Neighborhood Revitalization in New York City in the 1990s

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Introduction. New York City is widely perceived to have become a nicer place to live and work over the past decade. At the start of the decade a number of neighborhoods were far below the citywide average on several dimensions, particularly housing adequacy and public safety. The inequality across neighborhoods was readily apparent in the condition of a number of low- and moderate-income neighborhoods in parts of the Bronx and Brooklyn. The difficult conditions led to an intensification of both private and public sector actions on several fronts to improve the quality of life in low-income neighborhoods. A prominent example of these targeted efforts was the city's "Ten Year Plan" for housing rehabilitation and new construction, probably the largest public effort of its kind. The city's economy also experienced a boom over the 1990s. After reversing the losses of the 1989-1992 downturn, economic activity experienced its sharpest expansion in four decades. The combination of economic expansion and targeted private and public sector programs would appear to provide the most favorable circumstances for an improvement in the quality of life for residents of the city's poorest neighborhoods.[1]

This paper characterizes the pattern of neighborhood revitalization over the 1990s in New York City, with a particular emphasis on low- and moderate-income neighborhoods. We then explore the role of targeted city programs in driving these outcomes. Our operational definition of a neighborhood is a sub-borough, of which there are 55 in New York City. We exploit a variety of data sources available at this level of disaggregation, including the New York City Housing and Vacancy Survey (HVS) and

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[1] For an overview of recent trends in New York City's neighborhoods, see Schill and Daniels (2003).

the U.S. Census of Population. The particular targeted public policy program of interest is the housing assistance provided through the New York City Capital Programs, and data on this program are taken from the Department of Housing Preservation and Development (HPD).

We focus our analysis of neighborhood revitalization on measures of the quality and price of the housing stock, utilizing both neighborhood level and individual housing unit data. We also provide a discussion of the associated reduction in crime outcomes throughout the city. It is important to note that our measures of revitalization are independent of the economic and social characteristics of the residents themselves, and thus reflect the changes to the safety and physical structure of neighborhoods, per se.

In the next section of this paper we characterize the overall revitalization of New York City in the 1990s and highlight the substantial improvements in low- and moderate-income neighborhoods. As an illustration of the process of neighborhood revitalization, we provide short descriptions of the individual experiences of several of the city's poorest neighborhoods. The third section of the paper presents a model of neighborhood revitalization in which both public and private investments are the key sources of neighborhood improvement. The fourth section presents the model estimates.

To preview our results, we find that deficient housing units and the quality of neighborhood structures were likely to improve regardless of location. We also find, however, that the city housing program had a positive and significant effect on neighborhood improvement, and further, we provide evidence of spillover effects of city housing assistance in low-income neighborhoods.[2] Ellen, Schill, Schwartz and Voicu

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[2] In a series of studies, each with a slightly different focus, Ellen, Schill, Susin and Schwartz (2001); Ellen, Schill, Schwarz and Voicu (forthcoming); Ellen, Schill, Schwarz and Voicu (2003) have concluded that

(forthcoming) explain that production subsidies provided by the government can in theory generate positive spillovers and contribute to neighborhood revitalization, but note that the importance of these effects is an empirical matter. One aspect of their argument is that production subsidies are targeted to specific areas and therefore might be an important catalyst to neighborhood revitalization in a way that housing vouchers, for example, might not be. We view our results as providing support for the hypothesis that government subsidies to housing supply, as least as captured by New York City's "Ten Year Plan", do indeed lead to neighborhood revitalization and positive spillover effects. While our paper does not speak directly to the question of the relative merits of demand-oriented versus supply-oriented subsidies, our results lend support for the arguments in favor of supply-oriented programs.[3]

Finally, we also find that these improvements in housing quality and neighborhood structures were associated with increases in rents, a result that is consistent with our theoretical model's predictions of neighborhood improvement ultimately providing a positive return on public and private sector investment activity.[4] The last section of our paper summarizes our results and discusses the potential for future work on identifying the effects on neighborhood improvement of lending activities under the Community Reinvestment Act.[5]

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investments in place-based housing programs have the effect of increasing the value of homes in immediately proximate areas.

[3] See Ellen, Schill, Schwatz and Voicu (forthcoming) for a brief discussion of the debate over supply- and demand-oriented subsidies. Newman and Schnare (1997) and McClure (1998) also speak to this debate.

[4] Using a slightly different sample (1987 to 1996), Van Ryzin and Genn (1999) reach similar qualitative conclusions, though they note an increase in maintenance deficiencies over their sample, as well as increases in the share of poor single-parent and welfare dependent households.

[5] As Schwartz (1999) and Van Ryzin and Genn (1999) note, there are multitudes of non-profit and for-profit institutions involved in the implementation of a plan as large as the one undertaken in NYC. At this point, we know of no study that provides a comprehensive exploration of the role of CDCs, per se, in NYC neighborhood revitalization.

I.   How Did New York City's Neighborhoods fare over the 1990s?

(a) Measuring neighborhood revitalization

In this paper we employ a variety of data sources in order to examine the process

of "neighborhood revitalization." Here we outline some of the key data and definitions

we use throughout the analysis.

Neighborhood

Our definition of a neighborhood is a "sub-borough." New York City has a total

of 55 sub-boroughs, each comprised of about 40 census tracts and containing roughly

150,000 people. Examples include Central Harlem, the Upper East Side, and Bedford-

Stuyvesant. Chart 1 displays the sub-boroughs used in our analysis.

We choose the sub-borough as our definition of a neighborhood to exploit the

wealth of data that is produced at this level of disaggregation. In addition, using sub-

boroughs allows us to make use of any data reported at the tract-level, such as US Census

data, since tract data can easily be aggregated to the sub-borough level.

Although we are interested in neighborhood revitalization in all areas of the city,

much of our analysis focuses on revitalization in low-income neighborhoods. Numerous

times in the paper we refer to 'the 10 lowest-income sub-boroughs,' 'the middle 35,' and

'the top 10.' Our rankings are based on median household income for sub-boroughs at the

beginning of the decade taken from the 1990 U.S. Census of Population (income data

refer to the full year 1989).[6] Chart 1a lists (and shows the location of) the individual sub-boroughs that fall into each of these three categories.

Revitalization

The term "revitalization," when used to describe neighborhood-level phenomena could mean many things. Definitions might include improvements in the residents' perception of neighborhood safety, quality of the housing units, access to health services, schools or jobs, or even access to supermarkets and other retail stores that are conspicuously absent from some low-income areas. Since revitalization generally means a desirable change, any definition of the word implicitly includes a normative statement on what changes in a neighborhood people find desirable. For the purposes of this analysis, we focus on three aspects of revitalization—a reduction in crime, an improvement in the quality of housing, and an appreciation in rents.[7] We thus define neighborhood revitalization independent of the social or economic characteristics of the residents.

Crime data come from two distinct sources. The first is the New York Police Department, which has made available annual data on homicides, felonies and other crimes for the period from 1990 through 2000. These data are available at the sub-borough level. The second source for crime data is the Department of Vital Statistics of the New York City Department of Health (DOH). These data come by way of death certificates collected by DOH, which contain cause of death and place of residence of the

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[6] DeGiovanni and Minnite (1991) identify a set of high need sub-boroughs, and Van Ryzin and Genn (1999) use these in their analysis. The sub-boroughs we highlight in our analysis differ from theirs in that we use income to identify the "high need" sub-boroughs, whereas they use the prevalence of dilapidation, maintenance deficiencies, overcrowding, and rent burden to identify high need sub-boroughs.

deceased. From this data set we can obtain a yearly count of the number of homicides and drug-related deaths by sub-borough of residence, among other variables. The DOH was kind enough to aggregate the data to the sub-borough level for us, for the years 1991, 1993, 1996 and 1999.

Information to compute measures of housing quality are taken from the New York City Housing and Vacancy Survey (HVS), which is conducted every 2 or 3 years on a sample of roughly 18,000 vacant and occupied housing units throughout the 5 boroughs. Our analysis makes use of data from the years 1991, 1993, 1996 and 1999.[8] Two quality measures are computed. One is a count of the number of deficiencies in the housing unit.[9] The other is the resident's perception of the quality of the structures in their neighborhood. Other characteristics of the housing unit that we use in our analysis include the rent, rent controlled or stabilized status, ownership status, age, and location.

Neighborhood Characteristics

Our analysis includes not only characteristics of the housing units but also characteristics of the sub-borough in which the unit is located. Demographic and economic data are taken from the U.S. Population Census for 1990 and 2000. We also use employment data aggregated by sub-borough that were obtained from the New York Department of City Planning. The employment data contain, among other things, the total

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[7] See Basolo and Strong (2002), Greenberg (1999), Kutty (1999) and Kain and Quigley (1970) for discussions of issues surrounding the measurement of housing quality. See Oreopoulos (2001) for a discussion on the importance of housing quality.

[8] While we use the HVS starting in 1991, much of the City's housing program activity took place before this year. In fact, Schwartz (1999) points out that nearly 55 percent of all city-funded gut starts occurred before 1991 (for the Bronx this number is nearly 75 percent). For publicly funded new construction about 43 percent took place before 1991.

[9] The seven possible deficiencies are: 1. No toilets working for at least six consecutive hours at any time in the last three months. 2. Heating not working for at least six consecutive hours. 3. Use of additional sources of heat because regular heating system did not provide enough heat. 4. Mice or rats in building in

number of employees by major industry in each sub-borough, for several years throughout the 1990s.[10]

Targeted assistance programs: The City's Capital Programs

The New York City Department of Housing Preservation and Development (HPD) oversees over 100 programs that subsidize the rehabilitation and construction of affordable housing for low and moderate-income households.[11] Some of the notable programs include the Article 8-A loan program, which assists in the rehabilitation of occupied, privately owned units. Others focus on new construction, such as the Nehemiah Plan and the New York City Housing Partnership New Homes Program. These programs are financed by city, federal, state, and private funds and involve other entities, such as private developers or nonprofit organizations. Together, these programs are referred to as the City's "Capital Programs" (also known as "the Ten Year Plan"). These programs are estimated to have assisted about 180,000 housing units since 1987, which is close to 6% of the City's existing housing stock in 2000[12].

For the purposes of this paper, HPD has provided us, through NYU School of Law's Center for Real Estate and Urban Policy, with a data set that provides information on housing rehabilitation and new construction from 1987 to 2001. This data set gives an annual break down of HPD's housing efforts, by sub-borough and by type of city

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last 90 days. 5. Open cracks or holes in interior walls, ceiling, or floors. 6. Areas of broken plaster or peeling paint larger than 8.5 by 11 inches. 7. Water leaking into the apartment in the last 12 months.
[10] Schwarz (1999) explores the economic effects of the housing programs. He looks at direct effects, which are defined as the employment of neighborhood residents to construct and maintain city-financed housing, and indirect effects, which are the effects on commercial activity in the community. He concludes that there is evidence that the direct effects mattered, but that the indirect effects on commercial activity were moderate.

[11] The data on the city's housing program were provided for this project by HPD.

initiative. Included are rehabilitation of occupied and vacant housing units (including

both in rem and private housing), and construction of new owner-occupied and rental

housing units.[13] The category affecting the largest number of units was the rehabilitation

of occupied, private units, about 40 percent of all units. Two other categories –

rehabilitation of vacant, in rem units and rehabilitation of occupied, in rem units – each

affect about 20 percent of units. About 30% of all assisted units were located in the 10

poorest sub-boroughs.

Other public and private sector programs

Community Development Corporations (CDC's) played a large role in the

implementation of the city's housing efforts.[14] Therefore, the efforts of CDC's are

reflected to a large extent in the City Capital Programs. While data on CDC expenditures

in sub-boroughs are reported, these expenditure measures probably do not adequately

capture the full range of CDC activities and impacts and we thus do not explicitly

incorporate these measures into the empirical analysis in this paper. Targeted home

mortgage lending is another type of public sector effort that can influence revitalization.

While data on new home loans originated over the 1990s from Home Mortgage

Disclosure Act (HMDA) data is available from the Federal Reserve Board of Governors,

we are not certain at this time that we can correctly measure the number and types of

loans that are relevant for our neighborhood analysis. Future work could focus on

incorporating both CDC and HMDA lending data into our analysis.

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[12] Some examples of articles containing detailed discussions of New York City's "Ten-Year Plan", see Ellen, Schill, Schwartz and Voicu (forthcoming), Ellen, Schill, Susin and Schwartz (2001) and Van Ryzin and Glenn (1999), Schwatz (1999) and Blackburn (1995).
[13] Units classified as in rem have been taken over by the city generally for failure of the owner to pay property taxes.

(b) Dimensions of neighborhood improvement in the 1990s

A variety of indicators support the notion that virtually all New York City neighborhoods became more livable over the 1990s. The improvement is most readily apparent in two key dimensions of neighborhood revitalization—crime and housing quality. Moreover, the biggest improvements occurred in the city's poorest sub-boroughs.

The overall crime rate in New York City declined dramatically over the 1990s, and the decline far outpaced the decline in crime nationwide.[15] We use the number of murders per 100,000 residents as a measure of crime in the city, because it is clearly defined and considered to be particularly well measured. We report this rate for our three groupings of sub-boroughs arranged by median household income--the 10 lowest, the 35 middle-income, and the 10 highest (Chart 2). The homicide rate in the city's 10 lowest-income sub-boroughs fell dramatically over the decade, from an average of 80 (per 100,000 residents) in 1990 to 18 in 2000; the homicide rate in the 35 middle-income sub-boroughs was more than halved from 25 to less than 10, and the rate in the highest-income sub-boroughs declined from 10 to 3. Although the poorest sub-boroughs still recorded the highest average homicide rate among these three income groupings in both 1990 and 2000, the disparity between this group and the rest of the city was sharply reduced. All of the 10 lowest-income sub-boroughs experienced steep reductions in the homicide rate (Chart 2a).[16]

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[14] See Nye and Glickman (2000) for a discussion of the role CDCs and Community Development Partnerships (CDPs).

[15] See Bram, Haughwout, Orr (2002)

[16] The decline in the murder rate was mirrored in the decline in the felony rate. There were 81 felonies per 100,000 people in New York City in 1990. By 2000 this figure had declined to 22.9, with felonies down in every neighborhood. In fact, no sub-borough had even half as many felonies in 2000 as in 1990. The

Measures of housing quality also improved dramatically in most New York City

neighborhoods in the 1990s, and the broad pattern of improvement across neighborhoods

was comparable to that of the reduction in crime rates. Two measures reported in HVS

highlight this improvement. One measure involves the number of structural

deficiencies—specifically, the measure we use is the share of housing units in a

neighborhood with 3 or more deficiencies.[17] This measure showed strong improvements

in the quality of housing (fewer deficient units) across most neighborhoods in the 1990s

(Chart 3).[18] The largest reductions in housing deficiencies occurred in the lowest-income

sub-boroughs, leading to greater uniformity in the quality of the housing stock citywide.

All of the 10 lowest-income sub-boroughs saw an improvement in their housing quality

with particularly large gains in the Highbridge/South Concourse neighborhood in the

Bronx borough and in the Central Harlem neighborhood of Manhattan (Chart 3a).   A

second, more subjective, measure of housing quality--the share of residents who perceive

the quality of the housing structures in their neighborhood as poor--showed similarly

broad-based improvement across the city (Chart 4). Residents of the lowest-income

neighborhoods, as a group, reported the largest improvement in the quality of the

structures, and improvement was observed in all but one (University Heights/Fordham)

of these low-income neighborhoods (Chart 4a). Despite these gains, housing quality in

these relatively low-income areas—both measured and perceived—remains below that of

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pattern was similar for property felonies. Schwarz (1999) provides a discussion of the links between the
City's Plan and changes in factors such as crime and welfare dependency. While acknowledging the
speculative nature of his results, he concludes that both of these factors were positively affected by the
City's Plan.

[17] Our results do not differ significantly if we were to use another cutoff.
[18] We should note that at this point we are reporting point estimates of housing and neighborhood quality
and can not say anything about statistical significance. Nonetheless, we feel that the point estimates are
suggestive of the direction of changes in these variables across city neighborhoods.

the other groups. All in all, the findings based on this self-reported indicator of housing quality are broadly consistent with the compilations of the surveyors. Together, these measures support the contention that the quality of housing rose sharply across city neighborhoods, particularly in the poorest areas, over the past decade.

(c) Economic growth and housing quality

The widespread improvement in the quality of housing in New York City neighborhoods and the relatively strong economic performance of the city's economy over the 1990s suggests a simple story of cause and effect. Between 1990 and 2000, aggregate New York City employment expanded by roughly 4 percent while real aggregate earnings rose by roughly 12 percent. In the second half of the decade, in particular, the city's economy was creating jobs at a rate that matched or exceeded the national rate. Sustained economic growth at such a strong pace carries with it the potential to improve conditions in a local economy: more jobs and higher income can lead individual households to improve their housing quality and landlords to redevelop and upgrade rental structures in neighborhoods in high demand.

Yet, neighborhood-specific data on the growth in household income across city neighborhoods suggests that the improvement in neighborhood quality is not a simple story of a stronger economy. The change in real median household income in the 10 lowest-income sub-boroughs, the 35 middle-income sub-boroughs, and the 10 highest income sub-boroughs in New York City does not show the same general pattern of broad-based improvement across the city as did the improvements in housing quality (Chart 5). Median household income grew modestly in the lowest-income sub-boroughs and in the wealthiest sub-boroughs, and declined slightly in the middle-income sub-boroughs.

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Moreover, within the lowest-income sub-boroughs, median household income growth was unevenly distributed (Chart 5a).

The variation in income growth across neighborhoods reflects, in part, the dynamics of population change in the city over the 1990s. The city's population grew by roughly 700,000 (9%) between 1990 and 2000; this growth was the result of a net increase of 800,000 foreign-born residents and a decline of 100,000 native-born residents. While the Census data can not be used to calculate a median household income for native- or foreign-born residents, the Current Population Survey data show the native-born median income is about 4 percent above the city median and the foreign-born median about 8 percent below the city median.

With the exception of Asians, high-income groups in the city lost population while low-income groups in the city gained in numbers. The biggest population decline among demographic groups was the net loss of 300,000 white, Non-Hispanic residents.[19] These demographic shifts suggest that a significant portion of the residents of New York City neighborhoods in 1990 were not residing in the same neighborhood in 2000. Nevertheless, the modest shifts in the levels of median household income within the groups of neighborhoods and the lack of a clear correlation of residents' income growth with neighborhood improvement suggest that the process of neighborhood revitalization in the city is the result of the confluence of several forces.

A further look at the process of income growth across neighborhoods suggests only a limited role in neighborhood revitalization for gentrification; i.e., the rise in

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[19] The 2000 Census data for New York City show White, Non-Hispanic residents had the highest median annual household income in the city ($53,625). Direct comparison of race data between 1990 and 2000 are precluded because respondents in the 2000 Census could be multiracial, while in the 1990 Census only

income and educational attainment in a neighborhood that results from the displacement of lower-income households by higher-income households. We address this issue by looking at the correlation of changes in income and in the college-educated share of residents in neighborhoods. Chart 6 groups neighborhoods by their median household incomes in 1989 (the rows) and their median household real (inflation-adjusted) income growth rates between 1989 and 1999. The five sub-boroughs in the upper right hand panel became increasingly affluent—they began the decade with high-income levels and saw their incomes grow over the decade. The eight sub-boroughs in the lower right-hand panel, began with lower incomes but also saw an upward shift in income. To get at the issue of gentrification, we highlight in boldface type the sub-boroughs with substantial increases in college-educated residents over the 1990s.[20] While the sub-boroughs in the upper right hand panel all had relatively strong increases in college-educated residents, none of the poor sub-boroughs in the lower right hand panel saw a sizable increase in their college-educated residents. Based on the relative lack of change in the share of the population with college degrees, gentrification, at least in this form, does not appear to be a significant factor in the increasing income of most of the poorest sub-boroughs. Consequently, the observed improvement in neighborhood quality in poor sub-boroughs does not appear to be the result of gentrification.

(d) Three Neighborhood Revitalization Experiences:

While the crime and housing quality measures capture the broad outlines of revitalization, the process has taken several interesting and diverse forms in different

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one race could be indicated. The above estimate represents the average of an upper and lower bound estimate.

[20] The boldface sub-boroughs had increases in college-educated residents more than two standard deviations above the citywide average.

neighborhoods.[21] In this section we highlight the experiences of three New York City

neighborhoods over the 1990s—Mott Haven/Hunts Point, Central Harlem, and Coney

Island.

Mott Haven / Hunts Point

Although it remained the lowest-income sub-borough, this area saw substantial

improvement in quality-of-life indicators, such as crime and the housing stock,

during the 1990s. Unlike most low-income neighborhoods, it has a fairly large

business sector, led by distribution and manufacturing.

Income & Labor Force - This sub-borough of the Bronx saw a steep decline in median

income during the 1980s and had the city's lowest median household income in 1989. In

the 1990s, however, median income surged by 22%—the strongest gain of any area

outside Manhattan—but, at $17,250 in 1999, it was still lower than in any other sub-

borough. In 1992, more than 35% of residents were on public assistance, by far the

highest in the city, and an equal proportion were employed, the lowest in the city. By

2000, the percent on public assistance had fallen to 21% (no longer the highest), but the

percent employed remained the lowest, at 33%.

Quality-of-Life Measures - This area made substantial progress during the 1990s. The

murder rate, which had been among the highest in the city, tumbled from 98 (per 100,000

residents) to 14. Similarly, the drug dependency death rate fell from 40% to 23%, the

sharpest improvement of any sub-borough.

This neighborhood's housing stock improved noticeably but was still relatively

poor at the end of the decade. The incidence of deficient units fell from 25% to 16%, still

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[21] See Grogan and Proscio (2000) for numerous anecdotes as well as a comprehensive discussion of the
important factors in neighborhood revitalization.

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fairly high, and the proportion of residents complaining about poor neighborhood quality fell from 75% to 42%. The median rent was unchanged at $404—the lowest in the city— and the share of owner-occupied homes rose from 4% to 7%, still close to the lowest of any sub-borough.

Changing Population Profile - The composition of the neighborhood's population did not change much. Educational attainment was the lowest in the city both in 1990 and 2000, with the proportion of adults holding college degrees edging up from 3% to 5%. In 1990, nearly 70% of the population was Hispanic and 35% was black, and the racial mix remained about the same – a slightly higher proportion of Hispanics and a slightly smaller share of blacks. There was, however, a sizable 10% increase in the overall population and most of the net increase appears to be accounted for by immigrants.

Business Sector - In terms of businesses, this neighborhood is expected to undergo extensive change. Hunts Point is already a major wholesale distribution hub for food products, and its role will become increasingly important as the Fulton Fish Market relocates there from lower Manhattan. In 1999, wholesale trade accounted for 23% of jobs, up from 20% in 1991; manufacturing accounted for 14% of jobs—down from 23% in 1991 but the highest, by far, in the Bronx. More generally, employment grew by 11% in the 1990s (slightly below the citywide rate), and Mott Haven continues to have the greatest concentration of jobs of any sub-borough in the Bronx.

Central Harlem

This sub-borough has also seen substantial improvement in quality-of-life measures during the 1990s, with modest signs of gentrification, as reflected in above-average

income growth, a moderate increase in the population's educational attainment, and above-average rent increases. This appears to have been driven by this neighborhood's central location and excellent transportation links.

Income - This neighborhood saw median income rise 17% during the 1980s. Still, in 1990 it had the third lowest median income of any sub-borough. In the 1990s, however, median household income jumped another 12%, among the strongest gains in the city.

Quality-of-Life Measures - Like Mott Haven/Hunts Point, this sub-borough showed dramatic improvement in the 1990s. At the start of the decade, it had the second highest murder rate in the city and the highest rate of drug-dependency deaths. But during the 1990s, the murder rate tumbled by more than 80% while the drug-dependency death rate fell by a third, though both measures remained among the highest in the city.

The proportion of deficient homes also declined sharply, falling from 41% to 20%, though this figure remained the highest in the city. Similarly, the proportion of residents complaining of poor neighborhood quality fell from 81% to 59%, which, though still high, was no longer the highest in the city. The median rent, which at $430 in 1990 was near rock bottom, jumped 13% after adjusting for inflation—well above the average for low-income neighborhoods and even the city as a whole, but in line with other Manhattan neighborhoods. The incidence of owner-occupied homes rose from 5% to 7%, in line with other lower-income sub-boroughs.

Changing Population Profile - This neighborhood's population grew by 8% in the 1990s, close to the city average, while the composition of the neighborhood's population appears to have changed noticeably but not dramatically. The proportion of residents with college degrees rose from 10% to 15%—comparable to other neighborhoods in or near

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Manhattan.   The percentage with high-school degrees rose from 56% to 64%, one of the largest increases of any sub-borough. These figures suggest some gentrification, but not mainly from people at the top end of the income and education spectrum. This neighborhood's population was still overwhelmingly black in 2000, though less so than in 1990—84%, down from 92%. Conversely, Hispanics' share of the population rose from 10% to 17% (these categories are not mutually exclusive). There was also a large increase in the foreign-born population, evidently contributing much to net population growth.

Business Sector - Perhaps surprisingly, Central Harlem has a lower concentration of employment than almost any other sub-borough. Health and social services is the dominant industry in terms of both level and growth, accounting for 37% of jobs in 1991 and 45% in 2000; retail trade is somewhat important representing 20% of employment in both years. There was also good growth in entertainment services, which accounted for just 5% of jobs in 1991 but 10% in 2000. There is virtually no manufacturing.

Coney Island

This Brooklyn neighborhood differs noticeably from other low-income sub-boroughs, particularly in terms of demographics, crime and housing. Although median income declined, quality-of-life indicators improved in line with other low-income neighborhoods.

Income and Labor Force - This was one of only three NYC sub-boroughs to see a decline in real median household income in the 1980s (down 3%). At $28,565 in 1990, median income was well below the city-wide average, though nine sub-boroughs had lower incomes. During the 1990s it fell by another 9%, again one of the weakest performances

of any sub-borough, though its income rank did not change. In 1992, a relatively modest 13% of residents were on public assistance, but only 42% were employed.

Quality-of-Life Measures - This area improved substantially during the 1990s, from already favorable levels. The murder rate fell from 19 to 7 (per 100,000 residents), and the property felony rate registered a comparable drop. Both remained below the respective city-wide averages. Interestingly, however, the drug-dependency death rate *more than doubled*, from 7% to 15%, while the city-wide rate held steady at just over 10%.

At the beginning of the 1990s, the quality of the neighborhood's housing stock was close to the city-wide average and exceptionally good for a low-income sub-borough; during the 1990s it improved even further. The proportion of residents complaining about poor neighborhood quality fell from 42% to 28%, matching the city average, while the incidence of deficient units fell to 5%, well below the citywide figure of 7.8%. Real median rent rose 6.7%, comparable to the city as a whole, to $565, leaving it about 25 percent below average. The incidence of owner-occupied homes rose from 19% to 23%, only moderately below par.

Changing Population Profile - Population growth over the 1990s was below average at 4.7%. However, the composition of the neighborhood's population, as well as the change over the 1990s, was unusual for a low-income sub-borough. Educational attainment improved dramatically, with the share of college graduates surging from 13% to 23%, close to the NYC average. The proportion of blacks fell further below the NYC average, declining from 21% to 17%, and the share of Hispanics rose only modestly, from 14% to 16%. However, Asians' share rose from 6% to 11%. White, non-Hispanics continued to

represent a majority of the area's population, though it edged down from 59% to 57%.

The share of foreign-born jumped to 48% in 2000, from 32% in 1990; again, this is much

higher than in any other low-income neighborhood. This sub-borough is a leading

destination for Russian immigrants, and appears to be increasingly so for Asian

immigrants.

Business Sector - In terms of businesses, this neighborhood registered brisk employment

growth of 23%, among the highest in the city. Health and social services is the dominant

sector, representing about 35% of jobs in both 1991 and 2000. The strongest growth

contribution came from the transportation/utilities/ communication sector, whose share of

jobs surged from 6.6% to 12.8%. Retail trade accounted for 20% of jobs.

II.   A Model of Neighborhood Revitalization

We now present a theoretical framework for analyzing the key elements of the

process of neighborhood revitalization.   Although the model we present is relatively

abstract, it provides a basis for implementing our empirical analysis. We begin with the

assumption that households are freely mobile and simultaneously choose a neighborhood

and a quantity of housing. As a result, each neighborhood represents only one of the

many potential residential locations available to households. Each housing unit comes

with a set of neighborhood conditions which households take as given: each is too small

individually to affect the character of the neighborhood overall.

There are several ways that neighborhood conditions can improve during a

particular time period. Our focus is on improvements in private housing quality as an

index of neighborhood change. By this definition, investment decisions by individual

property owners are key to the process of neighborhood improvement. Property owners choose investments to solve the problem described in the following equation:

$$(1) \quad \max_i E(\pi) = PDV\{E[R(h_{u,n,t}, Y_{n,t}, Z_{n,t})] - r_{n,t}\}$$

where PDV refers to present discounted value, $E[R(\cdot)]$ is expected annual rents, $Y_{n,t}$ is annual income in neighborhood n in year t, $\mathbf{Z_{n,t}}$ is a set of exogenous determinants of neighborhood conditions, and $r_{n,t}$ is the (annualized) cost of new investments, potentially varying by neighborhood because of cost subsidy programs such as enforcement of CRA provisions or investment subsidy programs. $h_{u,n,t}$ is the quantity of housing capital in place in the uth unit in neighborhood n in year t and is given by

$$h_{u,n,t} = (1-\delta)\, h_{u,n,t-1} + i_{u,n,t},$$

where δ is the annual rate of housing stock depreciation.[22]

Profit-maximizing property owners choose $i_{u,n,t}$, new private housing investment, by equating the marginal (annualized) cost of improvements to the value of the same improvements' marginal impact on rent. $i_{n,t}$ may consist of improvements to existing units and/or new construction. That is, investments must pay for themselves in order to be worthwhile from the landlord's perspective.[23] Thus,

$$(2)\ i_{u,n,t} - \delta h_{u,n,t-1} = i\{E[R(h_{u,n,t-1}, Y_{n,t}, \mathbf{Z_{n,t}})], r_{n,t}\}.$$

Net new investment in each unit ($i_{u,n,t} - \delta h_{u,n,t-1}$) depends (positively) on changes in expected future rental return on new investments, and negatively on the cost of new investment.

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[22] While the model is written for rental units, a specification that begins with utility maximization by owner-occupants yields a similar expression for new investments in their homes.
[23] Alternatively, one could view property owners as adjusting stocks of housing so as to reach an optimal level of stock, again conditional on (expected) neighborhood conditions $Y_{n,t}$, $\mathbf{Z_{n,t}}$ and $r_{n,t}$. Such a

Note also that changes in rents will depend on the same set of variables, including the value of the housing stock currently in place. Thus,

$$(3) R_{u,n,t} = R(h_{u,n,t}, r_{n,t,}, Y_{n,t}, \mathbf{Z_{n,t}},); \; i.e. \; R = r(h(r), Y, Z).$$

Our focus is on identifying the effects of exogenous determinants of neighborhood conditions ($\mathbf{Z_{n,t}}$) on rental appreciation and new net investment in neighborhood housing units.[24] Among these exogenous determinants are

- Public sector housing investment

- Exogenous private housing investment, primarily by non-profit groups.

- Exogenous variations in the cost of new investments, potentially through CRA lending (which potentially affect r)

- Public goods provision (net of neighborhood tax cost)

- Changes in job location and amenity patterns across neighborhoods

The presence of neighborhood income ($Y_{n,t}$) on the right-hand side of (2) and (3) raises several issues. A neighborhood-level income increase is the weighted average of two parts: (1) increases in incomes earned by beginning-of-period residents who remain in the neighborhood (stayers) and (2) differences between incomes of beginning-of-period residents who leave the neighborhood (emigrants) and new residents (immigrants).

Of course, higher-income households can afford to move to nicer neighborhoods and are likely to spend more on housing. In addition, the presence of wealthier neighbors

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specification would result in an investment expression similar to (and empirically indistinguishable from) (1).

[24] In practice, we measure the effects of investments on deficiencies. This indicates a latent variable model, in which the observed reductions in deficiencies is some function of new investments.

may influence neighborhood attractiveness by many routes, including the fact that

residents are likely to value new investments in their neighbors' housing stocks.[25]

This means that rent, household income and housing investment all depend on

each other across neighborhoods and over time within a given neighborhood. The

endogeneity of neighborhood- (and unit-) level income complicates identification of the

structural effects of neighborhood-level policy interventions of the sort measured in $\mathbf{Z_{n,t}}$.

We will address this issue in our empirical specification by excluding current

neighborhood income from our regression analysis.

III.   Empirical Strategy and Model Estimates

Empirical Strategy and Model Estimates

Our empirical analysis tests for the existence of spillover effects from the

assistance provided by the city's capital programs. We know that the city's efforts

increased the supply of housing units in neighborhoods throughout the city. Our results

suggest that the city's efforts also induced an increased demand for housing which

spurred the additional quality improvements and rent increases that we associate with

neighborhood revitalization.

Housing Unit Improvement

The Housing and Vacancy Survey (HVS) asks residents seven yes or no questions

about the presence of specific deficiencies in their homes. We exploit the longitudinal

features of the HVS to model the probability that a unit with a high number of

deficiencies in the 1991 survey had a low number of deficiencies in the 1999 survey. In

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[25] Other routes that have been studied in the literature include, but are not limited to, potentially reduced
crime, improvements in local public school peer groups, and the attraction of new retail consumption

the results presented here, we define a high number of deficiencies as three or more and a low number of deficiencies as two or fewer. Results using different cutoffs or the absolute number of deficient units are similar.

Our sample consists of 1,260 occupied units that had more than three deficiencies in 1991 and appeared in the sample again in 1999. Our dependent variable is equal to one for the 857 units (68%) that registered fewer than three deficiencies in 1999 and zero for the 403 units that did not. Our key explanatory variables relate to city assistance to three kinds of housing units: occupied units, vacant units, and newly constructed units. Note that our data on city assistance is available at the sub-borough level. Thus we will model the probability of improvement in an individual unit as a function of the number of units publicly assisted in the unit's sub-borough.

Since our sample consists of occupied units, we expect city assistance to occupied units to have an important effect on the probability of improvement. The magnitude of this effect is of particular interest. In our specification, we use as an explanatory variable the number of occupied units assisted in the sub-borough as a percentage of the number of deficient occupied units in the sub-borough at the beginning of the period. If we assume that city assistance is targeted towards these deficient units, then our specification relates the probability that a deficient unit improved to the probability that a deficient unit was assisted. If the estimated coefficient on this probability is greater than one, it suggests that city assistance generated additional demand for housing that spurred improvements in nearby units. If the estimated coefficient is equal to one, then city assistance improved the units assisted but generated no significant spillover effects. If the estimated coefficient is less than one, it suggests that city assistance was not targeted

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opportunities. Each of which is likely to affect both rents and investments.

to deficient units, did not improve deficient units, was targeted to units that would have improved anyway, or encouraged investment in assisted units at the expense of other units.

We wish to allow this key coefficient to vary across sub-boroughs. Demand spillovers from city assistance will likely be more prominent when the assistance has a more visible impact on a neighborhood. This impact may be most visible when assistance is provided to neighborhoods where many deficient units are located close to one another, as they were in the neighborhoods where the city concentrated its assistance. Across sub-boroughs, we wish to allow the effect of assistance to deficient units to vary with the concentration of deficient units. To achieve this flexibility, we include in our specification an interaction between the percent of deficient units that were assisted and the percent of units that were deficient, a term that reduces to the percent of units that were assisted.[26]

We estimate a linear probability model of the form:

$$\mathbf{P}[\text{Improvement}] \quad = \quad \alpha_1 \, \text{pctAssistDef} + \alpha_2 \, \text{pctAssistAll} + \beta x + \varepsilon$$

Where $\mathbf{P}$[improvement] is the probability of improvement
    PctAssistDef is the percent of deficient units assisted
    PctAssistAll is the product of PctAssistDef and the percent of units deficient
    x is a vector of neighborhood and unit characteristics

The effect of the percentage of deficient units in a neighborhood assisted by the city is

$[\alpha_1 + \alpha_2 \, (\text{percent of units deficient})]$.

We also test whether city assistance to vacant units and newly constructed units affects investments in occupied units. If the rehabilitation of vacant units or construction

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[26] This interaction term is computed as: (number of units assisted/number of units deficient) x (number of units deficient/number of units) = (number of units assisted/number of units)

of new units makes a neighborhood a more desirable place to live, demand for existing, occupied units may rise, increasing the return to investing in improvements. However, if the supply of available units rises without attracting enough new residents, demand for existing, occupied units may fall. We include measures of these two forms of assistance in the regression.

However, our data on assistance to vacant units should be interpreted cautiously. Ideally, we would construct an explanatory variable as the number of vacant units assisted as a percentage of vacant units. We have data from the city on the number of vacant units that were assisted, but we have no measure of the existence of vacant units at the beginning of the period.[27] Instead, our explanatory variable will be the number of vacant units assisted as a percent of all units in the sub-borough. This variable measures the presence of vacant units at the beginning of the period rather than the extent to which they were assisted.

We include several other sub-borough and unit characteristics in our specification. We include three sub-borough characteristics: the median household income (1989) from the 1990 census, the percent of units with three or more deficiencies in 1991, and the distance from the center of the sub-borough to Union Square, an intersection in the middle of lower Manhattan which we use as a proxy for the "center" of the city. The first two control for the affluence and quality of a neighborhood at the beginning of the period; the third tests whether Manhattan's booming economy produced an increase in demand for (and supply of) housing in nearby neighborhoods. At the unit level, we control for the year each unit was constructed and each unit's rent regulation status. We

include control dummies for rent controlled, rent stabilized, and in rem units, as well as for those units that changed status from rent controlled to rent stabilized or from rent stabilized to market rate during the period. Units under other forms of rent regulation are excluded from the sample.

The model estimates are presented in Table 1. The estimated coefficients on city assistance to occupied units suggest that the concentration of assisted units in highly deficient sub-boroughs was a key factor in the success of the city's assistance. The coefficient on the percent of deficient units that were assisted is small and statistically insignificant, while the coefficient on its interaction with the percent of all units that were deficient is positive and statistically significant. This latter variable takes its maximum in Central Harlem, where 55 percent of units were deficient in 1991, and the number of assisted units (7,456) represented 41 percent of the number of deficient units. The estimated coefficients suggest that a one percent increase in the probability that a deficient unit was assisted was associated with a 1.32 percent (-0.012+2.429×0.55) increase in the probability that a deficient unit improved. This estimate is larger than one, suggesting that the city's assistance created additional demand for housing in Central Harlem, spurring improvements beyond those funded directly by the city. However, the standard error on this estimate, 0.46, does not permit us to conclude that the estimate is statistically different from one.

In the Stuyvesant Town/Turtle Bay sub-borough in lower Manhattan, only 11 percent of units had 3 or more deficiencies in 1991, and only 18 units (representing 0.2 percent of the deficient units) received assistance. Here, the estimated coefficients

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[27] The vacant units sampled in the HVS are those that are vacant and available for rent. The vacant units assisted by the city were generally abandoned buildings in need of gut rehabilitation. We are more

suggest that a one percent increase in the probability that a deficient unit was assisted was associated with a 0.29 percent ($-0.012+2.429 \times 0.11$) increase in the probability that a deficient unit improved. With a standard error of 0.28, we can reject the hypothesis that the estimate is equal to one at a five percent confidence level. Thus our estimates suggest that city assistance was most effective in neighborhoods with many deficient housing units and may have encouraged improvements beyond those in units directly assisted. In neighborhoods where deficient units were fewer and farther between, city assistance had less impact on the probability that any deficient unit would improve.

Variables that capture other city assistance programs were also included in the regression. The coefficient on assistance to new construction is positive, suggesting that assistance to new construction may encourage investment in existing units, though it is not statistically significant at any standard level. The coefficient on assistance to vacant units is negative and statistically significant. This variable takes its maximum, 0.14, for the units in the Central Harlem sub-borough. The estimated coefficient suggests that assistance to vacant units made each unit in Central Harlem 46 percent less likely to improve. This estimate must be interpreted cautiously because, as discussed above, it is likely to reflect the existence of vacant units at the beginning of the period rather than the city's assistance to those units.

The estimated coefficients on the unit and neighborhood control variables are consistent with our expectations. Rent stabilized, rent controlled, and in rem units were respectively 12, 25, and 25 percent less likely to improve than market rate units.[28] Each

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interested in the latter definition of vacant units.

[28] The owner occupied, rent stabilized, rent controlled, and in rem control variables take the value of 1 only for those units whose status was unchanged over the 1991 to 1999 period. There is some question whether owner-occupied and in rem units belong in the sample and whether their status can be considered

additional mile in distance from Union Square made a unit one percent less likely to improve, suggesting that spillover gains from Manhattan's economic growth were concentrated nearby.

Neighborhood Quality Improvement

The HVS also asks residents to rate the quality of the residential structures in their neighborhood as excellent, good, fair, or poor. We exploit the longitudinal features of the HVS to model the probability that a unit whose residents rated the neighborhood fair or poor in 1991 rated it good or excellent in 1999. Our sample consists of 2,223 units whose residents rated their neighborhood fair or poor in 1991 and that appeared in the sample again in 1999. The dependent variable is equal to one for the 1,267 units (57%) whose residents rated the neighborhood good or excellent in 1999 and zero for the 956 units whose residents did not.

Our explanatory variables will be the same as in the previous regression. Here, though, we do not test for a specific relationship between assistance and improvements. Rather, we are interested in whether the programs that we showed to have an impact on a relatively objective measure of housing quality also had an impact on residents' perceptions of housing quality.

The bottom half of Table 1 presents the regression results for this specification. The results indicate that city assistance to occupied units was indeed associated with improvements in perceived neighborhood quality. A one percent increase occupied,

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exogenous. We exclude public housing units from the sample on the argument that improvement decisions are made by a public entity rather than the private property owner that we have in mind in our model. A similar argument might be made for the in rem units. However, much of the city's assistance to occupied units went to in rem units with the intention of transferring them back to private ownership. We think that improvements in these units reflect the market mechanism that we have in mind. However, if a unit is still in rem at the end of the period, its status as such can not be considered exogenous. Either excluding the in

deficient units receiving assistance was associated with a 0.39 percent increase in the probability that a unit's residents upgraded their assessment of their neighborhood's housing. Unlike in the previous regression, the impact of the city's assistance did not vary significantly with the presence of deficient units at the beginning of the period.[29]

We might expect the unit-specific characteristics to affect changes in perceived neighborhood quality only because they proxy for the characteristics of other units in the neighborhood. It is not surprising that their coefficients are smaller in magnitude or less statistically significant than in the previous regression. The coefficients on assistance to vacant units and the construction of new units are negative and statistically insignificant, providing no evidence that these types of assistance had an impact on residents' perceptions of the quality of structures in their neighborhood.

Rent Increases

We have provided evidence that city assistance to occupied units in sub-boroughs with many deficient units created additional demand for housing that spurred improvements in other units. Now we show that this additional demand was strong enough to raise rents above their initial level.

We model the percentage change in a unit's real contract rent from 1991 to 1999 as a function of the explanatory variables from the previous two regressions. We limit our sample to units that began the period with fewer than three deficiencies on the assumption that they were not the targets of city assistance. Thus if we find any effect of

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rem units from the sample or removing the in rem control from the equation has little effect on our results regarding the impact of the city's assistance.

[29] In specifications not reported, the estimated effect of the interaction term from the previous regression was statistically and economically insignificant.

city assistance on their rent, we will interpret it as the result of a demand spillover and not the direct effect of city-funded improvements.

Results from this regression appear in Table 2. They indicate that city assistance to occupied units was indeed associated with rising rents. A one percent increase in deficient units receiving assistance was associated with a 0.5 percent increase in real rent.[30] As in the second regression, the effect of the city's assistance did not vary significantly with the presence of deficient units at the beginning of the period.[31] Again, the coefficients on assistance to vacant units and the construction of new units are statistically insignificant, providing no evidence that these types of assistance created demand spillovers strong enough to raise rents.

Rent stabilized units experienced a 9 percent greater rent increase than market rate units, while rent increases in rent controlled units were not statistically different than those in market rate units. These results are not inconsistent with what we would expect given New York City's rent regulations, which permit limited rent increases for tenants renewing their leases and larger increases when new tenants move in. Changes in rent regulation status, either from rent controlled to rent stabilized or from rent stabilized to market rate, were associated with very large real rent increases.

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[30] We note that this estimate may imply quite large returns to the city's investments through its capital programs. This result appears robust even if we limit the sample to units that showed no improvement at all over the period. We will examine these results and their implications more thoroughly in future work.
[31] At first glance it is surprising that housing unit improvements should vary in this way while rent increases do not. In fact this phenomenon is easily explained with a simple supply and demand model of the market for nondeficient units. We will discuss such a model further in our future work.

V.   Summary and directions for future research

Neighborhood revitalization in New York City was measured in this paper by the changes in the safety and the quality of the housing stocks in 55 sub-boroughs. Based on these measures, New York City neighborhoods clearly improved over the course of the 1990s. Furthermore, these gains were largest in neighborhoods that had the lowest-income at the start of the 1990s. Though the city's economy expanded sharply over the decade, this revitalization was not simply the result of a stronger economy. Rather, it reflected a combination of the gains in economic activity in the city and targeted city efforts to improve the housing stocks, particularly in lower-income neighborhoods.

Our empirical analysis focused on two specific measures of neighborhood quality— deficiencies in the housing stock and residents' perceptions of the quality of the structures in their neighborhood. Information on these measures as well as a variety of household characteristics is available for individual housing units from the New York City Housing and Vacancy Survey. We aggregate these measures to quantify the amount of improvement in housing quality across sub-boroughs and then exploit the longitudinal nature of the survey to estimate the underlying sources of improvement. Our findings show that the stronger economy in the city over the decade appears to have played a role in neighborhood revitalization and, notably, confirm an important role of the city's housing programs in the process of revitalization. Moreover, there was evidence that the effects of this housing assistance spilled over to other units in lower-income neighborhoods.

While this analysis focused on the city housing assistance, there have been a number of other public and private sector programs to improve the quality of New York City neighborhoods. Two key examples of these efforts are the activities of a variety of Community Development Corporations (CDCs) and lending to both lower-income individuals and in lower-income neighborhoods under the Community Reinvestment Act. The former efforts often worked in concert with the city housing assistance programs and at least some of the impact of these organizations is likely to be subsumed in the estimate of the effects of the city program. The data on the specific location and types of CDC expenditures in the city, however, was not detailed enough to be incorporated separately into our empirical analysis. While data on lending activities is available for individual neighborhoods, we did not believe the available measures were adequate to capture the impact of this lending on neighborhood improvement. Future work could attempt to fine tune both the CDC expenditure data and the lending data by neighborhood in order to derive an estimate of their impacts on neighborhood revitalization apart from any role they might play in the implementation of city housing programs.

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