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The Effect of Community Gardens on Neighboring Property Values

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Abstract

Cities across the United States increasingly are debating the best way to use vacant "infill" lots. The community garden movement is one of the major contenders for the space, as are advocates for small public "pocket" parks and other green spaces. To allocate the land most efficiently and fairly, local governments need sound research about the value of such gardens and parks to their host communities.

At the same time, cities are looking for new ways of financing the development and maintenance of public garden and park space. Some have turned to tax increment financing to generate resources, other are introducing impact fees or special assessments to cover the costs of urban parks. In order to employ such financing mechanisms, both policy concerns and legal constraints require local governments to base their charges on sound data about the impacts green spaces have on the value of the neighboring properties that would be forced to bear the incidence of the tax or fee.

Despite the clear public policy need for such data, our knowledge about the impacts community gardens and other such spaces have on surrounding neighborhoods is quite limited. No studies have focused specifically on community gardens, and those that have examined the property value impacts of parks and other open space are cross-sectional studies inattentive to when the park opened, so that it is impossible to determine the direction of the causality of any property value differences found. The existing literature also has paid insufficient attention to qualitative differences among the parks studied and to differences in characteristics of the surrounding neighborhoods that might affect the parks' impacts.

Applying hedonic methods to a unique data set of all property sales in New York City over several decades, we compared the prices of properties within a given distance of community gardens to prices of comparable properties outside the designated ring, but still located in the same neighborhood. By examining whether and how this difference changed once a community garden was established, we account for any systematic differences between the sites used for community gardens and other land in the neighborhood, thus resolving questions about the direction of causality and helping to disentangle the specific effects of community gardens from other contemporaneous changes occurring across neighborhoods and properties in the city

We find that the opening of a community garden has a statistically significant positive impact on residential properties within 1000 feet of the garden, and that the impact increases over time. We also find that higher quality gardens have the greatest positive impact. Finally, we find that gardens have the greatest impact in the most disadvantaged neighborhoods.

The Effect of Community Gardens On Neighboring Property Values

Vicki Been and Ioan Voicu

I. Introduction

In recent years, many communities have seen a huge increase in the number of vacant lots converted to community gardens. Some of those communities have warmly welcomed the movement, seeing the gardens as catalysts for the improvement of troubled neighborhoods. In others, most notably New York City, controversies have erupted when private owners or public agencies sought to convert the lots for development, often as affordable housing or public uses.

In such controversies, advocates for the gardens advanced many arguments about the value of the community gardens, claiming that gardens stabilize and improve their host neighborhoods, provide a focal point for community organizing and social networks, bring fresh produce to neighborhood where fresh fruits and vegetables often are not available, and provide recreation and therapy for neighborhood residents. Advocates cited anecdotal evidence that gardens increased the value of neighboring properties and spurred neighborhood revitalization. As proof of the value of such spaces, advocates also pointed to efforts of several cities to develop small "pocket" parks through initiatives such as New York City's "Green Streets" program.

Little empirical evidence about the effect community gardens have on surrounding properties is available, however, to inform the debates over whether to foster the development of community gardens, or when to replace community gardens with other uses. That gap is surprising, given that the benefits gardens and small urban green spaces provide, relative to alternative uses of the property, have played a key role in controversies over community gardens not just in New York, but in Boston, St. Louis and many other cities.[1] The value of gardens and small parks also is central to debates over the desirability of efforts to reduce sprawl by fostering infill development. More generally, local governments across the country face increasing

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[1] In addition, cities like Berkeley, Chicago, Madison, Philadelphia and Seattle have grappled with how to design programs to promote community gardens and neighborhood parks.

controversy about how much and what types of green space and park land should be provided by the community or by developers proposing to build within a community. Further, neighborhoods and cities increasingly are debating whether to charge developers impact fees to fund the provision of gardens and small parks within a project. The law requires that any such charges be based upon realistic assessments of the need for and value of such spaces. Finally, local governments need reliable data about the economic impact of different kinds of parks and open space in order to decide whether to employ tax increment financing (TIF) to support the provision of parks and open space.[2]

Despite this critical need for information, relatively little is known about the economic value of gardens, green spaces and other small urban parks. A number of studies have investigated the link between proximity to parks or other open space and property values, but the results of the studies may not be transferable to the setting in which many community gardens or small urban parks are found because of their focus on relatively low-density development. Further, the existing studies share methodological and data limitations that make it difficult to pinpoint the direction of the causality of any property value differences found.

In this paper, we attempt to fill these gaps, using unique data from New York City and a difference-in-differences specification of a hedonic regression model to estimate the effect of community gardens on neighborhood property values. Impacts are estimated as the difference between property values in the vicinity of garden sites before and after a garden opens relative to price changes of comparable properties farther away, but still in the same neighborhood. We examine whether effects change over time or vary with neighborhood type and garden quality.

We find that the opening of a community garden has a statistically significant positive impact on residential properties within 1000 feet of the garden, and that the impact increases over time. Higher quality gardens have the greatest positive impact. We also find that gardens have the greatest impact in the most disadvantaged neighborhoods. Finally, a simple cost-benefit

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[2] Under a TIF plan, a community designates a geographic area that is likely to benefit from the provision of open space, issues bonds to finance the purchase of that space, then pays for the debt service on the bonds from the additional property tax revenues resulting from the increased value of properties within the TIF district. For a TIF to be successful, the park or other amenity financed must spur private development and raise property values sufficiently to generate the increased tax receipts necessary for the debt service. Being able to accurately predict the property value impacts that different kinds of open space will have on neighboring property values accordingly is crucial to local governments considering TIF.

analysis suggests that the gain in tax revenue generated by community gardens in the 1000-foot ring may be substantial.

The paper is organized as follows. Section II offers a review of relevant literature. Section III describes the models and empirical strategy. Section IV provides a description of the data, and Section V presents results. The paper ends with a summary of the key findings.

II. Existing Literature

Although no studies have specifically examined the impact that community gardens have on surrounding properties, a number of studies have investigated the link between proximity to other open spaces and property values. These studies vary widely in their methodology, ranging from simple surveys to hedonic modeling or matched pair analysis. They have examined the influence of a wide range of open space types, such as golf courses, greenbelts, wetlands, agricultural spaces, urban parks and playgrounds. The studies that focus directly on parks of various kinds tend to show positive property value impacts. Crompton (2001) surveys the older literature, while Hobden et al. (2004) summarizes more recent literature. We review here the studies that focused on the small urban parks or other open spaces most analogous to community gardens.

Bolitzer and Netusil (2000) studied the effect of proximity to an open space (public and private parks, cemeteries and golf courses) in Portland, Oregon, using data on 16,402 sales of single family home between 1990 and 1992. Using a linear model, they found that a home located within 1500 feet (7 ½ blocks) of a 20-acre open space (the mean for the public parks in the area) sold for approximately $2670 (in 1990 dollars) more than homes that were further from a park. A semi-log model showed that proximity to any open space increased a home's sales price by 1.43%. When the authors estimated the effect of the different types of open space in the study area, however, the increase in value was limited to public parks and cemeteries; private parks had no statistically significant effect on home prices. Because the mean size of the public parks studied was twenty acres, while the mean size of the private parks was almost 4 acres, the finding that private parks did not have a statistically significant effect on neighboring properties is most relevant for our study of community gardens, which have a median size of 6,000 square feet (less than ¼ acre) in New York City.

Lutzenhiser and Netusil (2001), refined the approach taken in Bolitzer and Netusil (2000), using the same data from Portland, Oregon. Breaking the types of open space into five categories, they found that “urban parks” (those in which more than 50% of the area was landscaped or developed for uses such as swimming pools or ball fields) had a statistically significant effect of $1214 (in 1990 dollars), or 1.8% of the mean house value, on the value of single family residences within 1500 feet of the park. That effect was far lower than the effect of both “natural area parks” in which a majority of the land was preserved in natural vegetation, and golf courses ($10,648 and $8,849, respectively). The authors estimated that the size of an urban park that would maximize its positive effect on a home’s sales price would be 148 acres, almost 600 times larger than the median size of the community gardens in our study.

Espey and Owasu-Edusei (2001) used hedonic methods to investigate the effect proximity to 24 neighborhood parks had on the sales prices of single-family homes in Greenville, South Carolina between 1990 and 1999. The authors broke the parks down into four categories. Type I parks ranged from 15,620 to 87,687 square feet and were essentially playgrounds with some grassy areas, but were not “particularly attractive.” Type 2 parks were small, attractive parks with playgrounds. Type 3 consisted of attractive medium-sized parks with both sports fields or courts and playgrounds but also some natural areas; and type 4 parks were unattractive medium-sized parks with few amenities and no natural area. Using a semi-log model, the authors found that the Type I parks had a statistically significant negative effect on the sales prices of homes within 300 feet of the park, a significant positive effect of about 15 percent on the sales of houses between 300 and 500 feet, and a significant positive effect of about 6.5 percent on the sales prices of homes located between 500 and 1500 feet of the park. Small attractive parks (Type 2) had a statistically significant positive effect of 11 percent on the sales prices of houses within 600 feet of the park, but no statistically significant effect beyond that.

Pincetl et al. (2003) studied a neighborhood 5 miles from downtown Los Angeles in which most of the housing was multi-family, rental buildings. The neighborhood had no parks, but the authors examined the effect of greenery (as measured using aerial photographs) on 260 sales of single-family homes over an 18 month period. The authors found that an 11% increase in the amount of greenery (equivalent to a one-third acre garden or park) within a radius of 200 to 500 feet from the house increased the sales price of the house by approximately 1.5 percent.

Hobden et al. (2004) used a matched pairs methodology to measure the effect greenways had on adjacent properties. The authors grouped greenways into eight categories, based upon improvements to the greenways, and also distinguished between "small parks" in which the greenway was a narrow strip (often a pathway) of less than 50 percent of the area of the adjacent residential property. Using data from the years between 1980 and 2001, the authors identified 755 matched pairs. They found that adding a greenway increased the sales price of adjacent properties by 2.8%. Where the greenway was defined as a "small park", the greenway increased the values of adjacent properties by 6.9%.

Finally, New Yorkers for Parks and Ernst & Young (2004) found that the values of single family homes located near three well-improved parks in Brooklyn, Queens and Staten Island were 8 to 30% higher than values of homes further from the parks.

The usefulness of the existing literature to many local governments is limited in several ways. First, most of the studies focus on the parks' impacts on single-family residences in relatively low density settings that do not characterize the denser urban neighborhoods in which many controversies about establishing or preserving parks arise. See, e.g., Bolitzer and Netusil (2000); Espey and Owasu-Edusei (2001); Lutzenhiser and Netusil (2001); New Yorkers for Parks (2004). Second, none of the studies examine the effects the open space might have on nearby commercial properties. Third, the existing literature does not attempt, except in the most general way, to account for differences in the quality of the parks. See, e.g., Espey and Owasu-Edusei (2001) (distinguishing between unattractive and attractive parks).

Moreover, in the previous literature, data limitations make it difficult to pinpoint the direction of causality. The existing studies employ cross-sectional techniques that compare sales prices in neighborhoods with parks to prices in neighborhoods without, but it is difficult to know whether the two groups of neighborhoods truly are comparable. Therefore, their results could be interpreted to suggest that parks lead to improvements in the surrounding neighborhood, but could instead mean that parks are systematically located in strong neighborhoods. Finally, the existing literature does not address whether differences in the characteristics of the surrounding neighborhood affect the property value impacts of the parks.

III. Methodology

Our main empirical goal is to estimate the impacts of community gardens on neighboring property values. In this section, we outline various hypotheses about how gardens might affect neighborhood property values, and describe our empirical strategy to identify the property value impacts of gardens.

Hypotheses about how gardens might affect neighborhood property values

In principle, gardens, parks and other open spaces could have both positive and negative impacts on surrounding communities. They may benefit neighbors by providing access to recreational facilities, fostering a sense of community, providing attractive scenery and views for nearby residents and passersby, replacing an eyesore or a location for undesirable behaviors, and improving both the environmental quality and the general quality of life in the neighborhood. On other hand, they may provide a haven for loitering or other undesirable social behavior, or cause noise and congestion.[3] If the garden is not well maintained, it may be an eyesore. Since 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, these amenities and disamenities associated with gardens could be capitalized into the value of surrounding properties. Commercial property values may also respond to these various garden features, especially if the garden brings visitors that would increase a retail properties' customer base. Nonetheless, we expect to see lesser effects of gardens on commercial property values than on the values of surrounding residential

[3] Note, however, that some studies claim that urban gardening may, in fact, *reduce* local crime (Warner and Hansi, 1987; Haynes, 1996; Murphy, 1999)

properties, given that the customers and employees of commercial properties likely have only a temporary presence in the neighborhood.

While garden impacts – both positive and negative - may be largest in adjacent properties, they may well extend some distance, with diminishing magnitude. However, it is not clear, a priori, how the *net* effect varies with distance.

Garden effects also may vary with the garden area. Specifically, both the positive and negative externalities are likely to increase with garden area (e.g. larger gardens may provide more recreational facilities but they also may be noisier). Thus, it is uncertain, a priori, whether size has a positive or negative influence on the net effect of the garden.

Additionally, garden impacts may vary over time. For example, benefits may grow over time as more neighborhood residents become familiar with the garden and get involved in various activities taking place at the garden, or as gardens attract an increasing number of customers to the nearby commercial buildings, thus boosting their activity and increasing the attractiveness of doing business in the neighborhood.

The impact of a garden may vary across neighborhoods with different characteristics. As pointed out in several prior studies (Francis et al., 1984; Harnick, 2000; Saldivar-Tanaka and Krasny, 2004), gardens in poor neighborhoods provide an affordable alternative to city parks, which often are located in more affluent neighborhoods and are not easily accessible to poor residents. Therefore, gardens may be more valuable to these residents, leading one to expect larger positive impacts (or smaller negative impacts) on residential property values in lower-income areas.

Garden effects also may vary with the housing tenure of the neighborhood residents. Homeowners may have stronger economic incentives than renters to organize and garner financial support for the initial development of the garden and its subsequent maintenance, and, in general, to maintain the garden well. This would likely result in higher quality gardens, and assuming that property value impacts would be positively related to the quality of gardens, thus lead to larger positive impacts on residential property values in neighborhoods dominated by homeowners. Additionally, homeowners may tend to be more involved in community oriented activities – like those hosted by community gardens – than renters, either because of the homeowners' financial stake in neighborhood quality or because homeowners tend to stay in their homes for a longer period of time than do renters. On the other hand, homeowners actually may be less interested in community gardens because it is more likely that their properties already include some kind of private yard that fulfils at least some of the functions gardens serve or perhaps because they can access alternative open spaces such as parks more easily than renters.[4] Thus, it is not clear a priori what to expect about how garden effects will vary across neighborhoods with different homeownership rates.

Density is another neighborhood dimension along which garden impacts may vary. Dense neighborhoods, by definition, have a shortage of open spaces and thus community gardens may be particularly valuable in such areas. On the other hand, if the density is too high, a community garden - like a drop in a bucket - may not make much of a difference.

Because renters typically earn lower incomes than owners and live in poorer neighborhoods and because poorer, renter-dominated neighborhoods tend to be high-density, it may be difficult to empirically disentangle the variation in garden impacts along each of the specific neighborhood characteristics outlined above.

As for the effects of gardens on commercial property values, one might expect to see less

[4] Owners typically earn higher incomes than renters, and thus are more likely to live in wealthier neighborhoods which often include parks and better able financially to visit more remote parks.

variation across different neighborhood types, again because the customers and employees of these businesses are likely to be less attached to the garden neighborhood than are residents.

Garden impacts on commercial values may vary with the type of nearby commercial buildings; for example, one might expect to see larger positive effects on retail stores given that these are the most likely businesses to benefit from the increased pedestrian traffic (potentially) generated by a garden.

Baseline Model

Identifying the neighborhood impacts of community gardens is challenging, primarily because garden sites might not be randomly chosen (gardens might, for example, be sited on property with the lowest value or with the least development potential). Our basic strategy to address those challenges relies on a hedonic regression model with a difference-in-difference specification. Hedonic regression models explain the sales price of a property as a function of its structural characteristics (such as lot size and building age) and its neighborhood surroundings. In brief, we compare the sales prices of properties that are within designated distances - such as 1000 feet - of community gardens to prices of comparable properties that are outside the designated ring, but still located in the same neighborhood (defined here as a census tract).[5] Then we compare the magnitude of this difference before and after the garden is opened.[6] This "difference-in-difference" in property values is our measure of the impact gardens have on neighborhoods. The difference-in-difference measure avoids having to compare properties near gardens to other properties in different neighborhoods, and accordingly avoids bias that might be

[5] A typical city block (North/South blocks between streets) in Midtown Manhattan is about 260 feet long. Thus, the 1,000-foot ring allows for impacts extending up to roughly four blocks away from the garden. The 1000 foot radius was selected following Bolitzer and Netusil (2000) and Netusil (2004). The former assumed, based on discussions with park officials, that the impacts of urban parks may extend to up to 1500 feet; the latter used a 1300-foot (1/4 mile) radius to capture impacts of parks and other relatively large open areas (golf courses, wetlands, etc.). Since New York City community gardens are relatively small, we chose a somewhat smaller ring size.

[6] Ellen, Schill, Susin, and Schwartz (2002) employs a similar methodology to evaluate the impact of investments in selected homeownership developments.

introduced by any systematic differences between neighborhoods that host community gardens and other locations around the city.

To be concrete, our basic model – estimated separately for commercial and residential properties - takes the following form:

(1) $\ln P_{icdt} = \alpha + \beta X_{it} + \delta_c W_c + \gamma_{dt} I_{dt} + \rho_1 InRing_i + \rho_2 InRing_i * D_i + \rho_3 PostRing_{it} + \rho_4 PostRing_{it} * D_{it} + \rho_5 PostRing\_GArea_{it} + \rho_6 PostRing\_GArea_{it}^2 + \rho_7 PostRing\_GArea_{it} * D_{it} + \rho_8 PostRing\_PvtOwn_{it} + \rho_9 TPost_{it} + \rho_{10} TPost_{it}^2 + \rho_{11} TPost_{it} * D_{it} + \varepsilon_{it}$,

where $\ln P_{icdt}$ is, for residential properties, the log of the per unit sales price of property i (for commercial properties, the log of the sales price of property i) in census tract c, in community district d, and in quarter t;[7] X_{it} is a vector of property-related characteristics, including age, size and structural characteristics; W_c are a series of census tract fixed effects, which help control for unobserved, time-invariant features of different neighborhoods; I_{dt} are a series of dummy variables indicating the quarter and community district of the sale, which allow for distinct time trends for each of the 51 community districts used in the analysis;[8,9] and the remaining covariates are ring variables (described more fully below) that indicate proximity to garden sites. The coefficients to be estimated are α, β, δ, γ and ρ, and ε is an error term. Since we measure sales prices as logarithms, the coefficients can be 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

[7] For the commercial hedonic model, we follow Colwell, Munneke and Trefzger (1998) and use price, rather than the more usual price per square foot, as a dependent variable (and include building square footage among the regressors). Colwell, Munneke and Trefzger (1998) point out that the price per square foot approach may be problematic if the functions that describe the values of buildings and land are nonlinear.
[8] Most previous research has assumed that trends in housing prices are constant across a city or metropolitan area, but this seems particularly inappropriate in a city as large and diverse as New York. Schwartz, Susin, and Voicu (2003), for instance, find considerable variation in price trends across community districts in New York City.
[9] While specifying the time dummies using an even smaller geographic area – say 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 150,000 more dummy variables to the residential sales specification, significantly increasing the number of parameters to be estimated, and greatly reducing degrees of freedom. Moreover, there is little variation in the time dummies within the community districts – an F-test performed for the residential model could not reject the hypothesis that census tract-quarter dummy variables were the same within a community district. Finally, the use of tract-quarter effects is practically impossible in the commercial model because there are very few tract-quarter cells with multiple sales of commercial properties.

properties with the attribute – say a garage or a corner location – and those without.[10]

Our key variables of interest are the ring variables, which capture the proximity to community gardens. We include three vectors of ring variables – "InRing," "PostRing," and "TPost." Specifically, the InRing variable is a dummy variable that takes on a value of one if the property is located within 1,000 feet of the site of an existing or future garden. Intuitively, the coefficient on the InRing variable captures the baseline difference in sales prices between properties located within a 1,000-foot ring of garden sites and those further away, but still in the same neighborhood.[11] We interact InRing with D_i, the Euclidean distance between property i and the nearest garden site. This interaction term allows us to estimate how the effects of proximity to a garden site vary with distance to the site, within the 1,000-foot ring.

The PostRing dummy variable indicates whether the property is within 1,000 feet of an *existing* garden. Its coefficient provides the simplest impact estimate. The existing garden area within the ring of the property, PostRing_GArea, (and its square) offers a measure of the marginal effects of additional square feet of garden area. The share of existing garden area in the ring that is privately owned, PostRing_PvtOwn, captures differences in property prices due to differences in land ownership.[12] 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 garden opening date for properties in the 1,000-foot ring.[13] Note that because we control for the existing garden area within the ring of a sale and the share of this area that is privately owned, as well as for the time elapsed since the garden opened, the PostRing coefficient should be viewed as the fixed impact of a garden sited on publicly-owned

[10] More precisely, the coefficient on a dummy variable should 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 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).
[11] In preliminary research, we allowed baseline property values to also vary with both the size and the land ownership of the site; however, we didn't find any statistically significant variations along these dimensions and settled on the more parsimonious specification shown here.
[12] As mentioned below, 95 percent of the gardens in our sample are sited on publicly-owned parcels that are leased to local communities for gardening; the rest are located on privately-owned lots. Throughout the paper we are using interchangeably the terms "gardens sited on publicly-owned (privately-owned) land" and "public (private) gardens".
[13] To be clear, Tpost equals 1/365 if a sale is located within the ring of a garden and occurs the day after its opening; it equals one if the sale occurs one year after the garden opening; and so on. Tthe 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.

land (independent of its size), immediately after its opening.

We also interact the PostRing variable with distance to allow impacts to vary with distance. In addition, by interacting distance with PostRing_GArea and Tpost, we explore how the distance gradient of impacts changes with garden area and over time.[14,15]

As described below, we estimate two alternative models to the basic model in equation (1). First, we estimate a model which allows impacts to vary across neighborhood types. Second, we adapt the model to include information on the quality of gardens.

Heterogeneity of impacts across different neighborhood types

We explore the extent to which the impacts of community gardens vary with income levels in a neighborhood. While Schwartz, Ellen, Voicu, and Schill (2003) and Santiago, Galster, and Tatian (2001) find significant differences in the impact of publicly-subsidized housing investments across submarkets, nobody has explored such variation in the context of green spaces, despite its clear policy interest. We test for heterogeneity in impacts between low- and high-income areas by interacting all of our ring variables, ring-distance interaction variables, and hedonic variables with a dummy variable indicating neighborhood income level.[16] Following Schwartz, Ellen, Voicu, and Schill (2003), we identified two submarkets - defined by community districts - based on household income information from the 1990 Decennial Census: the low-income submarket consists of community districts with an average household income less than 80 percent of the MSA mean household income and the higher-income submarket includes all the remaining districts.[17]

[14] In preliminary work, we also allowed for nonlinear distance gradients by including distance squared terms; since their coefficients were not statistically significant we opted to exclude them from the models shown here.
[15] Although not shown in equation (1), our specification also includes a set of control variables that capture proximity to other gardens that could not be used for impact estimation either due to missing opening date or because the opening date was outside of the period covered by our sales data. If we don't include these controls and the location of these other gardens is correlated with that of our sample of gardens with valid data, our impact estimates will be biased.
[16] In earlier models, an F-test rejected the hypothesis that the coefficients on property characteristics are similar across neighborhoods.
[17] To create submarkets, we matched census tract-level data to community districts.

Garden Quality

To better understand the effects different types of gardens may have on neighboring property values, we conducted a survey to gather qualitative information on many relevant garden features and then extended our basic model to incorporate this information. In the survey, we focused on a subset of our sample of community gardens – those located in the Bronx. Following on-site visits, we ranked the Bronx gardens on the following criteria: accessibility to the general public, fencing quality and security, cleanliness, landscaping quality, presence of decorations, existence of social spaces, and overall condition of the garden.

For example, the accessibility rating is derived from questions about whether the garden advertises the hours during which it is open to public, whether the garden provides information about how to get involved with community gardening, and whether there are signs announcing the organization sponsoring the garden (see the Appendix for a detailed description of survey questions). If more than half of the answers under a given criterion reflected a favorable opinion, the garden was rated "Acceptable" on that criterion. The rating of the overall condition of the garden was derived from the whole survey questionnaire. Since no garden had less than 6 or more than 23 favorable answers (out of a total of 24 questions), we choose the mid-point of the (6,23) interval – 14 - as the threshold for “Acceptable” overall condition. To test the sensitivity of our results to alternative measures of overall condition, we also asked the surveyors to provide an overall assessment of the garden, on a scale of 1 to 5. A rating of 3 or more points was considered “Acceptable”. In addition, we constructed continuous measures of overall condition, equal to the number of favorable answers in the survey questionnaire or to the number of points in surveyors’ overall assessment. Finally, we considered a “Low / Good / Excellent” quality rating instead of just "Acceptable / Unacceptable".

Using these garden ratings, we then extend our basic model in two ways. First, we include two additional variables - share of existing or future garden area with acceptable overall quality, and share of existing garden area with acceptable overall quality - to control for the overall condition of the garden.[18]

[18] In sensitivity analysis using the alternative measures of overall condition, we replace these variables either with the shares of garden area of low and excellent quality or with the number of favorable answers (or points in surveyors’ overall assessment).

In the second extension, we allow impacts to vary with the garden's rating on each of the six criteria described above. For this, we replace share of existing garden area with acceptable overall quality with six variables representing the shares of existing garden area with acceptable rating on community access, fencing quality/security, cleanliness, landscaping, decorations, and social spaces.

IV. Summary of Data

To undertake the analysis outlined above, we obtained data from the Council on the Environment of New York City (CENYC) describing all the community gardens in the city. For each garden, this data set indicates the exact location (tax lot(s)), area, opening date, and land ownership. Our main estimation sample of gardens includes 636 gardens, established between 1977 and 2000.[19]

Since the CENYC database does not contain any qualitative data about the gardens, we inspected a subset of the city's gardens to obtain such information. We chose to survey the gardens in the Bronx because Brooklyn had so many gardens that it was impossible to inspect them all, and we feared that gardens in relatively affluent and high-density Manhattan might not be representative of gardens across the City. The Bronx contains a mix of housing and building types, so is more representative of the City's average neighborhood (and the average neighborhood in most large cities across the nation) than is Manhattan. As shown in Table 2A, gardens in the Bronx are smaller, on average, than all New York City gardens, and were somewhat older than all New York City gardens (44.3% of the Bronx gardens were established before 1991, compared with 38.1% of all gardens). We have no reason to believe that the relationship between the quality of the garden and its impacts on surrounding property would be different in the Bronx than in the rest of the City.

[19] The CENYC raw data included 783 gardens. Out of these, we focused on the 636 gardens established between 1977 and 2000. The reason for this selection criterion is that our sales data only covers the period 1974-2003, and it is generally desirable to match a minimum of two to three years of property sales data both before the earliest garden opening date and after the latest opening date. This approach ensures that the estimates of both pre- and post-opening levels and trends in prices in the micro-neighborhoods around the garden sites will be representative of all gardens included in the sample. Nonetheless, we also included in the analysis the rest of 147 gardens which were established outside of the 1977-2000 interval or had missing foundation year – but only to control for proximity to them and thus to obtain accurate impact estimates for the gardens on which we focus.

We deployed teams of students from NYU School of Law and the Robert F. Wagner Graduate School of Public Service to visit these gardens and rank them on such criteria as the garden's accessibility to the general public, how well-maintained the garden appears, whether there are social spaces in the garden, and whether the garden appears to contain trash or other disamenities. We were able to obtain valid information for 86 gardens (out of the 147 Bronx gardens).[20]

We supplemented our data on community gardens with geocoded data from several other 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, as well as for all industrial, retail and office buildings over the period 1974-2003.[21] Our residential sales sample includes 517,791 property sales, spread across 1,799 census tracts.[22] The commercial sales sample consists of 26,760 sales, spread across 1,679 census tracts. Both because of the long time span of the data and New York City's size, these are large sample sizes compared with much of the literature.

Second, data on building characteristics were obtained from an administrative data set gathered for the purpose of assessing property taxes (the RPAD file). Unfortunately, the RPAD data contains little information about the characteristics of individual units in apartment buildings (except in the case of condominiums).[23] Nonetheless, these building characteristics explain variations in prices surprisingly well, suggesting the data are rich enough for estimating

[20] We eliminated from the analysis garden sites which, upon inspection, turned out to not actually host a garden (e.g., the site was vacant or abandoned, or hosted a school playground), as well as gardens for which the surveyor could not obtain reliable information on one or more items of interest.

[21] Note that sales of cooperative apartments are not considered to be sales of real property and are not included in the DOF data set. We are in the process of obtaining, from another source, data on most cooperative sales in the city; we'll then add these sales to our estimation sample.

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).

[22] We limited the analysis to properties that are located within the 51 community districts (of the total 59) with community gardens.

[23] Most of the RPAD data we use were collected in 1999, and it is conceivable that some building characteristics may have changed between the time of sale and 1999. However, most of the characteristics that we use in the regressions are fairly immutable (e.g., corner location, square feet, presence of garage), and when we merged RPAD data from 1990 and 1999, we found that characteristics changed very rarely. Even among these apparent changes, we suspect that a majority are corrections, rather than true changes.

hedonic price equations.[24]

Third, we use demographic data about the neighborhoods from the U.S. Census files for 1980 and 1990.

As mentioned above, identifying properties in the vicinity of garden sites was critical to our analyses. We used GIS techniques to measure the distance between garden sites and each property for which a sale appeared in our database. From these distance measures, we created a variable that identified properties within 1,000 feet of a garden. A continuous distance variable indicates the distance from the property sold to the closest garden site.[25]

Table 1 shows summary statistics for our sales samples. The first panel shows statistics for the residential sales and the second panel describes the sample of commercial sales. In each panel, the first column shows the characteristics of our full sample of property sales; the second column shows the characteristics of transacting properties that were located or in the future would be located within 1,000 feet of a garden. Fifteen percent of the residential sales and 23 percent of the commercial sales were located within 1,000 feet of a garden site. As shown, most of the sales in our samples were located in Brooklyn and Queens, largely because those boroughs include a relatively large share of smaller properties, which sell more frequently than larger ones. Over two thirds of all residential buildings sold were either one- or two-family homes, and 87 percent were single-family homes, two-family homes, or small apartments. In the commercial sales sample, retail properties account for almost 70 percent of all sales, industrial buildings for approximately 25 percent, and office buildings for less than 7%.

The second column in each panel reveals some systematic differences between the transacting properties located close to garden sites and those that are not. Residential properties located within the 1,000-foot ring were more likely to be in Brooklyn and Manhattan than in the other boroughs. They were also older, less likely to be single-family homes, and more likely to

[24] See Ellen, Schill, Schwartz and Susin (2001) for more detail on the data and parameter estimates on the building characteristics in a similar model.

[25] Since all tax lots 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), community district and census tract. In the case of physical structures, a tax lot is usually a building and is an identifier available to the property 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. The community gardens data also include the tax lot(s) occupied by each garden, so we were able to assign x,y coordinates to each garden lot by the same method. If a garden encompassed multiple lots, we calculated the coordinates of the center of the garden.

be walk-up apartments. Commercial properties within 1000 feet of gardens were more likely to be in Brooklyn, the Bronx or Manhattan than in Queens of Staten Island; and they were also older.

Table 2 shows descriptive statistics for the sample including all of New York City gardens formed between 1977 and 2000, as well as for the sub-sample of Bronx gardens covered by our survey. Whereas the mean area of the city's gardens is 35,000 sq.ft, the median area is only 6,000 sq. ft., suggesting that the area distribution is highly skewed to the right. Most of the gardens are relatively new – 62 percent were established within the last decade - , and the overwhelming majority (95 percent) are sited on publicly-owned land. Most of the gardens are located in Brooklyn, Manhattan and the Bronx, with Brooklyn exhibiting the highest concentration (43 percent). Our surveyed gardens are remarkably similar to the whole New York City sample in terms of median area, completion year, and land ownership.

Table 3 compares the average 1980 characteristics of census tracts that include gardens to those that do not have a garden but are in a sub-borough area that does have at least one garden.[26] It shows that gardens were generally located in distressed neighborhoods.[27, 28] As compared to the average census tract without gardens, tracts with gardens had much lower mean family incomes, much higher poverty rates (twice as high) and unemployment rates, lower educational attainment, much lower homeownership rates (2.5 times lower), and higher vacancy rates. The tracts with gardens housed much greater shares of Hispanic and Black residents than the average tract without gardens. Finally, other demographic statistics indicate that the garden neighborhoods had smaller shares of foreign-born population, a younger population, and smaller shares of residents with stable neighborhood tenure.

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[26] We only use sub-boroughs with gardens for these statistics because our subsequent estimation of the garden impacts on property values is based only on these areas (recall from footnote 22 that we limited the analysis to properties that are located within the community districts with community gardens; sub-borough area boundaries are, in general, fairly similar to community district boundaries, and, in addition, they match exactly with census tract boundaries).

[27] The census tract data is taken from the 1980 Census. Tracts are characterized as including gardens even if these gardens did not open until later in the decade.

[28] We use 1980 tract characteristics since Table 2 shows that the vast majority of the gardens in our study were built during the last two decades. Thus, the table largely captures characteristics of the tracts *before* the gardens were opened.

V. Results

Baseline Model

Table 4 shows the key coefficients and their standard errors for our baseline model in equation (1). The first column presents the results for the residential sales model and the second column shows the results for the commercial sales model. Coefficients for structural variables are shown in the appendix, Table A1. The relatively high R^2's (0.86 for the residential model and 0.78 for the commercial model), together with the fact that the coefficients on the structural variables are consistent with expectations, suggest that these variables provide adequate controls for the characteristics of the properties sold.

Looking at the estimates of the residential model, the first thing to notice is that the coefficient for the InRing variable (coded "1" if the property is within 1,000 feet of the site of an existing or future garden) is negative and statistically significant. In particular, prior to the date the garden was opened, residential properties located right next to a garden site (D =0) sold for 11.1 percent less than comparable properties located outside the 1,000-foot ring. Anecdotal evidence suggests that sites on which gardens were built often were rubble-strewn sites that were havens for crime and other disamenities. The negative effect of the lots prior to their development as gardens is consistent with that evidence.[29]

The coefficient for the Post Ring variable (coded 1if the property sold was within 1000 feet of a garden) is positive and statistically significant. Its magnitude is 2.5 percentage points, indicating that the gap between prices in the ring and those outside the ring but in the same census tract narrowed after the garden was established.[30] Before the garden opened, the gap

[29] The coefficient for the InRing*D variable is positive and significant, indicating a sharp price gradient such that the pre-garden price-depressing effects of the site (the disamenity) decline with distance. For example, at a distance of 1,000 feet, residential prices are only 1.1 percent lower, meaning that the price differential falls at a rate of about 1 percentage point per 100 feet.

[30] As noted before, the Post Ring coefficient provides an estimate of the fixed component of the public garden effect - that is, the portion of the impact that is independent of the garden area. Increasing garden size appears to bring a smaller benefit, perhaps because larger gardens tend to be noisier and to generate more congestion. However, this negative marginal effect of garden area is fairly small and declines as the area increases. To take a concrete example, a 10,000 sq.ft increase in garden area, from 1000 to 11,000 sq.ft, reduces the external benefit by only 0.2 percentage points Spillover benefits are also negatively affected – though very slightly so - by the private ownership of the land on which the garden is sited. The benefit of a privately-owned garden is only 0.003 percentage points lower than that of similar garden sited on publicly-owned land. Finally, note that the coefficients on PostRing*D and

between properties adjacent to the garden site and out-of-ring properties was 11.1 percent; after the garden opened, this gap fell by 2.5 percentage points, to 8.6 percent.

Tpost measures the number of years between the opening of the garden and the property sale. The positive and significant coefficient on Tpost, together with the negative and significant coefficient on $Tpost^2$, imply that the positive impacts gardens have on surrounding properties grow over time at a (slightly) decreasing rate. The garden's increasing value to the neighborhood may result from greater certainty about the garden's maintenance, or perhaps may reflect neighbors' increasing awareness of, or involvement in, the garden. In the first year after the garden opens, the positive impact increases by 1.1 percentage points, and subsequent years bring additional, but smaller and smaller increments.[31] The negative and significant coefficient on the interaction between Tpost and distance suggests that impacts increase less over time farther away from the garden.

Estimates of the gardens' impact on commercial property values, shown in the second column of Table 4, present a much different picture. Again, the lots on which gardens will eventually be placed have a significant and negative effect on surrounding commercial property values before the garden is established, indicating that the vacant lot or other pre-garden use was a serious disamenity. The opening of a garden has no immediate effect on surrounding commercial properties (the PostRing coefficient is not statistically significant). A rise in property values may occur over time, however, as suggested by the positive and significant TPost coefficient – perhaps as gardens attract additional customers to the nearby commercial buildings, thus increasing the attractiveness of doing business in the neighborhood.

Figure 1 and Table 5 show estimated impacts on residential property values for a typical New York garden with an area of 6,000 sq.ft. – the median garden size in our sample.[32] The thick line in Figure 1 shows the percentage difference between prices in the ring and prices in the surrounding neighborhood, before the garden was established. As noted, this pre-garden

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PostRing_GArea∗D are not statistically significant, suggesting that impacts vary little with distance from the site right after garden opening.

[31] We cannot determine when this growth may stop because this would require making out-of-sample predictions (the maximum value for TPost in our sales samples is 26 years, and the growth rate stays positive during this whole interval).

[32] We use the median rather than the mean garden size to define the typical garden because our sample distribution of garden area is highly skewed to the right (e.g., the mean is larger than the 80^{th} percentile).

gradient is fairly steep, climbing at a rate of 1 percentage point per 100 feet, such that sales prices for property nearest to the site are 11.1 percent lower than prices for properties outside the 1000 foot ring.

The thinner lines above show price gradients one, three, and five years after garden opening and suggest substantial impacts, especially for housing close by. Before garden opening, prices are initially 11.1 percent lower in the immediate vicinity of the garden site; in the first year after opening this gap falls by 3.5 percentage points, to 7.6 percent. Over the five-year period after opening, the gap falls by 7.7 percentage points, to only 3.4 percent. Note that at 1,000 feet, impacts are smaller, ranging from 1 percentage point one year after the garden opening to 2.3 percentage points five years after opening.[33]

Table 5 also includes the dollar-value of garden impacts, estimated by applying the percentage-point impacts to the median real sale price - expressed in 2003 dollars - for housing in the 1000-foot rings around gardens ($88,031).[34] For example, in the immediate vicinity of the garden, the dollar-value impact is $3,099 one year after opening, and grows to $6,809 five years after opening.

In summary, we find that gardens were located on sites that acted as local disamenities within their communities. After opening, gardens have a positive impact on surrounding residential property values, which grows steadily over time, and declines somewhat with garden area and distance to the garden. Gardens do not appear to have any significant immediate impacts on neighboring commercial property values, although benefits may occur over time.

Heterogeneity of impacts across different neighborhood types

The first two columns of Table 6 report the results of the residential model in which impacts are allowed to vary between lower and higher income submarkets. Coefficients in

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[33] Note however that these estimates likely understate impacts at 1000 feet because the coefficients on the interactions of PostRing and Garden area with distance are not statistically significant, and yet we included them in predictions. Discarding the insignificant coefficients yields impact estimates at 1000 feet that vary between 2.8 percentage points one year after opening to 4 percentage points five years after opening.

[34] We use median rather than mean price in our simulations because the citywide mean house price is driven up by the hot submarkets in Manhattan and certain areas of Brooklyn. Nonetheless, in Table A2 in the appendix, we also show the less conservative dollar-value impact estimates based on the mean housing price in rings ($125,275). Right next to the garden, these estimates range from $4,410 one year after opening to $9,690 five years after opening.

column (1) capture impacts in higher-income submarkets; coefficients in column (2) capture the difference between the impacts in low- and higher-income submarkets.

The estimates reveal significant differences in garden impacts between the low and higher income neighborhoods. The coefficient for the PostRing variable (indicating that the property is within 1000 feet of a site on which a garden has been established) is not statistically significant in higher-income areas, but it is positive, significant, and relatively large in low-income areas.[35] These differences suggest that, while there is little positive impact of gardens in higher-income neighborhoods (at least not soon after opening)[36] gardens are likely to generate significant and sustained benefits in poorer neighborhoods.[37] We estimate that the price differential between a property located right next to a typical garden and a comparable property located outside the ring falls by 5.9 percentage points one year after a garden opens in low-income submarkets. This translates into a dollar-value of $5,232 (based on the city-wide median price). Five years after the garden opens, the impact is even larger: 9.5 percentage points or $8,405 (again, based on the city-wide median price). Again, impacts are smaller farther away from the garden, at 1000 feet away ranging from 0.9 percentage points one year after opening to 2.2 percentage points five years after opening (see appendix, Table A3 for more detailed estimates).

The finding that community gardens bring significantly larger benefits in lower-income neighborhoods is not surprising. As pointed out in several prior studies (Francis et al., 1984; Harnick, 2000; Saldivar-Tanaka and Krasny, 2004), gardens in poor neighborhoods provide an affordable alternative to city parks, which are usually located in more affluent neighborhoods and are not easily accessible to poor residents.

In the commercial model, shown in the last two columns of Table 6, we find virtually no difference in the neighborhood impacts of gardens for low income and higher income neighborhoods. The impacts of the gardens are statistically insignificant in both types of neighborhoods.

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[35] Additionally, in low-income neighborhoods, the negative marginal effect of additional garden area is significantly smaller than in higher income neighborhoods, and the positive TPost coefficient is only slightly smaller.

[36] Indeed, in higher income areas, the immediate impact of large gardens may be even negative; however, as time goes by, we may see benefits arising in these areas, too, as suggested by the positive and significant TPost coefficient.

[37] Note, however, that even in higher income areas benefits may arise over time, as suggested by the positive and significant TPost coefficient.

Garden Quality

We were unable to rate the quality of all the gardens in our sample, so we focused our quality survey on gardens in the Bronx. Our analysis of whether and how quality matters, therefore must use estimates of our baseline specification based on the surveyed Bronx gardens only. These estimates are presented in Table 7. The results for the residential model, shown in the first column, are generally in line with our general findings – gardens have a statistically significant positive effect on in-ring properties. The results also are consistent with our analysis of the neighborhood heterogeneity of impacts – that is, the positive impacts of gardens are larger in lower income areas, such as the Bronx. Note however that in the Bronx model, the positive PostRing coefficient and the negative coefficients of PostRing*D and Garden area are substantially larger than the low-income submarket coefficients estimated for the whole city, whereas the TPost coefficient is not statistically significant. These suggest that the positive impacts of Bronx gardens, although very large for small gardens and in the immediate garden proximity, decline relatively quickly with garden area and distance to the garden, and are time invariant.

Estimates of the commercial model based on the surveyed gardens are shown in the second column of Table 7, and are consistent with our previous findings that gardens have little impact on commercial property values.

The garden quality measures summarized in Table 2 show that between 60 and 77 percent of the surveyed gardens (depending on the assessment method) have acceptable overall condition. About two thirds of the surveyed gardens have acceptable community access and fencing quality/security; more than half are acceptable in terms of cleanliness and have some sort of (non-seasonal) decorations; a large majority (93 percent) have acceptable landscaping; and relatively few gardens (35 percent) have some kind of social gathering spaces.

We next turn to the results of estimating several extensions of the baseline model, that include variables describing the quality of gardens. First, we focus on the estimates of a specification that includes the “Acceptable / Not Acceptable” measure of the overall garden condition derived from the whole survey questionnaire. Table 8 presents these estimates for both the residential and commercial sales samples. As shown in the second column of Table 8, our estimate of the effect of the overall garden condition on commercial property values is not statistically significant, so our discussion will focus on the residential properties.

The coefficients of the residential model recorded in column (1), reveal first that gardens with acceptable overall condition were built in relatively more distressed neighborhoods than gardens with unacceptable overall condition. Specifically, the InRing coefficient shows that prior to the garden opening, properties located right next to a site that would host a low-quality garden sold for 6.6 percent less than comparable properties located outside the 1,000-foot ring (but still in the same census tract).[38] By comparison, for sales adjacent to sites that will ultimately hold good-quality gardens, estimated prices initially were 14.5 percent lower than in the surrounding neighborhood.[39] These disamenity effects decline with distance to the site, as shown by the positive InRing*D coefficient.

The PostRing coefficient, which quantifies the fixed effect of a low-quality garden, is significant, positive and has a magnitude of 7.3 percentage points. By comparison, the (fixed) effect of a good-quality garden – given by the sum of the coefficients on PostRing and Share of existing garden area with acceptable quality - is twice as large, suggesting that garden quality plays an important role for its impacts. As noted earlier, impacts decline significantly with garden area and distance to the garden, but are time invariant.

Again, simulations are helpful to summarize results. The impact of a low-quality garden of typical size on the properties located in its immediate vicinity is 6.2 percentage points, whereas that of a good-quality garden of similar size is 13.9 percentage points.[40] As distance to the garden increases, however, the positive impact of low-quality gardens vanishes (at around 540 feet) and is transformed into an increasingly negative effect which reaches 5.3 percentage points at 1000 feet. By comparison, the positive impact of good-quality gardens, although it diminishes, too, with distance, can still be felt at 1000 feet, with a magnitude of 2.4 percentage points.[41]

[38] In this discussion, we are using interchangeably the terms "acceptable (unacceptable) condition" and "good (low)-quality"
[39] The 14.5 percent is obtained by adding up the coefficients on the InRing and the Share of existing/future garden area variables.
[40] These estimates are computed at one year after garden opening; however impacts vary little over time in this specification, as shown by the insignificant TPost coefficients.
[41] This is because the positive impact of good-quality gardens is much larger right next to the garden (at D=0).

These results are robust across specifications using alternative measures of the overall garden condition (described in the methodology section above). The estimates of these alternative specifications are presented in the appendix, Tables A4 and A5.

Table 9 presents results of specifications that focus on specific aspects of garden quality identified in the survey - community access, fencing quality/security, cleanliness, landscaping, decorations, and social spaces.[42] The results for the residential model reported in the first column show that the features that matter most are fencing quality/security, cleanliness, and landscaping. Ensuring good fencing quality and security boosts the garden impact by 3.1 percentage points, on average (relative to the impact of a garden with unacceptable fencing quality and security); acceptable garden cleanliness adds 4.1 percentage points; and acceptable landscaping increases impacts by 5.5 percentage points.

Costs and Benefits of Community Gardens

The City usually has incurred little or no expense, other than opportunity costs, related to the development and maintenance of the existing community gardens. These costs usually were supported by funds local community groups raised from local fundraising or from grants from foundations, private individuals, or federal or state government agencies. However, from a policy perspective, it would be informative to also consider alternative scenarios in which some or all costs are paid for through public subsidies.

To quantify garden costs, we rely on estimates provided in earlier studies by Francis, Cashdan, and Paxson (1984) and Francis (1987). The former study, which surveyed a group of community gardens in New York City, estimated that when all the resources contributed are considered, such as technical assistance, materials, and hours of time and sweat, the funding needed for the development of a middle-scale project can total \$5,000 - \$20,000.[43] We use the upper limit of this range to be conservative. Maintenance costs are not included in these

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[42] As shown in the second column of Table 9, these specific garden features play little role in the garden impacts on commercial property values, so our discussion will, again, focus on the residential properties. The only significant coefficient among the quality variables in the commercial model is that on the share of garden area with decorations. However, given its abnormal magnitude, we believe that this finding may be just a fluke of the data.

[43] Most of the gardens on which these estimates are based were developed at the end of the 1970s, so we assume that these dollar values represent 1980 dollars. In 2003 dollars, the cost ranges between \$11,200 and \$44,700.

estimates; however, in a study of community gardens and parks in Sacramento, Francis (1987), found that these costs are small - a 121,300 square feet community garden (much larger than the typical garden size in New York) costs only $550 per year to maintain.[44,45] To obtain the total garden cost, we add the net present value of a perpetual stream of maintenance costs to the (one-time) development costs.[46] In the end, we estimate that a garden would cost, on average, about $131,000 (in 2003 dollars) to develop and maintain.

To simulate the gross tax revenue gains generated by community gardens, we estimate the aggregate increase in residential property values generated by each garden (within a 1,000-foot radius) and then apply a standard tax assessment formula to these benefits, following the approach in Schwartz, Ellen, Voicu, and Schill (2005).[47] Specifically, to estimate the aggregate benefits, we undertake a three-step process. First, we use the RPAD database[48] to identify all the residential properties (whether sold or not) that were located within 1,000 feet of a garden site and thus should have benefited from the garden establishment.

Second, we assign an approximate initial or "pre-completion" price to each of these properties. To do this, we first calculated, for each year in our data, the median per unit sales price for all properties that sold within 1000 feet of garden sites, prior to the establishment of any garden. We then assigned a pre-completion price to each property (sold or not) equal to the median pre-completion price in ring estimated for its year of earliest project completion.

Third, we use the pre-completion price and number of units of each property, the size and land ownership of gardens within 1,000 feet of each property, the distance from each property to the nearest garden site, and our baseline post-completion coefficients, to estimate the increase in property values that should have occurred following garden completion. The sum of these gains over all properties is an estimate of the total benefit that all the gardens delivered to residential

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[44] Urban Harvest, an independent nonprofit organization supporting community gardening, also mentions on its website (http://www.urbanharvest.org/community/budgeting.html) that most gardens only require "a few hundred dollars a year" in maintenance costs.

[45] Since the first version of this study occurred in 1984, we assume that the $550 maintenance costs represent 1984 dollars.

[46] Again, to be conservative, we compute the present value of maintenance costs over an infinite time horizon, which is consistent with the assumption that gardens are indestructible assets providing a perpetual stream of services. For this computation, we assume a growth rate in maintenance costs of 4.2 percent (equal to the average inflation rate over the study period), and a discount rate of 5.35 percent (the average for recent city general obligation debt issues).

[47] We limit our simulation to residential properties because we did not find much effect of gardens on commercial property values.

[48] The RPAD database is an annual census of all New York City properties, described above.

properties within a 1,000-foot radius. To be conservative, we assume that the growth in impacts over time (given by the TPost coefficient) ends five years after garden establishment. And, given this assumption, we compute total benefits as the net present value of the five annual increments.[49]

Using this three-step method, we estimate that the benefits generated in the 1,000-foot ring total almost $1.5 billion (in 2003 dollars) – or $2.3 million per garden.[50] To measure the corresponding tax revenue gains, we first discount total benefits by a factor of 0.7 since the appraised market values used by the New York City Department of Finance for tax assessment purposes are, on average, about 70% below sales prices (on which our measured benefits are based). We then estimate the increase in tax revenues in the first year after garden completion by applying the New York City assessment ratios and tax rates to the discounted benefits accrued during that year.[51] Finally, we compute the total tax revenue gains as the present value of the stream of annual tax benefits over a 20-year period, based on assumptions suggested by the staff of the New York City Independent Budget Office.[52]

In the end, we estimate that the city gross tax benefit generated by all community gardens over a 20-year period amounts to about $563 million. Under the scenario in which the local government would have fully subsidized the garden provision, the city's total investment would have amounted to about $83.5 million. Thus, the estimated net tax benefit would be, in the aggregate, about $480 million or, per garden, over $750,000.

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[49] For this calculation, we assume, again, a temporal discount rate of 5.35 percent.

[50] A comparison between the 1998 assessed values of properties in rings that sold in 1999 and the assessed values of *all* properties in rings suggests that transacting properties may have higher values than other properties. We thus correct for this selection bias when estimating total benefits.

[51] Assessment ratios and tax rates vary by property type. The Department of Finance groups residential properties into three classes - class 1 (1-3 family houses), class 2 (4-6 family buildings), and class 2A (all the others) - and sets an assessment ratio and a tax rate for each class. The assessment ratio for class 1 is 0.08, for class 2 is 0.25 and for class 2A is 0.45. The tax rate for class1 is 0.116, and for the other two classes is 0.108. Due to this variation in assessment and tax rates, we also estimate the total benefits from gardens separately for each of the three building classes and then apply the corresponding rates to the benefit for each class.

[52] Specifically, we assume an annual growth of 2.5 percent in property taxes over 20 years, based on average increases in assessments, and a discount rate of 5.35 percent. Note that during the first five years after garden completion, the assumed 2.5 percent annual increase in taxes is over and above the increase due to the growth in garden impacts.

Conclusion

Our finding that community gardens have significant positive effects on surrounding property values in all neighborhoods, and that those effects are substantial in the poorest of host neighborhoods (raising neighboring property values by as much as 9.5 percentage points within five years of the garden's opening) should help local governments make sounder decisions about whether (and how much) to invest in (or encourage private investment in) community gardens and other green spaces. Such investments have a sizeable payoff for the surrounding community, and ultimately for the city itself, as it realizes additional property tax revenues from the neighborhood.

Our findings also will help local governments considering whether to use tax increment financing (TIF) to estimate the potential benefits of investments in urban parks and gardens. Our results show that such gardens can lead to increases in tax revenues of around $750,000 per garden over a 20-year period. Finally, local governments may use our results to justify the imposition of impact fees to finance the provision of gardens or urban parks, by showing the benefits the developers' properties will receive as a result of proximity to such spaces.

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Table 1

Characteristics of Residential Properties Sold

	Percentage of all property sales	Percentage of sales within 1000 feet of community garden sites
Borough		
Manhattan	8.0	17.2
Bronx	12.0	14.3
Brooklyn	37.2	53.3
Queens	37.4	14.6
Staten Island	5.4	0.7
Building Class		
Single-family detached	21.8	10.0
Single-family attached	13.9	9.0
Two-family	33.1	31.6
Walk-up apartments	18.1	31.5
Elevator apartments	1.0	2.0
Loft buildings	0.0	0.0
Condominiums	7.7	9.2
Mixed-use, primarily residential	4.3	6.7
(includes store or office plus residential units)		
Other Structural Characteristics		
Built pre-World War II	78.4	89.4
Vandalized	0.0	0.2
Other abandoned	0.1	0.3
Garage	33.9	16.3
Corner location	7.3	7.5
Major alteration prior to sale	1.1	3.4
N	517,791	77,642

Note: Universe = all sales in community districts with community gardens

Characteristics of Commercial Properties Sold

	Percentage of all property sales	Percentage of sales within 1000 feet of community garden sites
Borough		
Manhattan	11.9	16.8
Bronx	16.1	20.6
Brooklyn	44.0	53.8
Queens	24.6	8.0
Staten Island	3.4	0.8
Building Class		
Industry	24.6	25.0
Retail	68.8	69.8
Office	6.6	5.2
Other Structural Characteristics		
Built pre-World War II	76.5	84.7
Vandalized	0.2	0.3
Other abandoned	0.4	0.5
Garage	4.1	2.2
Corner location	27.4	26.9
Major alteration prior to sale	5.8	6.2
N	26,760	6,252

Table 2A. Descriptive statistics on New York City gardens

Garden area (x 1000 sq. ft.)	
mean	35.5
median	6.0
Completion year	
% established between 1977 and 1980	8.8
% established between 1981 and 1990	29.3
% established between 1991 and 2000	61.8
Land Ownership	
% public	95.3
% private	4.7
% Borough	
Manhattan	27.2
Bronx	23.1
Brooklyn	43.1
Queens	6.1
Staten Island	0.5
Number of gardens	636

Table 2B. Descriptive statistics on surveyed gardens in the Bronx

Garden area (x 1000 sq. ft.)	
mean	9.7
median	6.1
Completion year	
% established between 1977 and 1980	8.2
% established between 1981 and 1990	36.1
% established between 1991 and 2000	55.8
Land Ownership	
% public	95.3
% private	4.7
Overall quality of garden	
% gardens with acceptable overall quality[1]	76.7
% gardens with acceptable overall quality[2]	60.5
Detailed garden quality	
% gardens with acceptable community access	67.4
% gardens with acceptable fencing/security	64.0
% gardens with acceptable cleanliness	55.8
% gardens with acceptable landscaping	93.0
% gardens with (non-seasonal) decorations	53.5
% gardens with social spaces	34.9
Number of gardens	86

1) Based on surveyor's assessment

2) Based on answers to all questions

Table 3. 1980 Characteristics of Census Tracts with and without Gardens

	Tracts with gardens	Tracts without gardens but in SBA with gardens
Mean family income	29,649	45,593
Mean poverty rate	36.7	18.8
Mean unemployment rate	13.2	8.1
Mean homeownership rate	12.7	31.5
Mean vacancy rate	5.8	2.9
Mean percentage of 25+yr old residents with some college education	16.8	25.2
Mean percentage black	49.8	25.1
Mean percentage Hispanic	31.8	18.8
Mean percentage foreign born	17.9	24.0
Mean percentage kids (age<5 years)	10.0	7.8
Mean percentage age 5-17	23.2	18.4
Mean percentage age 18-64	57.1	59.9
Mean percentage old (age 65+)	9.7	13.9
Mean percentage of 5+yr old people who didn't change address within last 5 years	57.3	61.0
N tracts	308	1316

Notes:

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

Table 4. Selected Regression Results - Baseline Models

	Residential	Commercial
Ring variables		
In Ring	-0.1108 ***	-0.1847 ***
	(0.0057)	(0.0392)
In Ring * D	9.9E-05 ***	2.0E-04 ***
	(7.4E-06)	(4.9E-05)
Post Ring	0.0254 **	0.0354
	(0.0101)	(0.0705)
Post Ring * D	-1.8E-05	-4.2E-05
	(1.3E-05)	(9.7E-05)
Garden area at the time of sale	-2.0E-04 ***	-1.8E-04
	(5.8E-05)	(5.5E-04)
Garden area at the time of sale * D	8.8E-08	-2.7E-07
	(7.2E-08)	(7.3E-07)
(Garden area at the time of sale)^2	6.6E-08 *	5.7E-07
	(3.6E-08)	(4.9E-07)
Share of privately owned land at the time of sale	0.0000 ***	-0.0001
	(0.0000)	(0.0001)
Tpost	0.0111 ***	0.0175 ***
	(0.0012)	(0.0062)
Tpost * D	-7.4E-06 ***	-2.1E-05 **
	(1.0E-06)	(9.4E-06)
Tpost^2	-8.6E-05 **	
	(4.2E-05)	
N	517,791	26,760
R^2	0.8560	0.7838

Note :
All regressions include census tract and community district-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 5. Impacts of a Typical Garden on Residential Property Values
(estimates based on median per-unit sales price of properties in rings)

	Distance to garden site (feet)					
	0		500		1000	
Time since completion	%	$-value	%	$-value	%	$-value
right after completion	2.4	2,134	1.5	1,359	0.7	585
1 year	3.5	3,099	2.3	1,997	1.0	895
3 years	5.7	4,984	3.7	3,227	1.7	1,470
5 years	7.7	6,809	5.0	4,397	2.3	1,985

Notes : % impact is percentage point change in gap between prices in ring and outside;
$-value impact is obtained by applying the % impact to the median per-unit sales price of properties sold in rings. Median price per unit of properties sold in rings is $88,031
The typical garden is considered one which is publicly-owned and has an area of 6,000 sq.ft. (the median garden size in our sample).

Table 6. Models with Neighborhood Heterogeneity

	Residential		Commercial	
	High Income Submarket	Low Income - High Income Differential	High Income Submarket	Low Income - High Income Differential
	(1)	(2)	(3)	(4)
Ring variables				
In Ring	-0.0468 ***	-0.0931 ***	-0.2364 ***	0.0799
	(0.0102)	(0.0123)	(0.0724)	(0.0859)
In Ring * D	3.9E-05 ***	8.7E-05 ***	2.3E-04 **	-3.3E-05
	(1.3E-05)	(1.6E-05)	(9.3E-05)	(1.1E-04)
Post Ring	-0.0235	0.0746 ***	0.1156	-0.0983
	(0.0190)	(0.0224)	(0.1531)	(0.1726)
Post Ring * D	2.9E-05	-7.1E-05 **	-1.4E-04	1.0E-04
	(2.6E-05)	(3.0E-05)	(2.1E-04)	(2.4E-04)
Garden area at the time of sale	-3.7E-04 ***	2.6E-04 **	-1.7E-03	2.0E-03
	(9.6E-05)	(1.2E-04)	(1.8E-03)	(1.9E-03)
Garden area at the time of sale * D	6.1E-08	4.7E-08	7.5E-07	-1.4E-06
	(1.0E-07)	(1.4E-07)	(1.5E-06)	(1.8E-06)
(Garden area at the time of sale)^2	2.3E-07 ***	-2.5E-07 ***	3.4E-06	-3.0E-06
	(5.7E-08)	(7.4E-08)	(4.1E-06)	(4.1E-06)
Share of privately owned land at the time of sale	-4.0E-05 ***	3.2E-05 *	-7.8E-05	-2.1E-05
	(1.5E-05)	(1.9E-05)	(1.1E-04)	(1.5E-04)
Tpost	0.0138 ***	-0.0048 *	0.0096	0.0096
	(0.0022)	(0.0026)	(0.0126)	(0.0145)
Tpost * D	-7.7E-06 ***	1.2E-06	-3.2E-05 *	1.8E-05
	(2.0E-06)	(2.3E-06)	(1.8E-05)	(2.1E-05)
Tpost^2	-2.6E-04 ***	2.6E-04 ***		
	(8.0E-05)	(9.4E-05)		
N	517791		26760	
R^2	0.8576		0.7843	

Note :
Coefficients in columns (2) and (4) correpond to a set of interactions between the ring variables and a dummy which is equal to 1 for the low income submarket and 0 otherwise. The low income submarket comprises community districts for which the CD/MSA mean household income ratio is smaller than 0.8 (and the high income submarket includes all the other community districts).
The regressions include census tract and CD-quarter dummies, and the full set of building controls and their interactions with the low income submarket dummy.
Standard errors in parentheses. *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

Table 7. Baseline Models based on Survey Samples

	Residential	Commercial
Ring variables		
In Ring	-0.1221 ***	-0.3089 **
	(0.0178)	(0.1304)
In Ring * D	1.0E-04 ***	5.3E-04 ***
	(2.3E-05)	(1.7E-04)
Post Ring	0.1230 ***	0.0211
	(0.0273)	(0.2403)
Post Ring * D	-1.1E-04 ***	1.1E-04
	(3.6E-05)	(3.2E-04)
Garden area at the time of sale	-2.2E-03 **	4.8E-04
	(8.9E-04)	(7.9E-03)
Garden area at the time of sale * D	-6.4E-07	-1.9E-05 **
	(8.6E-07)	(8.6E-06)
(Garden area at the time of sale)^2	1.7E-05 ***	1.1E-04 **
	(5.5E-06)	(5.0E-05)
Share of privately owned land at the time of sale	0.0000	0.0000
	(0.0000)	(0.0002)
Tpost	0.0016	0.0310
	(0.0033)	(0.0198)
Tpost * D	1.6E-06	-3.7E-05
	(2.8E-06)	(2.8E-05)
Tpost^2	-1.5E-05	
	(1.2E-04)	
N	61,880	4,298
R^2	0.8755	0.6682

Note :
All regressions include census tract and community district-quarter dummies and the full set of building controls.
Standard errors in parentheses. *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

Table 8. Models with Overall Quality of Garden

	Residential	Commercial
Ring variables		
In Ring	-0.0663 ***	-0.0429
	(0.0212)	(0.1482)
In Ring * D	9.5E-05 ***	4.7E-04 ***
	(2.3E-05)	(1.7E-04)
Overall quality of future or existing gardens		
Share of existing or future garden area with acceptable quality	-0.0787 ***	-0.3691 ***
	(0.0159)	(0.0979)
Post Ring	0.0734 **	-0.0717
	(0.0295)	(0.2545)
Post Ring * D	-1.1E-04 ***	1.3E-04
	(3.6E-05)	(3.1E-04)
Garden area at the time of sale	-2.1E-03 **	-2.0E-03
	(8.9E-04)	(8.0E-03)
Garden area at the time of sale * D	-6.6E-07	-1.8E-05 **
	(8.6E-07)	(8.6E-06)
$(\text{Garden area at the time of sale})^2$	1.7E-05 ***	1.2E-04 **
	(5.5E-06)	(5.0E-05)
Share of privately owned land at the time of sale	-3.9E-05	-3.5E-05
	(3.3E-05)	(2.4E-04)
Tpost	0.0013	0.0345 *
	(0.0033)	(0.0198)
Tpost * D	1.9E-06	-4.0E-05
	(2.8E-06)	(2.8E-05)
Tpost^2	-2.2E-05	
	(1.2E-04)	
Overall quality of existing gardens at the time of sale		
Share of existing garden area with acceptable quality	0.0773 ***	0.1448
	(0.0167)	(0.1179)
N	61,880	4,298
R^2	0.8756	0.6698

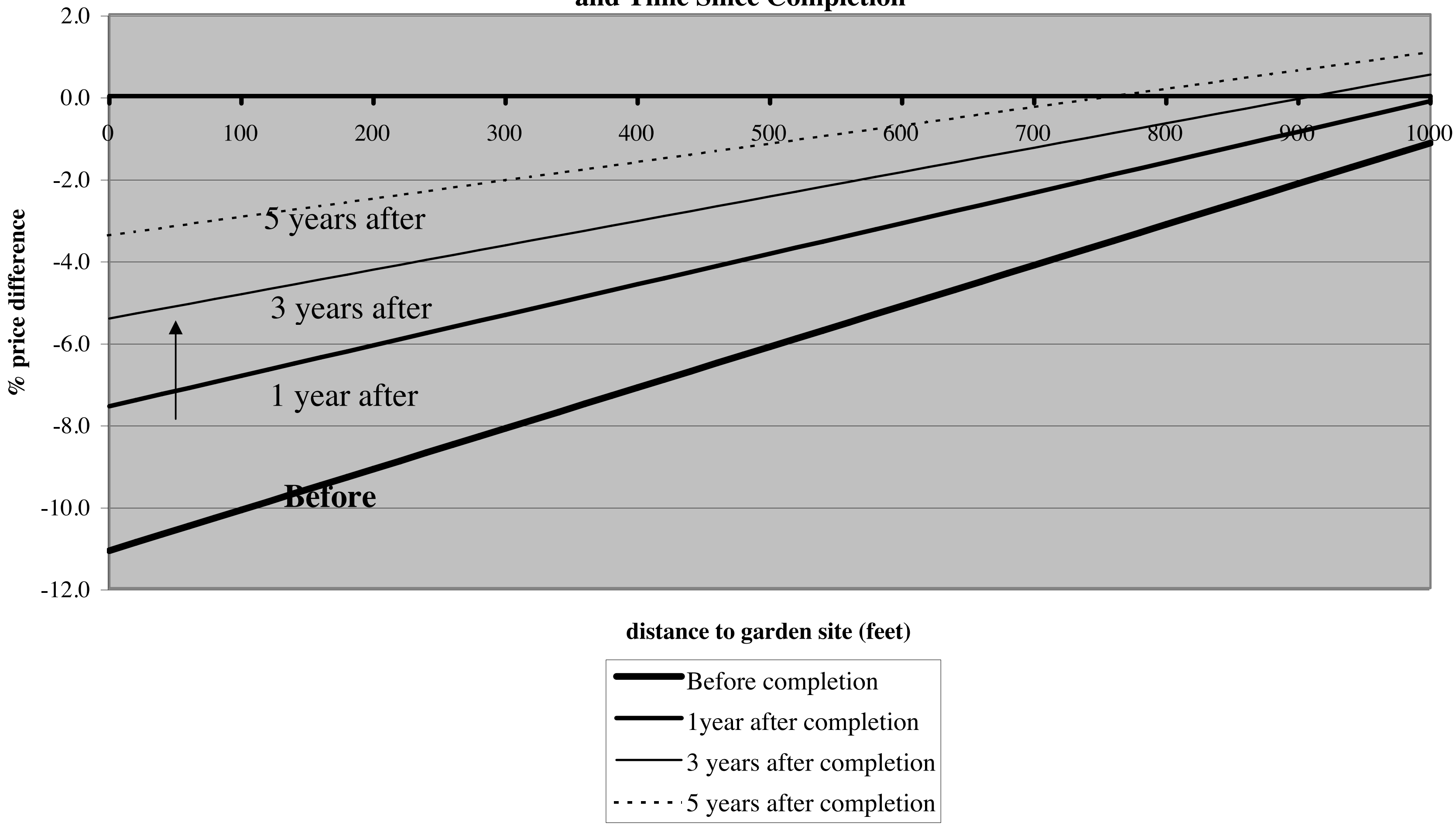
Note :
All regressions include census tract and community district-quarter dummies and the full set of building controls.
Standard errors in parentheses. *** denotes 1% significance level; ** denotes 5% significance level;
* denotes 10% significance level.

Table 9. Models with Specific Quality Features

	Residential	Commercial
Ring variables		
In Ring	-0.1019 ***	-0.0552
	(0.0201)	(0.1448)
In Ring * D	1.0E-04 ***	4.9E-04 ***
	(2.3E-05)	(1.7E-04)
Overall quality of future or existing garden		
Share of existing or future garden area with acceptable quality	-0.0344 **	-0.3436 ***
	(0.0137)	(0.0901)
Post Ring	0.0598 *	-0.2014
	(0.0325)	(0.3161)
Post Ring * D	-1.1E-04 ***	1.5E-04
	(3.7E-05)	(3.1E-04)
Garden area at the time of sale	-2.5E-03 ***	-2.1E-04
	(9.0E-04)	(8.2E-03)
Garden area at the time of sale * D	-8.8E-07	-2.0E-05 **
	(8.6E-07)	(8.6E-06)
(Garden area at the time of sale)^2	1.7E-05 ***	1.3E-04 ***
	(5.6E-06)	(5.0E-05)
Share of privately owned land at the time of sale	-1.5E-05	1.5E-04
	(3.5E-05)	(2.7E-04)
Tpost	0.0010	0.0348 *
	(0.0033)	(0.0199)
Tpost * D	1.3E-06	-4.2E-05
	(2.8E-06)	(2.8E-05)
Tpost^2	2.2E-05	
	(1.2E-04)	
Detailed garden quality at the time of sale		
Share of existing garden area with acceptable community access	0.0100	-0.0562
	(0.0196)	(0.1403)
Share of existing garden area with acceptable fencing/security	0.0312 **	0.1490
	(0.0155)	(0.1052)
Share of existing garden area with acceptable cleanliness	0.0406 **	0.0868
	(0.0194)	(0.0994)
Share of existing garden area with acceptable landscaping	0.0546 **	-0.1555
	(0.0251)	(0.2212)
Share of existing garden area with (non-seasonal) decorations	-0.0187	0.3473 ***
	(0.0144)	(0.1125)
Share of existing garden area with social spaces	-0.0111	0.0388
	(0.0150)	(0.1177)
N	61,880	4,298
R^2	0.8756	0.6707

Note :
All regressions include census tract and community district-quarter dummies and the full set of building controls
Standard errors in parentheses. *** denotes 1% significance level; ** denotes 5% significance level;
* denotes 10% significance level.

Figure 1
Percent Differerence between Residential Prices in 1,000-Foot Ring and Surrounding Neighborhood, Before and After Completion of a Typical Garden, by Distance to Garden Site and Time Since Completion



Note: The typical garden is considered one which is publicly-owned and has an area of 6,000 sq.ft. (the median garden size in our sample)

APPENDIX

Table A1. Complete Regression Results for Baseline Model

Residential

Variable	Coefficient	
Ring variables		
In Ring	-0.1108	***
	(0.0057)	
In Ring * D	9.9E-05	***
	(7.4E-06)	
Post Ring	0.0254	**
	(0.0101)	
Post Ring * D	-1.8E-05	
	(1.3E-05)	
Garden area at the time of sale	-2.0E-04	***
	(5.8E-05)	
Garden area at the time of sale * D	8.8E-08	
	(7.2E-08)	
(Garden area at the time of sale)^2	6.6E-08	*
	(3.6E-08)	
Share of privately owned land at the time of sale	0.0000	***
	(0.0000)	
Tpost	0.0111	***
	(0.0012)	
Tpost * D	-7.4E-06	***
	(1.0E-06)	
Tpost^2	-8.6E-05	**
	(4.2E-05)	
Ring variables for gardens with invalid completion year [1]		
In Ring	-0.0198	*
	(0.0105)	
Post Ring	0.0074	
	(0.0107)	
Garden area at the time of sale	-3.3E-07	***
	(4.3E-08)	
Characteristics of properties sold		
Vandalized	-0.0770	***
	(0.0243)	
Other abandoned	-0.0868	***
	(0.0138)	
Odd shape	0.0225	***
	(0.0017)	
Garage	0.0491	***
	(0.0012)	
Extension	0.0484	***
	(0.0016)	
Corner	0.0493	***
	(0.0018)	
Major alteration prior to sale	0.0454	***
	(0.0048)	
Age of unit	-0.0103	***
	(0.0001)	
(Age of unit)2	6.8E-05	***
	(8.4E-07)	
Age of unit missing	-0.2148	***
	(0.0042)	
Log square feet per unit	0.4120	***
	(0.0016)	
Number of buildings on same lot	-0.0410	***
	(0.0027)	

Commercial

Variable	Coefficient	
Ring variables		
In Ring	-0.1847	***
	(0.0392)	
In Ring * D	2.0E-04	***
	(4.9E-05)	
Post Ring	0.0354	
	(0.0705)	
Post Ring * D	-4.2E-05	
	(9.7E-05)	
Garden area at the time of sale	-1.8E-04	
	(5.5E-04)	
Garden area at the time of sale * D	-2.7E-07	
	(7.3E-07)	
(Garden area at the time of sale)^2	5.7E-07	
	(4.9E-07)	
Share of privately owned land at the time of sale	-0.0001	
	(0.0001)	
Tpost	0.0175	***
	(0.0062)	
Tpost * D	-2.1E-05	**
	(9.4E-06)	
Ring variables for gardens with invalid completion year [1]		
In Ring	0.0035	
	(0.0733)	
Post Ring	-0.0854	
	(0.0753)	
Garden area at the time of sale	-1.4E-07	
	(4.2E-07)	
Characteristics of properties sold		
Vandalized	-0.2856	***
	(0.1008)	
Other abandoned	-0.2083	***
	(0.0717)	
Odd shape	0.0977	***
	(0.0095)	
Garage	-0.0592	***
	(0.0214)	
Extension	0.0114	
	(0.0116)	
Corner	0.1366	***
	(0.0095)	
Major alteration prior to sale	0.1584	***
	(0.0190)	
Age of unit	-0.0088	***
	(0.0006)	
(Age of unit)2	4.0E-05	***
	(5.1E-06)	
Age of unit missing	-0.4283	***
	(0.0301)	
Log square feet	0.4813	***
	(0.0083)	
Square feet missing	3.1427	***
	(0.0735)	

Table A1. Complete Regression Results for Baseline Model (continued)

Residential

Includes commercial space	0.0284	***
	(0.0051)	
Square feet missing	2.8897	***
	(0.0200)	
Condo and square feet missing	-0.1124	***
	(0.0170)	
Single-family detached	0.0881	***
	(0.0017)	
Two-family home	-0.3354	***
	(0.0017)	
Three-family home	-0.5773	***
	(0.0022)	
Four-family home	-0.7579	***
	(0.0034)	
Five/six-family home	-1.1274	***
	(0.0039)	
More than six families, no elevator	-1.5211	***
	(0.0040)	
Walkup, units not specified	-1.3726	***
	(0.0054)	
Elevator apartment building, cooperatives	-1.3830	***
	(0.0092)	
Elevator apartment building, not cooperatives	-1.5100	***
	(0.0061)	
Loft building	-0.7711	***
	(0.0244)	
Condominium, single-family attached	-0.2397	***
	(0.0113)	
Condominium, walk-up apartments	-0.2445	***
	(0.0054)	
Condominium, elevator building	-0.5053	***
	(0.0050)	
Condominium, miscellaneous	-0.7777	***
	(0.0102)	
Multi-use, single family with store	-0.0865	***
	(0.0071)	
Multi-use, two-family with store	-0.5488	***
	(0.0062)	
Multi-use, three-family with store	-0.7706	***
	(0.0086)	
Multi-use, four or more family with store	-0.9609	***
	(0.0067)	
N	517,791	
R^2	0.8560	

Commercial

Log number of stories	-0.0491	***
	(0.0118)	
Log frontage	0.2483	***
	(0.0116)	
Commercial ratio on the block	0.0022	***
	(0.0002)	
Retail	0.0722	***
	(0.0121)	
Office	0.2942	***
	(0.0214)	
N	26,760	
R^2	0.7838	

Note :

All regressions include census tract and community district-quarter dummies.

Standard errors in parentheses. *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

1) Gardens with invalid completion year include gardens completed before 1977 or after 2000, and gardens with missing completion year.

For the later, we assume that the completion year is prior to the earliest sale date in our sales sample, so that we can construct the Post variable.

Table A2. Impacts of a Typical Garden on Residential Property Values

(estimates based on mean per-unit sales price of properties in rings)

	Distance to garden site (feet)					
	0		500		1000	
Time since completion	%	$-value	%	$-value	%	$-value
right after completion	2.4	3,037	1.5	1,934	0.7	832
1 year	3.5	4,410	2.3	2,842	1.0	1,273
3 years	5.7	7,093	3.7	4,592	1.7	2,092
5 years	7.7	9,690	5.0	6,257	2.3	2,825

Notes : % impact is percentage point change in gap between prices in ring and outside;
$-value impact is obtained by applying the % impact to the average per-unit sales price of properties sold in rings. Average price per unit of properties sold in rings is $125,275.
The typical garden is considered one which is publicly-owned and has an area of 6,000 sq.ft. (the median garden size in our sample).

Table A3. Impacts of a Typical Garden on Residential Property Values in Low- and High-Income Neighborhoods

(estimates based on median per-unit sales price of properties in rings)

	Low-income submarket						High-income submarket					
	Distance to garden site (feet)						Distance to garden site (feet)					
	0		500		1000		0		500		1000	
Time since completioı	%	$-value	%	$-value	%	$-value	%	$-value	%	$-value	%	$-value
right after completion	5.0	4,440	3.0	2,612	0.9	784	-2.6	-2,263	-1.1	-965	0.4	332
1 year	5.9	5,232	3.5	3,121	1.1	1,010	-1.2	-1,072	-0.1	-112	1.0	849
3 years	7.7	6,817	4.7	4,141	1.7	1,465	1.3	1,172	1.7	1,458	2.0	1,744
5 years	9.5	8,405	5.9	5,164	2.2	1,923	3.7	3,231	3.2	2,843	2.8	2,456

Notes : % impact is percentage point change in gap between prices in ring and outside; $-value impact is obtained by applying the % impact to the median per-unit sales price of properties sold in rings. Median price per unit of properties sold in rings is $88,031.

The typical garden is considered one which is publicly-owned and has an area of 6,000 sq.ft. (the median garden size in our sample).

The negative impacts in the high-income submarket should be treated with caution since they are mainly driven by the relatively large, negative, but statistically insignifcant PostRing coefficient

Table A4. Alternative Models with Overall Quality of Garden

	Residential		Commercial	
	(1)	(2)	(3)	(4)
Ring variables				
In Ring	-0.0486 **	-0.1449 ***	0.0719	-0.2517 *
In Ring * D	9.9E-05 ***	1.0E-04 ***	4.8E-04 ***	4.9E-04 ***
Overall quality of future or existing gardens				
Quality rating of existing or future garden (0-17 points)	-0.0072 ***		-0.0359 ***	
Share of existing or future garden area with low quality		0.0984 ***		0.2298 *
Share of existing or future garden area with excellent quality		0.0018		-0.1518 *
Post Ring	0.0568 *	0.1500 ***	-0.1555	0.0299
Post Ring * D	-1.2E-04 ***	-1.2E-04 ***	1.1E-04	1.1E-04
Garden area at the time of sale	-0.0021 **	-0.0021 **	-0.0009	0.0019
Garden area at the time of sale * D	-6.5E-07	-6.7E-07	-1.9E-05 **	-1.9E-05 **
$(\text{Garden area at the time of sale})^2$	1.7E-05 ***	1.6E-05 ***	1.2E-04 **	1.0E-04 **
Share of privately owned land at the time of sale	-4.0E-05	-4.3E-05	-2.8E-05	1.1E-04
Tpost	0.0015	0.0015	0.0332 *	0.0321 *
Tpost * D	1.9E-06	2.0E-06	-3.9E-05	-3.8E-05
Tpost^2	-3.3E-05	-3.1E-05		
Overall quality of existing gardens at the time of sale				
Quality rating of existing garden (0-17 points)	0.0069 ***		0.0189	
Share of existing garden area with low quality		-0.0932 ***		-0.2714
Share of existing garden area with excellent quality		-0.0056		0.0246
N	61,880	61,880	4,298	4,298
R^2				

Note :
All regressions include census tract and community district-quarter dummies and the full set of building controls.
Standard errors in parentheses. *** denotes 1% significance level; ** denotes 5% significance level;
* denotes 10% significance level.

Table A5. Alternative Models with Surveyor's Assessment of Overall Quality of Garden

	Residential			Commercial		
	(1)	(2)	(3)	(4)	(5)	(6)
Ring variables						
In Ring	-0.0605 **	-0.0803 ***	-0.1286 ***	-0.2595	-0.4916 ***	-0.4687 ***
In Ring * D	1.0E-04 ***	9.9E-05 ***	9.9E-05 ***	5.2E-04 ***	5.4E-04 ***	5.8E-04 ***
Overall quality of future or existing gardens						
Share of existing or future garden area with acceptable quality	-0.0713 ***			-0.0459		
Quality rating of existing or future garden (0-4 points)		-0.0150 **			0.0683	
Share of existing or future garden area with low quality			0.0686 ***			0.1415
Share of existing or future garden area with excellent quality			-0.0066			0.4001 ***
Post Ring	0.0651 **	0.0777 **	0.1255 ***	-0.1038	-0.2525	0.0293
Post Ring * D	-1.1E-04 ***	-1.1E-04 ***	-1.1E-04 ***	1.3E-04	1.7E-04	7.4E-05
Garden area at the time of sale	-0.0021 **	-0.0021 **	-0.0021 **	0.0017	0.0063	0.0032
Garden area at the time of sale * D	-6.9E-07	-6.4E-07	-6.8E-07	-1.9E-05 **	-1.9E-05 **	-1.9E-05 **
(Garden area at the time of sale)^2	1.7E-05 ***	1.7E-05 ***	1.7E-05 ***	1.1E-04 **	8.8E-05 *	1.0E-04 **
Share of privately owned land at the time of sale	-4.0E-05	-4.3E-05	-4.0E-05	8.1E-05	1.9E-04	1.1E-04
Tpost	0.0014	0.0016	0.0014	0.0317 *	0.0322 *	0.0276
Tpost * D	1.6E-06	1.7E-06	1.8E-06	-3.7E-05	-3.8E-05	-3.4E-05
Tpost^2	-5.7E-06	-1.8E-05	-1.3E-05			
Overall quality of existing gardens at the time of sale						
Share of existing garden area with acceptable quality	0.0663 ***					
Quality rating of existing garden (0-4 points)		0.0162 **		0.1133	0.0652	
Share of existing garden area with low quality			-0.0599 ***			-0.0910
Share of existing garden area with excellent quality			0.0165			-0.0363
N	61,880	61,880	61,880	4,298	4,298	4,298
R^2						

Note:
All regressions include census tract and community district-quarter dummies and the full set of building controls.
Standard errors in parentheses. *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

SURVEY QUESTIONAIRE

Garden Name:

Garden Address:

Identifying Information. If the name posted on the garden, or the location of the garden differs from the information we have provided to you, please note that information here:

Name: ____________________

Location Description: ____________________

____

____

Type of Garden. Please check **ONE** of the following.

IS a community garden: ❍
- ❑ Greenspace, with individual garden plots
- ❑ Greenspace, without individual garden plots.

NOT a community garden:
- ❑ Vacant/abandoned open space
- ❑ School Found, Garden not found
- ❑ Building, under construction
- ❑ Building, completed
- ❑ Other: ____________________

Community Accessibility. Please check ALL that apply.

- ❑ Is there information about when the garden is open to visitors? ❍

  Please list days/times/seasons the garden is open to the public if it is posted:

  ____

  ____

- ❑ Is there information about how community members can become involved with the garden? ❍
- ❑ Is there information suggesting an affiliation with a special program or organization? ❍
  - ❑ Green Thumb
  - ❑ Green Guerillas
  - ❑ New York Restoration Project
  - ❑ Other: ____________________

Decorations. Please check ALL that apply.

- ❑ Are there seasonal decorations? ❍
- ❑ Are there other decorations? ❍

Fencing. Please check ALL that apply.

- ❑ Is the fence secure? ❍
- ❑ Does the fence have special permanent features? ❍
- ❑ Is the fence visually appealing? ❍
- ❑ Is the entrance well-demarcated? ❍

Cleanliness. Please check ALL that apply.

- ❑ Is there litter/trash inside the garden's fence (not in receptacle)? ❍
- ❑ Is there litter/trash on the sidewalk in front of the garden (not in receptacle)? ❍
- ❑ Are there trash receptacles in the garden? ❍
- ❑ Are there receptacles designated for recycling? ❍
- ❑ Is there evidence of dumping or that the garden is being used for furniture/appliance storage? ❍
- ❑ Are tools stored in neat and orderly manner? ❍
- ❑ Is there broken glass, condoms, dead animals, or drug paraphernalia? ❍
- ❑ Is there graffiti? ❍
- ❑ Is the garden relatively free of weeds? ❍

Garden Plots. Please check ALL that apply.

- ❑ Are garden beds bordered or raised? ❍
- ❑ Are all the beds planted? If not, are unplanted beds tidy, or covered with mulch, or fabric/plastic? ❍
- ❑ Are any plantings in bloom? ❍
- ❑ Are there permanent plantings? ❍

Social Spaces. Please check ALL that apply.

- ❑ Is there an orderly, unsheltered gathering area? ❍
- ❑ Is there an orderly, semi-sheltered gathering area? ❍
- ❑ Is there an orderly, fully-sheltered gathering area? ❍
- ❑ Is there a BBQ grill or gas stove? ❍
- ❑ Is there a play area for children? ❍

Overall Assessment. Assume a new Community Garden is going to be installed in your neighborhood. How much would you like the new CG to be just like this? Circle one choice, on a scale of 1 to 5.

1	2	3	4	5
Strongly Dislike		*Indifferent*		*Strongly Like*