownership site, during the year of completion.
[c] Within the specified distance of a homeownership site, the specified number of years after completion of the project.
* $p < 0.1$. ** $p < 0.05$. *** $p < 0.01$.

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