CLOSUP Working Paper Series
Number 19

October 2009

Has Competition Led to Healthier Neighborhood Effects? A Study of Low-Income Housing Tax Credit Projects Built by Three Sectors

Lan Deng
University of Michigan

This paper is available online at http://closup.umich.edu

Center for Local, State, and Urban Policy
Gerald R. Ford School of Public Policy
University of Michigan

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Acknowledgement

This research was supported by the Center for Local, State, and Urban Policy and Rackham Graduate School at the University of Michigan. The author takes sole responsibility for any errors in this paper.

Lan Deng
Assistant Professor
Urban & Regional Planning
A. Alfred Taubman College of Architecture + Urban Planning
2000 Bonisteel Boulevard
University of Michigan
Ann Arbor, MI, 48109-2069
(734) 936-0951
landeng@umich.edu

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Oct 8, 2009

Draft
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Abstract

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Introduction

Housing has externalities. The external neighborhood effects of affordable housing projects are an especially sensitive subject that has sparked extensive debate. Numerous studies, for example, have been conducted to address NIMBYism arising from the potential negative effects of affordable housing projects (Goetz et al. 1996; Briggs et al. 1999; Galster et al. 1999; Santiago et al. 2001). Meanwhile, efforts have also been made to evaluate whether government-assisted affordable housing developments have helped to revitalize distressed urban neighborhoods (Simons et al. 1998; Ding et al. 2000; Schill et al. 2002; Galster et al. 2006; Schwartz et al. 2006). Despite the strong interest in these subjects, few studies have examined the external neighborhood effects generated by Low-Income Housing Tax Credit (LIHTC) projects.

As part of the Tax Reform Act of 1986, the LIHTC program was enacted to provide tax credits for low-income rental housing owners and investors. It now gives states the equivalent of nearly $5 billion in annual budget authority to issue tax credits and has become the largest affordable housing production program in the United States. As of 2006, over 27,000 projects, about 1.6 million housing units, have been placed in service through this program (U.S. Department of Housing and Urban Development 2009a).

Several reasons may explain why few studies have examined the external neighborhood effects of the LIHTC projects. First, many people may view the LIHTC simply as a funding mechanism that brings private investors into the affordable housing industry, but not making affordable housing production any special. As a result, they may not see the need to separate LIHTC projects from other affordable housing projects being built today. This seems to be the case considering the flexibility of the program. The federal government has imposed few

restrictions on which type of projects can be subsidized. The funding is distributed as a block grant to each state, which then exercises its discretion to allocate it to individual projects. As a result, the LIHTC has subsidized a variety of projects that differ significantly from each other. The lack of unique features characterizing LIHTC projects is perhaps another reason that they have not been examined as a group. Finally, while some individual projects may face NIMBYism, in general the LIHTC program has not acquired the negative reputation that dogged the older production programs, which may have reduced urgency to examine it (Freeman 2006).

I would argue, however, that the very flexibility of the LIHTC program makes it even more important to evaluate its impact. The LIHTC program is the only federal funding source for affordable housing development, and many state housing finance agencies face the critical question of how to allocate their limited housing resources more efficiently, for example, by funding the right types of projects.[1] For example, while few would deny the improved housing quality assisted families enjoy by living in newly built affordable housing projects, it is these projects' external benefits (or costs) that are often questioned and need to be examined. Moreover, since different states have set up different criteria in allocating LIHTC funding, it would be helpful if states could learn from each other what has worked and what has not. To do so, we would need more careful studies of how LIHTC is used in specific local markets, what impacts it has caused, and whether state policy targeting, if any, has generated the desired outcome (Varady 2006). Thus, even though there is no urgent need to defend the LIHTC program, a better understanding of its impacts could greatly improve its administration.

[1] The LIHTC program has faced serious challenges recently due to the national mortgage market meltdown and the subsequent credit crunch, which has significantly reduced financial institutions' demand for LIHTC. As a result, it has become difficult to raise funds from the private sector.

As part of the larger efforts to fill this gap, this paper examines LIHTC developments in Santa Clara County, California. Also known as Silicon Valley, Santa Clara County is located in the southern portion of the San Francisco Bay Area. With a unique dataset that provides detailed information about the area's LIHTC development activities from 1987 to 2000, this study measures the external impacts of these developments on nearby single-family property value and, in particular, what factors have shaped these effects. For example, under the LIHTC program, anyone who wants to build affordable housing is eligible to apply. The LIHTC has indeed been allocated to a variety of developers. Among the 78 LIHTC projects (8,407 units) placed in service in Santa Clara County by 2000, 43 (3,944 units) were built by nonprofit developers, 22 (3,397 units) were built by for-profit developers, and 13 (1,066 units) were built by the Housing Authority of the County of Santa Clara (HACSC). The significance of nonprofit production may not be surprising considering that the San Francisco Bay Area has been well served by a sophisticated nonprofit industry (Christensen 2000). What is interesting is the large number of LIHTC units built by HACSC, given that nationally, the participation of local public housing authorities (PHA) in the LIHTC program has been limited (Cabrera 2007).[2] Santa Clara County thus offers a unique opportunity to compare LIHTC projects across the three sectors.

Moreover, since the area suffers from a severe housing shortage and high development costs, the LIHTC has been a critical resource for Santa Clara County's affordable housing needs. Yet with demand far exceeding supply, the process of getting LIHTC funding has been extremely competitive in California (Basolo and Scally 2008). Studying the LIHTC projects in Santa Clara County would allow us to examine the effects of competition, which, presumably, has led to the selection of quality projects. Furthermore, in a study of the health industry,

[2] According to Cabrera (2007), nationwide approximately 230 PHAs have developed 775 LIHTC projects, about 97,930 units, as of 2005.

Rosenau and Linder (2003) propose that competition may create similar pressure and incentives, which would lead to the convergence of performance between nonprofit and for-profit sectors. This study can examine whether this might be the case for LIHTC development in Santa Clara County, given the involvement of the three sectors discussed above.

In addition to strong statewide competition, another feature that makes Santa Clara County interesting to study is the significant role played by local governments in this area's LIHTC developments. As discussed below, local governments in Santa Clara County have worked not only as development regulators, but also as lenders and developers. Such involvement did not just make affordable housing happen. It also ensured that the LIHTC projects were built to meet local planning objectives such as the pursuit of smart growth.

Clearly, one could argue that there might be some selection bias in conducting the study in Santa Clara County, given the tight market environment within which the LIHTC projects have been built. For example, several existing studies have argued that affordable housing developments may be less likely to have negative impacts in tight housing markets than in declining markets (Koschinsky 2009; Schwartz et al. 2006; Briggs et al. 1999). While this might be the case, it is also important to note that as a suburban metropolis, Santa Clara County, including its core city of San Jose, has a landscape that is largely dominated by low-density developments. Building affordable housing projects in this area often involves some alteration of the existing neighborhood character, especially when such projects have been used as part of smart growth strategies to promote infill developments (Simonson 2003). In fact, our interviews of LIHTC developers in this area also confirm that concern over increasing density has been a

common reason for neighborhood resistance.[3] Examining how single-family home sales in the surrounding areas have responded to the LIHTC developments would help address such concerns.

This paper is organized into several sections. The next section presents the research background for the LIHTC program. The third section describes the LIHTC development activities in Santa Clara County. The fourth section examines the externality effects generated by the LIHTC projects and the factors that shape these effects. The final section concludes.

Research Background for the LIHTC Program

This section establishes the research background for the LIHTC program, with a particular focus on three issues. First, how do state housing finance agencies select projects for LIHTC funding? Second, who has built the LIHTC projects? Third, what do we know about the LIHTC projects that have been built?

How Do State Housing Finance Agencies Select Projects for LIHTC Funding?

It is important to understand how state housing finance agencies select projects for LIHTC funding, since this affects what types of housing will eventually be built. As noted before, LITHC funding is given to each state as a block grant. Each year, states must prepare their own qualified allocation plans (QAP) that describe how they will allocate the tax credits. Since the LIHTC is allocated on a competitive basis, QAPs must include a scoring system to rank all the applications. QAPs may also set up preferences or set-asides that favor particular kinds of projects. Overall, the preferences and set-asides used to allocate the LIHTC vary widely from state to state, either due to the variations in local housing needs or the political considerations

[3] As required by our university's Institutional Review Board (IRB) that reviewed our interview protocol, all our interviewees must remain anonymous in any reports we produce.

involved in resource allocation. However, it is not very clear how QAPs specifically respond to these different demands. Only one study, to this author's knowledge, has examined QAPs across all 50 states. Interestingly, it did not find a strong relationship between measures of state-level housing needs and QAP preferences and set-asides (Gustafson and Walker 2002). More studies are needed to help us understand QAP processes.

Despite their importance, QAPs are effective only when states have large application pools. The more applications states receive, the more leverage they have in achieving their policy goals. Indeed, until the financial crisis, the demand for LIHTC was very strong and often exceeded the available tax credits in most states. In California, for example, the demand for 9 percent tax credits typically exceeds availability by about 3 to 1 (Basolo and Scally 2008). As a result, the state could choose the projects that fit its policy goals. This is also confirmed by the QAP study mentioned above, which found that QAPs strongly influenced the characteristics of the LIHTC units being developed (Gustafson and Walker 2002). Many housing advocates believe that this competitive process has contributed to the program's success (Smith and Hendelman 2008).

Who Has Built LIHTC Projects?

To understand the impacts generated by LIHTC projects, it is important to know who built them. After all, states can only choose from the applications submitted. It is the developers who identify market opportunities and decide what to build. This section discusses the developers that have built LIHTC projects and how they differ from each other.

As noted earlier, under the LIHTC program, anyone who is interested in building affordable housing is eligible to apply. According to the most recent LIHTC database published by the U.S. Department of Housing and Urban Development (2009b), nationwide about 29% of

the LIHTC projects were built by nonprofit housing developers, and the rest were built by for-profit developers. As many scholars such as Walker (1993) and Bratt (2008) have argued, nonprofits and for-profits can differ significantly in their housing developments. For-profit developers, for example, can respond freely to market opportunities and build housing more efficiently, but they may not have incentives to maintain its long-term affordability. The opposite may be true for nonprofits, which are bound by their commitment to the community and can respond to only a limited set of development opportunities. As a result, nonprofits are more likely to undertake difficult projects in resource-poor environments (Walker 1993; Bratt 2008).

More specifically, Ellen and Voicu (2006) have examined the differences in spillover effects between nonprofit and for-profit affordable housing developments. Both types of housing are found to have positive impacts on nearby property value, but the impacts of nonprofit housing remain stable over time, whereas the impacts of for-profit housing decline slightly over time. According to the authors, this is likely due to the different organizational principles of the two sectors. While for-profits have an explicit responsibility to maximize earnings for their shareholders, nonprofits are limited in how income can be distributed to those controlling the organization. As a result, nonprofits have less incentive to economize on costs and are more likely to deliver housing valued by the community.

Despite its significant contribution, Ellen and Voicu's unique study may not be generalizable, not only because it was conducted in New York City, but also because it examines only city-supported rehabilitation projects. As they argue, some of the spillover effects may come from the removal of existing disamenities in the rehabilitation process. For new developments that do not have strong removal effects, the direction and magnitude of the spillover impacts are tied more to the quality of the development itself. This is the case for

LIHTC projects in Santa Clara County. Unlike New York City, Santa Clara County does not have significant rehabilitation activities, since most of its housing stock was developed after World War II. Moreover, the area also has few distressed neighborhoods, thanks to strong economic growth and exorbitant housing costs that have priced out many low-income families. As a result, most of the LIHTC in Santa Clara County was allocated to encourage new developments and expand affordable housing stock. It is important to know whether these developments have also generated significant spillover effects.

By distinguishing only between nonprofits and for-profits, existing studies have often overlooked other institutions that may participate in affordable housing production, such as the local PHAs. This is an issue particularly for the LITHC program. While the program is designed mainly to subsidize private developments, it does not exclude PHAs from using it. In fact, some PHAs have used it either to redevelop distressed public housing units or to build new housing units, even though the overall share is small (Kleit and Page 2008). However, all of these projects were labeled as nonprofit in HUD's LIHTC database. No studies or databases, to this author's knowledge, have examined them separately.[4]

To some degree, the lack of attention to projects built by PHAs reflects the reality that many PHAs have largely withdrawn themselves from new developments. For decades, no federal funds have been available for the construction of new public housing units, with the exception of replacements for demolished units (Quercia and Galster 1997). Yet, as Kleit and Page (2008) have found, a small number of the PHAs have used the LIHTC or HOME fund to build housing

[4] For many LIHTC projects built by the public housing authorities, HUD's database lists only the limited partnership name instead of the public housing authorities that built these projects. As a result, HUD's database has seriously underestimated the number of LIHTC projects built by public housing authorities. For example, by examining each individual project, we were able to identify 13 LIHTC projects built by the Housing Authority of the County of Santa Clara by 2000. Yet, in HUD's database, the county housing authority was credited for only three projects.

outside of the purview of HUD. How might these PHA developments differ from for-profit or nonprofit housing activities? In a study of the changing roles of PHAs, Quercia and Galster (1997) argue that PHAs were originally created to serve nonmarket, social purposes and were not meant to behave like private sector providers. Yet, due to changing political realities, they now have to compete with private sector providers for tenants and have to act more like market participants. According to Quercia and Galster, despite the conflicting goals PHAs often face, some of them have the potential to become entrepreneurial developers, for example, by adopting a nonprofit development model. As one of the most active developers of affordable housing in the San Francisco Bay Area, HACSC represents those who have succeeded, which offers us the opportunity to compare projects across the three sectors.

What do We Know about the LIHTC Projects That Have Been Built?

Despite the limited knowledge of its development impacts, two issues about the LIHTC program have been widely debated. The first is the concern about development efficiency, raised in response to the complexity associated with LIHTC financing. This complexity, as Stegman (1991) argued, would impose unnecessary transaction costs relative to direct capital grants and waste government subsidies. Later studies, however, have found that the program's efficiency has greatly improved as investors have become more confident and willing to pay a higher price for tax credits over time (Cummings and DiPasquale 1999; Deng 2005). Thus, until the recent mortgage market meltdown, the LIHTC had been widely accepted as an effective vehicle to raise capital for affordable housing development.

The second is the concern about the LIHTC units' effect on their surrounding neighborhoods. For example, Bruce Katz (2004) has criticized LIHTC for its disproportionate

concentration in distressed inner-city neighborhoods, arguing that this concentration has restricted the assisted families' education and employment outcomes. Yet a study by Deng (2007) has revealed considerable variation in the spatial distribution of LIHTC units across housing markets, a result of both state LIHTC allocation policies and local market environments. Nationwide, McClure (2006) finds that compared to the alternative housing voucher program, a larger share of LIHTC units are located in low-poverty suburban areas, a success he attributes to the program's popularity among both for-profit and nonprofit developers.

Despite the existing evidence, neither the development efficiency issue nor the neighborhood environment issue can be fully addressed without knowing the external impacts of the LIHTC developments. After all, the external benefits or costs generated by the LIHTC projects should be considered in examining the return to government subsidies. Similarly, one cannot accurately assess the quality of their neighborhoods without knowing how these neighborhoods might have been changed by the LIHTC developments. Only two studies, to this author's knowledge, have examined the neighborhood impacts caused by LIHTC developments. Rosenthal (2007) found that the concentration of LIHTC units in a neighborhood leads to a deterioration of the neighborhood's economic status in the next decade. Green et al. (2002), on the other hand, presented a more ambiguous picture: LIHTC developments either increased nearby single-family property value or had no impact; they were unlikely to have a negative impact. Neither study looks into the developers behind these projects nor whether there are cross-sectoral differences in development outcomes, an issue this study addresses.

LIHTC Development Activities in Santa Clara County

This section will provide an overview of the LIHTC projects built in Santa Clara County. The LIHTC data used in this study were collected from the California Tax Credit Allocation Committee (CTCAC), the state housing finance agency in charge of allocating the LIHTC. The CTCAC data were also compared and verified with HUD's LIHTC database to ensure complete coverage of Santa Clara County. This study examines the LIHTC projects placed in service from 1987 to 2000, the period for which we could get the most detailed information on these developments. Extra efforts were also made to identify the developers for each individual project, since such information is often missing in existing databases.

Basic Characteristics of the LIHTC Development Portfolio

According to our LIHTC database, a total of 78 LIHTC projects (8,407 units) have been placed in service in Santa Clara County from 1987 to 2000, the second highest production of LIHTC units among California counties during this period (National Council of State Housing Agencies 2001). Table 1 presents the basic characteristics of the LIHTC development portfolio, including development nature, project size, targeted population groups, and targeted income levels. As noted before, the LIHTC developments in Santa Clara County are predominantly new construction, with only a small number of rehabilitation projects. Most of the LIHTC projects are medium to large scale, with a mean project size of 107 units per project. It is important to note that California's Qualified Allocation Plan does not allow scattered-site developments during our study period. Thus, all of the units produced by a single development are located on the same site, which makes it convenient to examine their impacts. Table 1 also shows that the LIHTC projects in Santa Clara County serve a diverse population, producing not only family housing,

but also a significant number of senior housing units, as well as single-room occupancy (SRO) units for special population groups such as the homeless. Only nine (out of 78) LIHTC projects are mixed-income developments that contain some portion of market housing. The rest of them are all 100% qualified. [5] Most of the qualified LIHTC units are targeted at families making 50% or 60% of AMI, the highest eligible income under the LIHTC program. [6] Only about one-fifth of them are reserved for families with lower incomes.

[Table 1 about Here]

LIHTC Projects by Sponsor Types

The last panel in Table 1 also distinguishes the LIHTC projects and units by three sponsor types: nonprofits, for-profits, and the local public housing authority. Overall, there are 12 nonprofit developers in Santa Clara County that have built 43 LIHTC projects, 47% of the total units. Twelve for-profit developers have built 22 projects, 40% of the total units. The remaining 13 projects, 13% of the units, were built by HACSC. Interestingly, a rough examination of these developers' websites shows that all of these nonprofit developers are citywide or region-wide developers and have produced as many housing units as their for-profit competitors.[7] None of them are small community-based development organizations (CDCs) that serve particular neighborhoods. Still, all of these nonprofit developers tend to focus their development activities

[5] To be eligible for tax credits, a project must have at least 20 percent of its units affordable to households with incomes of less than 50 percent of area median income, or 40 percent of its units affordable to households with incomes of less than 60 percent of area median income. A qualified unit is a unit that is affordable to such households.

[6] Households with lower incomes can live in these units if they have managed to get some additional subsidies such as housing choice vouchers.

[7] The production capacity of the nonprofit developers examined in this study ranges from 600 units to 13,000 units, with a median production level of about 4000 units. In addition to the total number of housing units the organization has produced, we also examined the size of its staff and the targeted geographic area.

in the Bay Area or in California. By contrast, most of the for-profit developers have built housing in other states as well.

Two possible reasons can explain why small CDCs were not found on the developer list. First, our examination reveals only the current capacity of developers, not their historic capacity. It is possible that some of the nonprofit developers might have been small CDCs at the time of their LIHTC developments but have grown since then.[8] Lance Freeman (2006) has argued that the growth of the community development movement into a network of sophisticated developers and service providers is partly due to the funds and experience acquired from developing LIHTC projects. Indeed, in a survey of the nonprofit housing developers in San Francisco Bay Area, Christensen (2000) has found that half of them rely on developer fees from LIHTC projects. On the other hand, the lack of participation by small CDCs, especially in more recent years, may also reflect the fact that the LIHTC program has become so competitive that it is hard for CDCs to compete with larger nonprofits or for-profits.

In describing the diversity of the nonprofit sector, Rachel Bratt (2008) has highlighted a group of national or regional nonprofits known as Housing Partnership Network (HPN). HPN is "a peer network and business cooperative of 95 of many of the most accomplished affordable housing nonprofits in the country" (Bratt 2008, 327). According to Bratt, HPN members are not only locally prominent; many of them also have major national reputations throughout the nonprofit community. Thus, it would be useful to distinguish HPN members from other nonprofit developers. Among the 12 nonprofit LIHTC developers examined in Santa Clara County, four of them are HPN members, including Mid-Peninsula Housing Coalition, Bridge Housing

[8] Unfortunately, since the projects examined in this study were built between 1987 and 2000, it would be impossible to conduct a retrospective study of these developers at the time of each LIHTC development.

Corporation, Eden Housing, and South County Housing.[9] Together they account for over half of the nonprofit LIHTC production in Santa Clara County. The third sponsor type, HACSC, has acted like a large nonprofit developer. It has been involved in LIHTC developments since 1988 and has produced the second-most LIHTC units in this area, behind only Mid-Peninsula Housing Coalition. As a public agency, HACSC has unique advantages over private developers. HACSC, for example, can use county-wide eminent domain, even though its use has been infrequent. More importantly, HACSC has been an active issuer of tax exempt or private activity bonds, which has helped greatly with its project financing.

While recognizing HACSC's unique advantages, we should also note that almost all of the LIHTC projects built in Santa Clara County have received significant public support from their local governments, regardless of their sponsor type. For example, our study of 57 LIHTC projects with detailed financial records shows that only five projects did not receive any local government funding. For the rest of them, the share of local government loans in total development cost ranges from 5% to 74%, with a median share of 23%. In some cases, local governments do not just provide gap financing; they are also lenders of primary mortgages. Such financial support is possible since California law requires 20% of tax increment funds received by local redevelopment agencies to be used to preserve and produce affordable housing. In the late 1990s, this generated about $14 million in redevelopment funds annually for the City of San Jose's affordable housing programs.[10] Considering the high cost of development in this area, the additional local funding is critical to produce affordable housing for low-income families.

[9] During our study period, Mid-Peninsula Housing Coalition built 13 projects, 1288 units; Bridge Housing Corporation built 4 projects, 648 units; Eden Housing built 2 projects, 195 units; and South County Housing built 4 projects, 185 units.

[10] This funding is not guaranteed, and it tends to fluctuate with the economy. For example, the current economic downturn has reduced redevelopment activity in San Jose, thus limiting the revenue to this funding.

Where Have the LIHTC Projects Been Built?

As many other studies have argued, the impacts of affordable housing projects can differ significantly in different neighborhood contexts (Ding et al. 2000; Freeman and Botein 2002; Koschinsky 2009). It is thus important to know where the LIHTC projects have been built in Santa Clara County. Among the 78 LIHTC projects examined in this study, 48 projects representing almost 70% of the total units were built in the central city of San Jose. The remaining 30 projects are located throughout the suburbs. It is not surprising that the City of San Jose has accommodated the largest number of LIHTC projects. As discussed below, the city has made a strong commitment to affordable housing production and has been aggressively promoting this goal through both financial support and land use planning. In fact, a study conducted by the Nonprofit Housing Association of Northern California (2002) has ranked San Jose as one of the seven cities on the honor roll for making significant planning efforts to accommodate affordable housing developments, whereas most other Bay Area cities and counties have failed to do so.

Besides their general location, this study also takes a closer look at the neighborhood environment within which the LIHTC projects have been built. To do so, we applied a hierarchical cluster analysis to sort all census block groups in Santa Clara County into different neighborhood clusters according to their demographic, social, economic and housing characteristics.[11] We use census block groups not only because they are the smallest geographic units for which we could get these socioeconomic data, but also because they are the closest to

[11] This study uses the 1990 census data to identify these neighborhood clusters. The variables entered for cluster analysis include demographic variables such as percentage of minority population, social variables such as educational achievement, economic variables such as poverty rate and median household income, and housing variables such as housing cost and homeownership rate.

the impact areas of LHITC projects. As discussed below, to develop our hedonic regression model, we define the impact area for each LIHTC project as the area within 1000 feet of the project site. [12] Ideally, to examine how the external effects of LIHTC projects have differed in different neighborhood contexts, we would want to know the characteristics of the impact areas. Such data, however, is not available. As a compromise, we use census block groups. Even though the two do not perfectly overlay each other, the cluster analysis based on census block groups can still inform us about the nature of the neighborhoods surrounding the LIHTC projects.[13] Table 2 presents the results from the cluster analysis and the distribution of LIHTC projects and units among these clusters. The clusters are labeled according to my interpretation of the similarities and differences among them.

[Table 2 about here]

As Table 2 shows, there are a large number of upper-income neighborhoods in Santa Clara County that are occupied by either a non-Hispanic white population or a mixed white and Asian population. While this results from the area's phenomenal economic growth in the last two decades, it also reflects excessive housing costs that have priced out many lower-income families. Nevertheless, the large number of upper-income neighborhoods does increase the odds that an assisted housing development such as an LIHTC project will be built there. Consequently, almost 30% of the LIHTC projects and units in Santa Clara County have entered these upper-

[12] There is no consensus with regard to how the impact area of an affordable housing project should be defined. For example, while some studies have used 2,000 feet to define the impact area such as Santiago et al. (2001), Ding et al. (2000) have found that the impacts of nearby housing developments were limited to an area as small as 300 feet. This study chooses 1,000 feet, but it also allows the impacts to vary within the zone by including a distance variable in the hedonic price model.

[13] We did not use census tracts to run the cluster analysis for two reasons. First, the census tract is too large to be used as a proxy for LIHTC neighborhoods. Second, in our hedonic regression model, each census tract is already represented by a dummy variable that controls for its idiosyncratic characteristics.

income neighborhoods, even though they are all concentrated in only 16 of them. Moreover, about a quarter of the LIHTC projects and units are located in the area's middle-class neighborhoods. By contrast, since only 85 block groups are identified as low-income neighborhoods countywide, they accommodate a smaller share of LIHTC projects. In particular, 12 LIHTC projects, about 12% of the total units, are found in these low-income neighborhoods.

Besides greater access to economically sound neighborhoods, another notable feature of the LIHTC development pattern in Santa Clara County is the prevalence of Transit-Oriented Development (TOD). In the City of San Jose, 23 of 48 LIHTC projects are TOD (City of San Jose Department of Planning, Building, & Code Enforcement 2007). The use of LIHTC to promote TOD in Santa Clara County is a result of both state and local government initiatives. Since the 1990s, local governments in Santa Clara County have aggressively pursued TOD as a means of increasing the supply of affordable housing and promoting compact, mixed-use developments (Cervero and Duncan 2004). Measures to encourage TOD include higher-density rezoning, land assembly, impact fee waivers, tax exempt financing, etc. To receive LIHTC funding, these local efforts must also be supported by the state LITHC allocation policy. According to the California QAP scoring system, a proposed TOD receives an extra five points. These few points can make a difference in California's extremely competitive LIHTC allocation process. More significantly, California QAP also gives preferential treatment to projects leveraging other public funds, which may receive up to 20 points. As noted above, many LIHTC projects built in Santa Clara County have received significant local government funding. Since local governments can choose which type of projects to fund, this gives them the opportunity to achieve their planning objectives, in particular, the promotion of greater urbanization through

infill developments. As a result, the LIHTC has become an important vehicle for adding affordable housing around the area's transit stations.

Measuring the External Effects of LIHTC Developments

Research Methodology

As noted earlier, numerous studies have been conducted to examine the neighborhood impacts of affordable housing projects. All of these studies, however, have faced the same methodological challenge; that is, how to establish the causality between the observed neighborhood changes and the nearby affordable housing projects. In fact, according to a review by Galster (2004), many earlier studies on this topic have failed to do so. To address this issue, this study applies a difference-in-difference hedonic regression approach, also known as adjusted interrupted time series approach, to examine nearby property values before and after each LIHTC development. By examining whether any pre-existing difference in property value between the impact area of an LIHTC development and the rest of the census tracts has been altered by the development, this approach has the advantage of controlling for the differences in historical development trends. Several recent applications of this approach have shown that it can establish a convincing counterfactual and deal with neighborhood selection bias, which would help us identify the direction of causality (Galster et al. 1999; Galster 2004; Schwartz et al. 2006; Koschinsky 2009).

To develop the difference-in-difference hedonic regression model, we purchased single-family housing transaction data for the period of 1985 to 2002 from Fidelity National Information Services, Inc. (FIS) for Santa Clara County. This slightly extended period would

allow us to examine the property value changes for each LIHTC development in our database.[14] After cleaning for some possible data miscoding and outliers, we were left with 138,075 single-family housing transactions. To ensure that our model would generate a good estimate of the property value changes, this study examines only the LIHTC projects with at least two single-family housing transactions in their impact areas before and after the development. The impact area is defined as the area within 1000 feet of an LIHTC development. This reduced the LIHTC projects from 78 to 51. However, a comparison of the 51 sample projects with the 78 projects shows that the sample projects are very representative of the entire LIHTC development portfolio on both development features and neighborhood environment.[15]

Baseline Hedonic Regression Model

This section will describe our baseline hedonic regression model. The baseline model examines LIHTC projects' property value impacts by their basic development features such as project size, nature of the development, and neighborhood environment. The model will later be expanded to examine how such impacts may also differ for projects built by different types of developers. The following equation presents the baseline model structure. Table 3 explains each variable used in the model.

[Table 3 about here]

[14] To ensure that the measured property value impacts come only from the LIHTC projects examined in this study, we exclude some housing transactions from 2000 to 2002 that are affected by more recent LIHTC developments beyond our study period.

[15] Tables describing the characteristics of the 51 sample projects and their neighborhoods environment are available from the author upon request.

$$LnP = \sigma + a\,[\text{Structure}] + b\,[\text{Time}] + c\,[\text{Census\_Tracts}]$$
$$+ d\,\text{IMPACT\_Level} + e\,\text{IMPACT\_Trend}$$
$$+ f\,\text{IMPACT\_Post} + g\,\text{IMPACT\_Post\_Large} + h\,\text{IMPACT\_Post\_Medium}$$
$$+ k\,\text{IMPACT\_Post\_NC} + m\,\text{IMPACT\_Post\_Distance} + n\,\text{IMPACT\_Post\_Trend}$$
$$+ p\,\text{IMPACT\_Lowincome} + q\,\text{IMPACT\_Post\_Lowincome}$$
$$+ r\,X + s\,Y + t\,X*X + u\,Y*Y + v\,X*Y + \varepsilon$$

The dependent variable *LnP* is the log of single-family home sales value. Among the independent variables, *[Structure]*, *[Time]*, and *[Census_Tracts]* are vectors that describe the characteristics of each single-family property being sold, time of sale, and the census tracts within which the property is located. They are included as control variables. All the other variables are key impact variables for this study. The first two, *IMPACT_Level* and *IMPACT_Trend,* capture the preexisting price level and price trend in an LIHTC project' impact area before the LIHTC development. They are included to address the possible self-selection issue; that is, the micro-neighborhoods surrounding the LIHTC project may be systematically different from the rest of the census tracts (Santiago et al. 2001).

After establishing the preexisting price pattern, the next several variables examine how this pattern may be altered by an LIHTC development. *IMPACT_Post* examines whether there are any systematic impacts associated with *all* LIHTC developments. Since LIHTC developments can differ significantly from each other, it is also important to distinguish them. *IMPACT_ Post_Large* and *IMPACT_Post_Medium* are thus introduced to measure the property value impacts resulting from large (over 100 units) or medium-sized (50 to 100 units) LIHTC projects. The omitted category is small projects with less than 50 units. *IMPACT_Post_NC* is included to

measure the property value impacts from new construction projects. The omitted category is rehabilitation projects.

Regardless of their project size and development nature, *IMPACT_Post_Distance* and *IMPACT_Post_Trend* are introduced to allow for a spatial and temporal variation of the property value effects from the LIHTC developments. *IMPACT_Post_Distance* measures whether the property value effects decay with distance away from the project site, while *IMPACT_Post_Trend* examines how the post-development effects might also change over time. Finally, the last two variables in the model examine LIHTC projects' impacts by neighborhood context. *IMPACT_Lowincome* provides further control for the preexisting price pattern if the single-family home sale, located in the impact area of an LIHTC project, is also within one of the low-income neighborhoods identified in the previous cluster analysis. *IMPACT_ Post_Lowincome* measures the property value impacts from the LIHTC projects in those low-income neighborhoods. Finally, following Can (1997), Santiago et al. (2001), and Galster et al. (2006), we also introduced five variables to correct for the spatial autocorrelation problem that such a model may face. Variables X and Y represent the geographic coordinates of each single-family property in the database, normalized to the center of Santa Clara County. X*X, Y*Y, and X*Y are the polynomial transformations of the coordinates.

Table 4 presents the results of the baseline hedonic price model. The last column was added to show the percentage change in price as a result of a one-unit increase in each independent variable.[16] The model as a whole explains 78% of the price variations in our housing transaction data. All the structural variables are highly significant and consistent with

[16] The calculation is based on Halvorsen and Palmquist (1980). For a continuous variable, the percentage change in price is roughly equal to its coefficient. For a dummy variable, the calculated percentage change in price may be quite different from the coefficient.

expectations. All the time variables describing the year of transaction are also highly significant and positive, indicating a consistently rising housing price in the area during the study period. The following discussion will focus on the impact variables, since they are our main concern. We first look at the two variables capturing the preexisting price pattern in an LIHTC project's impact area. Interestingly, both variables are statistically significant, but with different signs. The coefficient for *Impact_Level* is positive, indicating a higher price level in the impact area relative to the rest of the census tract before the LIHTC development; the coefficient for *Impact_Trend* is negative, indicating a lower appreciation trend in the impact area before the LIHTC development. While this may seem confusing, it is important to recall that our model, by introducing the variable *IMPACT_Lowincome,* has specifically controlled for the preexisting price level in the impact area of an LIHTC project in low-income neighborhoods. Thus, the ambiguous picture observed here suggests that except for low-income areas hosting LIHTC projects, the micro-neighborhoods hosting the LIHTC projects in Santa Clara County are not obviously disadvantaged, which is consistent with our previous observations.

[Table 4 about here]

After controlling for the preexisting pattern, what does the model tell us about the impacts generated by the LIHTC developments? First, *IMPACT_Post* is not statistically significant, showing that there are no systematic effects associated with *all* LIHTC projects. Yet, when LIHTC projects reach a certain magnitude, their impacts do become significant. As the model shows, both large and medium-sized LIHTC projects have similar and statistically significant positive impacts on nearby property values. Specifically, a single-family property located right next to those LIHTC projects would sell for about 5% higher than a comparable property located outside the impact area, but still in the same census tracts. These effects are fairly robust in our

testing of alternative model specifications. On the other hand, the model shows that the nature of the development does not seem to matter. Both new construction and rehabilitation projects can help raise nearby property value as long as they produce over 50 units. But their impacts do decay with distance. With every 100 feet away from the LIHTC project site, property value drops by about 0.4 percentage points. On the other hand, since the coefficient for *IMPACT_Post_Trend* is not significant, the observed positive effects from these LIHTC projects do not decline over time, at least during the study period, which may attest to the development quality and management effectiveness of the projects after they were placed into service.

In terms of neighborhood context, the two variables describing LIHTC developments in low-income neighborhoods are both found to be statistically significant. As discussed above, the coefficient for *IMPACT_Lowincome* is negative, indicating a lower preexisting property value in the impact area. The coefficient for *IMPACT_Post_Lowincome* is positive, showing that the development of LIHTC projects has helped raise the property value in these neighborhoods. This increase is in addition to the positive effects that a large or medium-sized LIHTC project might have had in all neighborhoods. Thus, even if the LIHTC project is small (less than 50 units), it can still increase nearby property value by about 5% in low-income neighborhoods. But if the LIHTC project is more than 50 units, the overall increase in nearby property value would be the combined effects, which would be up to 10%.

As noted before, a significant number of LIHTC projects in Santa Clara County were also built in upper-income neighborhoods. Since the discrepancy between LIHTC projects and their neighborhood settings might be the largest in these neighborhoods, one might expect such projects to have more negative effects than those built in other types of neighborhoods. To test this, we replace the two low-income variables with two new variables measuring the property

value before and after the LIHTC development in upper-income neighborhoods. [17] Neither variable is statistically significant, showing that there were no negative effects from the LIHTC projects built in these neighborhoods. Moreover, the significantly positive effects observed for large and medium-sized projects remain almost unchanged. Thus, even in these upper-income neighborhoods, projects with over 50 units can still help boost nearby property value, but small projects do not have significant effects.

Another issue we have examined is whether LIHTC projects' external impacts might be affected by their tenant characteristics. While we could not obtain data on who actually lives in these projects, we did have information on these projects' targeted population groups and targeted income levels, as discussed in the previous section. Existing studies have found that senior housing projects are more likely to be accepted by the surrounding communities than family housing developments (Rohe and Freeman 2001). It would be interesting to see whether this might also be the case in this study. To address this issue, we added variables describing the targeted population groups and targeted income levels into our baseline model. [18] Neither the targeted population groups nor the targeted income levels were found to be significant. In other words, projects serving large families, families with lower incomes, and even special population groups such as the homeless are not more likely to have negative effects than senior housing projects in Santa Clara County. While this contradicts our expectation, it is consistent with our previous observations. It shows that the LIHTC developments in Santa Clara County have been able to overcome some of the prejudice against low-income households, either through quality development or effective management.

[17] Results are not reported here, but are available from the author upon request.
[18] Results are not reported here, but are available from the author upon request.

Finally, given the prevalence of TODs among this area's LIHTC developments, one might also wonder how this feature might affect these developments' external impacts. We also tested this in our hedonic regression model by adding new dummy variables describing the TOD projects. [19] We did not find any significant differences between TOD and non-TOD projects. This is understandable, since the benefits of a TOD housing project would probably go to the tenants living in that development, not to nearby property owners. After all, the value of a TOD location should have been capitalized into the preexisting property values. If there are any impacts from a TOD-type LIHTC development, they are likely to be caused by the development itself, not by its TOD feature. For example, given their location advantages, it is possible that a TOD housing project may have higher density and fewer parking spaces than other projects, which can be a concern for neighborhood residents. Yet our study did not reveal any significant negative impacts from TOD projects. Instead, TOD and non-TOD projects are equally likely to have positive impacts on nearby property value.

The Differential Impacts of LIHTC Projects Built by Different Developers

This section examines whether there might be any sectoral differences in the external impacts of LIHTC projects. The baseline hedonic regression model was expanded to incorporate three new dummy variables reflecting the impacts of LIHTC projects built by three different types of sponsors. In particular, the variable *IMPACT_Post_HousingAuthority* was created to reflect the impacts of LIHTC projects built by HACSC; the variables *IMPACT_Post_HPN* and *IMPACT_Post_NonHPN* were created to reflect the post-development impacts of LIHTC projects built by HPN and non-HPN nonprofits, respectively. The omitted category is projects

[19] Results are not reported here, but are available from the author upon request.

built by for-profit developers. Note that only four nonprofit developers are HPN members. The non-HPN group thus includes most of the nonprofit developers in the area. Interestingly, in examining where the LIHTC projects have been built, we find that projects built by non-HPN nonprofits are much more likely to be located in disadvantaged neighborhoods than those built by other types of developers.[20] To control for this difference in preexisting neighborhood conditions, we added a new variable, *IMPACT_Trend_NonHPN,* which measures the baseline price trend in the impact areas of the non-HPN projects. Table 3 also explains these new variables.

Table 5 presents the results for the key impact variables from this expanded model. All of the control variables have similar coefficients as reported in the baseline model. As in the baseline model, the coefficients for *IMPACT_Post_Large* and *IMPACT_Post_Medium* remain positive and statistically significant. Since the omitted category for project sponsor type is for-profit developments, these two coefficients reflect the baseline impacts of for-profit developments. Thus, according to the two coefficients, a large, for-profit LIHTC development would increase nearby property value by about 5%, while a medium-sized for-profit development would increase nearby property value by 6%.

[Table 5 about here]

Table 5 shows some additional effects from projects built by other types of developers. In particular, projects built by HACSC and an HPN nonprofit have significantly larger impacts on nearby property value, about 4 and 6 percentage points higher than the impacts caused by for-profit projects. Thus, a large or medium-sized project sponsored by HACSC or an HPN nonprofit can increase nearby property value by about 9 to 12%. This confirms the capability of the HPN

[20]For example, our cluster analysis shows that over one-third of the LIHTC projects built by non-HPN nonprofits are located in low-income neighborhoods, versus only 9% of projects built by other sponsor types.

nonprofits, which not only have produced large volumes of affordable housing units, but also have excelled in the quality of their developments. It also shows that in developing affordable housing, HACSC has performed just as a sophisticated nonprofit developer. By contrast, the impacts of projects built by a non-HPN nonprofit do not significantly differ from those of for-profit developments, even though *IMPACT_Post_NonHPN* has a negative coefficient. It is worth noting that this negative coefficient would become statistically significant if we did not control for the preexisting price trend for these developments. Without this control, one might incorrectly argue that the impacts of the LIHTC projects built by these non-HPN nonprofits are less positive than those of the for-profit developments.

It should not come as a surprise that for-profit projects have delivered benefits similar to those of projects sponsored by the area's most nonprofits. This finding is consistent with what Ellen and Voicu (2006) have reported in New York City, and it is supported by our interviews with some of the largest LIHTC developers in this area. For example, we were told that it is quite common for for-profit developers to partner with nonprofits, especially since the City of San Jose requires for-profit developers to form such partnerships in order to receive property tax abatements. One example is JSM Enterprises, Inc., a for-profit developer that has built all seven of its LIHTC projects with a nonprofit partner. In these projects, the nonprofit entity often acts as a managing partner. In addition to cross-sector cooperation, the state LIHTC allocation policy may also have helped eliminate some of the differences in development motives between for-profits and nonprofits. For example, under California QAP, every LIHTC project is subject to a 55-year affordability period. As a result, both nonprofit and for-profit developers have to care about the long-term viability of their projects, if only for "selfish" reasons, as one for-profit developer commented. Of course, as noted above, state policy would not be effective if there

were no strong competition for the LIHTC. As several developers have commented, without a good track record, it is very difficult to get LIHTC allocation in California. Competition has helped ensure the quality of the LIHTC projects built by different developers

Like the similarity between the for-profit and nonprofit sectors, the larger external effects generated by projects built by HACSC and HPN nonprofits are also very interesting. According to our development cost data, both HACSC and HPN nonprofits have on average spent more per unit on construction costs than the non-HPN nonprofits and for-profits have spent.[21] While many factors may have caused such a difference, this study shows that their larger expenditure has at least been rewarded by the stronger spillover effects of these projects. It also shows that any examination of the cost efficiency of affordable housing developments would be insufficient if it did not consider the external impacts generated by these developments.

Finally, Table 5 also shows that the impacts of LIHTC projects in low-income neighborhoods, regardless of who built them, have remained strong and significantly positive. To summarize, our study shows that the external impacts of LIHTC developments vary by project size, sponsor organization, and neighborhood context. Since they may not always change in the same direction, it would be useful to know how these effects come together for actual LIHTC developments. To address this, we apply the regression results to each of the LIHTC projects in our database and calculate their predicted aggregate impacts. Table 6 presents the distribution of LIHTC projects by their predicted impacts among different sponsor types. Overall, the median impact among all 78 LIHTC projects examined is about 6%. But the impacts can vary greatly by individual project. Except for three small projects that did not have any significant impacts, all of

[21] The average construction cost per unit for projects built by for-profits and non-HPN nonprofits is around $100,000, while the average construction cost per unit for projects built by HACSC and the HPN nonprofit is around $120,000 (in 2000 dollars).

the projects generated positive impacts on nearby property value that can be as high as 16%. As expected, Table 6 shows that projects built by HPN nonprofits and HACSC have larger aggregate impacts than those built by for-profits and non-HPN nonprofits. But Table 6 also shows that projects built by non-HPN nonprofits have slightly larger aggregate impacts than those built by for-profits, a pattern that seems to contradict what was reported before. Yet a closer look at the characteristics of these projects shows that this is largely because more non-HPN projects are located in low-income neighborhoods; thus they generate more positive spillover effects.

[Table 6 about here]

Conclusion

This paper examines the external neighborhood effects of Low Income Housing Tax Credit projects built in Santa Clara County. It finds that almost all LIHTC projects examined have generated significantly positive impacts on nearby property value. This finding is consistent with several recent studies that evaluate the external impacts of subsidized housing developments in New York City, such as Schill et al. (2002), Schwartz et al. (2006), and Ellen and Voicu (2006). Nevertheless, the magnitude of the impacts reported in study is smaller than what was observed in New York City, which is reasonable considering that most of the LIHTC projects in Santa Clara County are new developments built in decent neighborhoods. Thus their neighborhood impacts may not be dramatic as those of the subsidized housing developments in New York, where there are more rehabilitation activities in distressed neighborhoods (Schwartz et al. 2006).

As noted above, to understand the impacts caused by the LIHTC projects, we should first acknowledge the unique market and institutional environment within which the program operates. For example, since a chronic housing shortage has begun to threaten the area's economy, the

public and private sectors of Santa Clara County have developed a strong consensus on the need for affordable housing (Nonprofit Housing Association of Northern California 2002). Given this background, it is reasonable to assume that residents of Santa Clara County may be more tolerant of affordable housing developments than residents elsewhere. Even if they were not, the supply constraints faced in this market may have helped maintain a strong demand for neighborhoods hosting affordable housing projects.

A supportive market environment itself, however, cannot sufficiently explain the positive impacts of the LIHTC projects. As our study shows, property values in the immediate areas of LIHTC developments have increased much faster than those in the rest of the census tracts, showing that these micro-neighborhoods have become more attractive. This would not happen if these projects were not well developed and managed. It also confirms what was frequently argued in our expert interviews: LIHTC units built in this area often meet or exceed the quality of market-rate housing. Indeed, in our search for information on individual LIHTC projects, we were surprised by the number of award-winning projects among this area's LIHTC developments, a phenomenon we did not see in our study of LIHTC projects in other areas.

In addition to evaluating the external effects generated by the LIHTC projects in general, this study also distinguishes these projects by their sponsor organizations. As our study shows, there are no significant differences in the external impacts of projects built by for-profits and non-HPN nonprofits, confirming Rosenau and Linder's (2003) hypothesis on the convergence of performance between the nonprofit and for-profit sectors. Yet this convergence is not caused by strong competition alone; it also results from government incentives that encourage cross-sector cooperation and set performance standards for developments.

Perhaps the most intriguing finding presented in this study is the much larger positive impacts observed for projects built by four HPN nonprofits and HACSC. The superior performance of HACSC projects is especially amazing, considering the history of the public housing program and the general stigma against public housing authorities. Our interviewees reported that there was some skepticism when HACSC first started to act as a developer. Yet, as our study shows, the quality of the developments produced by HACSC has overcome the initial doubts.[22] Today, the agency has been rated as a "strong performer" by Standard & Poor and has drawn resources from a variety of investors and lenders for its affordable housing development (HACSC 2009). The success of HACSC can thus offer lessons for other PHAs that are interested in expanding their affordable housing developments.

Finally, despite the uniqueness of LIHTC development in Santa Clara, other places can learn from it. For example, by aligning their incentives, both the state tax credit allocation committee and local governments have played very important roles in influencing where the LIHTC projects have been built. In the City of San Jose, this has led to the development of a large number of high-quality transit-oriented developments. As our study shows, these developments not only offer easy access for low-income families; they can also help boost nearby property value. The LIHTC developments of Santa Clara County thus offer a positive example of how LIHTC can be used to promote an area's smart growth agenda.

[22] In our database, six of the 13 LIHTC projects built by the county housing authority have received some type of national or regional award for design excellence.

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Table 1: Characteristics of the LIHTC Developments in Santa Clara County

		No. of Projects	% of Total Projects	No. of Units	% of Total Units
Development Type	NC	63	81%	6,779	81%
	Rehab	13	17%	1,498	18%
	Missing	2	3%	130	2%
Project Size (units)	Less than 50	13	17%	318	4%
	50 to 99	28	36%	2,026	24%
	100+	37	47%	6,063	72%
Target Population Groups	Family	51	65%	5,215	62%
	Senior	21	27%	2,612	31%
	SRO	6	8%	580	7%
Target Income Levels (AMI)	50% to 60%	44	56%	5,300	63%
	30 to 50%	16	21%	1,431	17%
	less than 30%	1	1%	25	0%
	Missing	17	22%	1,651	20%
Developer Type	Nonprofit	43	55%	3,944	47%
	- HPN	23	29%	2,316	28%
	-NonHPN	20	26%	1,628	19%
	For-profit	22	28%	3,397	40%
	HACSC	13	17%	1,066	13%
Total		78	100%	8,407	100%

Source: Tabulated by the author.
Note: AMI - Area Median Income; HACSC - The Housing Authority of the County of Santa Clara

Table 2: Distribution of LIHTC Projects by Different Neighborhood Clusters

Neighborhood Clusters		No. of BKGP in Each Cluster	No. of BKGP with LIHTC Units	No. of LIHTC Projects	% of LIHTC Projects	No. of LIHTC Units	% of LIHTC Units
Upper-income Neighborhoods	White Dominant	355	10	13	17%	1,414	17%
	White/Asian Mixed	110	6	8	11%	809	10%
Middle-class Neighborhoods	White Dominant	221	14	20	25%	2,053	24%
Working-class Neighborhoods	White/Asian Mixed	167	20	22	29%	2,722	33%
	Asian/Hispanic Mixed	43	2	2	3%	358	4%
Low-income Neighborhoods	Hispanic Dominant	30	7	8	11%	552	7%
	Racially Mixed	55	2	4	5%	389	5%
Total		981	61	77	100%	8,297	100%

Source: Tabulated by the author.
Note: BKGP – Block Group.
One project is missing due to the lack of 1990 census data in its block group.

Table 3: Description of Variables Used in Two Hedonic Regression Models

Variables	Description
LnP	Log of single-family property sales value
σ	Constant term
[Structure]	A set of variables describing the single-family property structure. Includes square feet of living area, number of bathrooms, lot size, and age of the property at sale.
[Time]	A set of dummy variables describing the time of housing transaction, including three seasonal dummies for sales occurring in the first, second, and third quarter and17 yearly dummies for sales occurring between 1986 and 2002. The omitted year is 1985.
[Census_Tracts]	A set of dummy variables describing in which census tract the single-family property is located. These variables help control for both the idiosyncratic neighborhood characteristics and the preexisting price trend in the census tract areas. There are 286 census tract variables in the model.
IMPACT_Level	A dummy variable describing whether the single-family property being sold is located in the impact area of an LIHTC development, an area within 1,000 feet of the LIHTC project site. Its coefficient tells us whether the impact area has systematically lower price levels than the rest of the census tract prior to the LIHTC development.
IMPACT_Trend	A trend variable measuring the annual price appreciation trend in the impact area of an LIHTC project. IMPACT_Trend equals the difference (in years) between the transaction year and 1984 (the year before the housing transaction data starts) if the property is located in the impact area; otherwise 0. Its coefficient tells us whether the impact area has a lower price appreciation trend than the rest of the census tract prior to the LITHC development.
IMPACT_Post	A dummy variable describing the property value impacts from a generic LIHTC project. IMPACT_Post equals 1 if the single-family property is located in the impact area of an LIHTC project and its sale occurred after the LIHTC development; otherwise 0. Its coefficient will tell us whether there are any systematic impacts associated with all LIHTC developments.

Table 3, continued

IMPACT_Post_Large & IMPACT_Post_Medium	Two dummy variables describing the property value impacts from a large or a medium-sized LIHTC development. IMPACT_Post_Large (IMPACT_Post_Medium) equals one if the single-family property is located in the impact area of a large (medium-sized) LIHTC project and its sale occurred after the LIHTC development; otherwise 0. A large project is a project with over 100 units, while a medium-sized project is a project with 50 to 100 units. The omitted category is LIHTC projects with fewer than 50 units.
IMPACT_Post_NC	A dummy variable describing the property value impacts from a new construction LIHTC project. IMPACT_Post_NC equals one if the single-family property is located in the impact area of a new construction LIHTC project and its sale occurred after the LIHTC project was built; otherwise 0. The omitted category is rehabilitation projects. The coefficient for this variable will tell us whether the impacts of new construction project differ significantly from those of rehabilitation projects.
IMPACT_Post_Distance	A distance variable that interacts IMPACT_Post with a variable describing the Euclidean distance between the single-family property being sold and the nearest LIHTC project. Its coefficient measures whether the property value impacts of an LIHTC development varies with distance from the development site. The distance is measured by hundreds of feet.
IMPACT_Post_Trend	A trend variable that equals the number of years between the date of the single-family sale and the completion of the LIHTC project if the property is located in the impact area and sold after the LIHTC project; otherwise 0. Its coefficient measures whether the LIHTC development's impacts change over time.
IMPACT_Lowincome	A dummy variable describing the preexisting price level in the impact area of a LIHTC project that is also part of the low-income neighborhood. It equals one if the single-family property is located both in the impact area of an LIHTC project and in an low-income neighborhood as identified by the cluster analysis; otherwise 0.
IMPACT_Post_Lowincome	A dummy variable describing the impacts of an LIHTC project in low-income neighborhoods. It equals one if the single-family property is located in the impact area of an LIHTC project, is within a low-income neighborhood, and is sold after the LIHTC development; otherwise 0.

Table 3, continued

IMPACT_Post_HousingAuthority	A dummy variable describing the impacts of an LIHTC project built by the county housing authority. It equals one if the single-family property is located in the impact area of an LIHTC project built by the county housing authority and is sold after the LIHTC development; otherwise 0.
IMPACT_Post_HPN	A dummy variable describing the impacts of an LIHTC project built by an HPN nonprofit. It equals one if the single-family property is located in the impact area of an LIHTC project built by an HPN nonprofit and is sold after the LIHTC development; otherwise 0.
IMPACT_Post_NonHPN	A dummy variable describing the impacts of an LIHTC project built by a non-HPN nonprofit. It equals one if the single-family property is located in the impact area of an LIHTC project built by a non-HPN nonprofit and is sold after the LIHTC development; otherwise 0.
IMPACT_Trend_NonHPN	A trend variable describing the baseline price trend in the impact area of a non-HPN LIHTC project. It equals IMPACT_Trend if the single-family property is located in the impact area of an LIHTC project built by a non-HPN nonprofit; otherwise 0.
X	X coordinate of the single-family property, normalized to the center of Santa Clara County
Y	Y coordinate of the single-family property, normalized to the center of Santa Clara County.
X*X	Square of X coordinate
Y*Y	Square of Y coordinate
ε	Error Term

Table 4: Results of Baseline Hedonic Regression Model
(Dependent Variable: Ln (Price); No. of Observations: 138,075; Adjusted R^2 = 78%)

	Coefficient	Standard Error	Sig.	Price Change from one unit increase in each variable
(Constant)	11.371	.017	***	
Control Variables				
Building Area (Square Feet)	.0003	.000	***	
Lot Size (Acres)	.0754	.004	***	
No. of Bedrooms	-.0147	.001	***	
Age of Property at Sale	-.0035	.000	***	
Quarter 1	-.0651	.002	***	
Quarter 2	-.0131	.002	***	
Quarter 3	-.0036	.002	***	
17 Dummy Variables for Years				
286 Dummy Variables for Census Tracts				
Impact Variables				
IMPACT_Level	.0263	.016	*	2.67%
IMPACT_Trend	-.0026	.002	*	-0.26%
IMPACT_Post	-.0036	.028		
IMPACT_Post_Large	.0479	.016	***	4.91%
IMPACT_Post_Medium	.0543	.018	***	5.57%
IMPACT_Post_NC	-.0081	.016		
IMPACT_Post_Distance (measured by 100 feet)	-.0044	.002	*	-0.44%
IMPACT_ Post_Trend	.0004	.002		
IMPACT_Lowincome	-.0537	.023	***	-5.23%
IMPACT_Post_Lowincome	.0491	.030	*	5.03%

Source: Author's calculation.
Note: Since the dependent variable is the natural logarithm of housing price, the coefficient for each independent variable cannot easily be interpreted. The last column was added to show the percentage change in price as a result of a one unit increase in each independent variable. Mathematically, this is calculated using the following formula presented by Halvorsen and Palmquist (1980): $\%\ \text{change in price} = Exp(\beta_i) - 1$. For a continuous variable, the percentage change in price is roughly equal to its coefficient, but for a dummy variable, it may be quite different from its coefficient.
Sig.: Significance level. *: significant at 10% level. **: significant at 5% level. ***: significant at 1% level.

Table 5: Property Value Impacts of LIHTC Projects Built by Different Developers
(Dependent Variable: Ln (Price); No. of Observations: 138,075; Adjusted R^2 =79%)

	Coefficient	Standard Error	Sig.	Price Change from one unit increase in each variable[1]
IMPACT_Level	.0195	.016		
IMPACT_Trend	-.0012	.002		
IMPACT_Post	-.0243	.030		
IMPACT_Post_Large	.0490	.018	***	5.02%
IMPACT_Post_Medium	.0587	.019	***	6.04%
IMPACT_Post_NC	-.0244	.017		
IMPACT_Post_Distance (Measured by 100 feet)	-.0036	.002		
IMPACT_ Post_Trend	-.0011	.002		
IMPACT_Lowincome	-.0539	.023	**	-5.25%
IMPACT_Post_Lowincome	.0612	.031	**	6.32%
IMPACT_Trend_NonHPN	-.0017	.002		
IMPACT_Post_HousingAuthority	.0401	.020	**	4.09%
IMPACT_Post_HPN	.0594	.017	***	6.12%
IMPACT_Post_Non-HPN	-.0386	.032		

Source: Author's calculation.
Note: Sig.: Significance level. *: significant at 10% level. **: significant at 5% level. ***: significant at 1% level.

Table 6: Predicted Impacts of LIHTC Projects Built by Different Developers

Predicted Impacts		For-profit	Non-HPN Nonprofits	HPN Nonprofits	Housing Authority	Total Projects
Median Value		5%	6%	11%	10%	6%
No. of Projects	No. Impacts	0	3	0	0	3
	1% to 5%	13	4	0	3	20
	6% to 10%	7	7	5	8	27
	11% to 16%	2	6	18	2	28
	Total Projects	22	20	23	13	78

Source: Author's calculation.

Note: Predicted impacts are calculated based on the regression results reported in Table 5. They measure the increase in nearby single-family property value from each LIHTC development in our database, assuming that the property is located right next to the LIHTC development. Only coefficients that are statistically significant in Table 5 are included in the calculation. Specifically, predicted impacts are calculated as follows:
Predicted impacts = exp(0.049**Dummy_Large* + 0.0587**Dummy_Medium* + 0.0612**Dummy_Lowincome* + 0.04**Dummy_HousingAuthority* + 0.059**Dummy_HPN*)-1.
Dummy_Large and *Dummy_Medium* are dummy variables indicating whether the LIHTC development is a large or medium-sized project; *Dummy_Lowincome* is a dummy variable indicating whether the LIHTC project is located in low-income neighborhoods; *Dummy_HousingAuthority* is a dummy variable indicating whether the LIHTC project is built by the county housing authority; *Dummy_HPN* is a dummy variable indicating whether the LIHTC project is built by a nonprofit who is an HPN member.