HOPE VI Neighborhood Spillover Effects in Baltimore

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Abstract

A major goal of the HOPE VI (Housing Opportunities for People Everywhere) Program is to improve surrounding communities by removing physically deteriorating public housing projects—a source of concentrated poverty and crime—and replacing them with mixed-income communities. This article uses a difference-in-differences approach to determine if Baltimore's three completed HOPE VI redevelopments had positive neighborhood spillover effects on surrounding property values. The analysis compares property sales prices in the area immediately surrounding each site before and after redevelopment to sales prices of comparable properties farther away but in the same neighborhood and at the same time. Only one redevelopment showed convincing evidence of a positive effect on property values in its surrounding neighborhood. This redevelopment was located in a less distressed neighborhood than the other two sites, adhered more closely to the mixed-income model, and implemented the project's social and community services component through a partnership between the private developer and the tenant organization. These findings suggest that adherence to HOPE VI's main principles of implementation and preexisting neighborhood conditions make a difference in neighborhood spillover effects and raise the question of whether HOPE VI investment is best targeted to severely distressed neighborhoods or to stable or already improving neighborhoods.

Introduction

Under the federal HOPE VI (Housing Opportunities for People Everywhere) Program, distressed public housing is redeveloped into mixed-income and mixed-tenure (that is, some occupants are renters and some are owners) communities with the goals of reducing the concentration of poverty, moving residents of public housing toward self-sufficiency, and revitalizing communities. It is the most ambitious U.S. urban initiative of the past few decades. Between fiscal year (FY) 1993 and FY 2005, the U.S. Department of Housing and Urban Development (HUD) awarded more than $6 billion in HOPE VI grants to 190 housing authorities across the country (HUD, 2006).

HOPE VI represents a new vision of public housing policy. Historically, HUD's primary role in public housing was to maintain and manage its properties. After most new construction of public housing ended in the early 1970s, the physical and social conditions of these projects deteriorated over time. By the 1980s, a subset of public housing projects—primarily highrises in large inner cities—along with the neighborhoods surrounding them had become notorious for their blight, social isolation, and high concentrations of poverty and crime. HOPE VI was created in 1992 as a way to deal with the structural deterioration of the most severely distressed of these projects, but over time it has evolved into a more ambitious revitalization effort that also addresses the problems associated with high concentrations of poverty. By combining subsidized and market-rate units (thus housing a range of income groups) and attracting private investment to the community, HOPE VI revitalization aims to transform neighborhoods.

The Quality Housing and Work Opportunity Reconciliation Act, which reauthorized HOPE VI in 1998, reflects this redefinition of public housing. It outlined HOPE VI's four main goals:

1. Improving the living environment for public housing residents.
2. Revitalizing public housing project sites and contributing to the improvement of the surrounding neighborhood.
3. Providing housing that will avoid or decrease the concentration of very low-income families.
4. Building sustainable communities.[1]

This article focuses on the second of these goals—which explicitly states the expectation that HOPE VI will have positive spillover effects (that is, indirect effects on the quality or desirability of its developments' surrounding neighborhoods)—and uses a difference-in-differences[2] approach to test this hypothesis for three HOPE VI sites in Baltimore, Maryland. Empirical estimates are supplemented with qualitative information from local newspapers and interviews with city and housing experts to better understand implementation strategies, the community response to HOPE VI redevelopment, and other neighborhood changes and investments that may have affected property prices in the HOPE VI neighborhoods during the study period. This article aims to contribute to existing knowledge of HOPE VI spillover effects in general and to provide insight into whether HOPE VI has contributed to neighborhood revitalization in Baltimore. The article refers to neighborhood revitalization and positive spillover effects as improvement in the neighborhood's economic value to property owners,[3] reflected by property sales prices.

Only one redevelopment showed convincing evidence of a positive effect on property values in its surrounding neighborhood. Local newspaper coverage and interviews with city and housing

[1] U.S. Housing Act of 1937, Section 24(a). Public Law 93-383 (42 U.S.C. 1437v), as amended by Section 535 of the Quality Housing and Work Responsibility Act of 1998. Public Law 105-276, October 21, 1998.

[2] A difference-in-differences approach estimates a treatment effect by comparing the change in an outcome of one group before and after treatment with the change in the outcome over the same time period for a comparison group that was not exposed to the treatment.

[3] Sean Zielenbach (2000) identifies two alternative interpretations of neighborhood revitalization: neighborhood improvement in terms of the social conditions of the residents and neighborhood improvement in terms of the economic development and viability of the neighborhood. This article focuses on the second interpretation.

experts are consistent with empirical findings, showing that this redevelopment adhered more closely to the mixed-income implementation model than did the other two. Also, it was located in a less distressed neighborhood than were the other two sites, raising the question of whether HOPE VI investment is best targeted to severely disadvantaged neighborhoods or to stable or already improving neighborhoods.

Previous Research on Hope VI Spillover Effects

Existing research that evaluates the neighborhood spillover effects of HOPE VI redevelopments generally finds improvements in the social and economic conditions of the surrounding neighborhoods, although the magnitude of effects is mixed, and some indicators of neighborhood health did not show improvement in some sites. Four major studies have looked at HOPE VI in different cities to examine these impacts: (1) a study by Sean Zielenbach (2002) for the Housing Research Foundation, (2) an assessment by Holin et al. (2003) for HUD, (3) a large-scale evaluation by the U.S. General Accounting Office (GAO) (2003), and (4) a series of case studies by the Brookings Institution (Turbov and Piper, 2005). Two studies have examined the effect of HOPE VI on surrounding neighborhoods in Baltimore: (1) a study of all 5 Baltimore sites by a class of public policy graduate students from Johns Hopkins University (JHU MPP, 2003) and (2) a case study of Pleasant View Gardens, Baltimore's first HOPE VI redevelopment, which forms part of the 11-site interim assessment by Holin et al. (2003).

Zielenbach was the first to examine HOPE VI spillover effects. In his 2002 report for the Housing Research Foundation, he examined changes in economic conditions (such as unemployment, lending rates, and crime) in the neighborhoods of eight large HOPE VI projects across the country. Comparing the status of the projects' surrounding neighborhoods in 1990, before any of the HOPE VI projects began, to that in 2000, when the eight projects were far along in their redevelopment, he found that the neighborhoods showed substantial improvement in socioeconomic and market indicators, including significant increases in per capita income and rates in commercial and residential lending rates, as well as substantial decreases in crime and unemployment rates relative to citywide indicators (Zielenbach, 2002). In a separate study (Zielenbach, 2003) he expanded this analysis to include comparison neighborhoods with poverty rates greater than 30 percent. HOPE VI neighborhoods were worse off economically and had higher crime rates than these comparison neighborhoods in 1990, before redevelopment, but by 2000 they had improved so much that they were better off than the high-poverty comparison neighborhoods.

Holin et al. (2003) examined changes in unemployment, poverty, crime, racial integration, vacancy rates, and residents' education levels in the surrounding neighborhoods of 11 of the earliest HOPE VI sites between 1990 and 2000 and compared the changes to those for the city as a whole. Although nearly all the surrounding neighborhoods experienced some improvement relative to pre-HOPE VI conditions, the study found great variation in the levels of improvement among the 11 sites.

The large-scale evaluation of the HOPE VI Program by the GAO (2003) included an examination of the surrounding neighborhoods of the 20 sites that had received a revitalization grant in 1996. The study found significant improvements between 1990 and 2000 in levels of education, average household income, poverty rates, and average housing values in neighborhoods surrounding

HOPE VI sites but found mixed or insignificant changes in mortgage lending activity, unemployment rates, percentage of units built within the past 10 years, occupancy rates, average gross rent, and total population. The authors also looked more closely at four of these sites, comparing them with four public housing neighborhoods in the same city that had not had HOPE VI developments, and found that the HOPE VI neighborhoods had greater improvements in mortgage lending activity and crime compared with the four non-HOPE VI neighborhoods, but that other indicators—such as poverty rates and average housing values and rents—did not demonstrate significant improvement (GAO, 2003).

The most recent study of HOPE VI spillovers, by Turbov and Piper (2005), used census data and administrative data[4] on crime, housing values, non-HOPE VI investment, and school performance along with interviews to examine the effects of four HOPE VI projects on surrounding neighborhoods and assess the program's ability to attract new investments and encourage revitalization. They found a surge in new investments and property value increases in HOPE VI neighborhoods—as well as significant improvements in socioeconomic indicators such as income, crime, and unemployment—and concluded that HOPE VI was successful as a catalyst for neighborhood investment and revitalization.

The JHU MPP 2003 study is the only comprehensive analysis to date of spillover effects of all five HOPE VI projects in Baltimore. The study used census and administrative data to examine socioeconomic and demographic changes in surrounding neighborhoods, as well as interviews with experts and neighborhood residents to assess any changes in the public image of HOPE VI's ability to attract investment to these neighborhoods. They did not find strong evidence of positive spillover effects for the three HOPE VI redevelopments included in the present analysis. Spillover effects in Townes at the Terraces and Heritage Crossing were very limited and short lived. Broadway Overlook was not completed at the time of the study, but the authors did not find evidence of positive spillovers from announcements of the redevelopment.

Neighborhood Context of Hope VI in Baltimore

Five HOPE VI sites are currently in Baltimore: Pleasant View Gardens, Townes at the Terraces, Heritage Crossing, Broadway Overlook, and Flag House Courts. This analysis focuses on three of these sites: Townes at the Terraces, Heritage Crossing, and Broadway Overlook. Flag House Courts and Pleasant View Gardens are excluded because the former was not completed at the time of this study and the latter's surrounding neighborhood has only a small residential area and thus has too few residential property sales to detect the effects of redevelopment. The three HOPE VI sites in this study differ greatly from each other in implementation and neighborhood conditions, as shown in exhibit 1.

The following descriptions of the HOPE VI sites and neighborhoods, based on expert interviews and local newspaper coverage, provide important context for interpreting the empirical findings. The limited public investments—outside of HOPE VI—that are narrowly targeted to the study neighborhoods (and the limited effectiveness of the public investments that did occur, such as the

[4] Organizations or government agencies collect administrative data for their own administrative purposes.

Exhibit 1

HOPE VI Site Characteristics

HOPE VI Site	Townes at the Terraces	Heritage Crossing	Broadway Overlook
Former public housing project	Lexington Terrace	Murphy Homes	Broadway Homes
Number of units in former public housing project	667	781	429
Date of demolition	July 1996	July 1999	August 2000
Date of first unit's availability for occupancy	July 1999	June 2002	August 2003
Number of public housing units after redevelopment	250	75	84
Number of subsidized (including LIHTC) homeownership units[a]	100	185	5
Number of market-rate rental units	41	0	48
Number of market-rate homeownership units	0	0	29
Total residential units after redevelopment	391	260	166

LIHTC = Low-Income Housing Tax Credit Program.

[a] Some disagreement exists within the Housing Authority of Baltimore City (HABC) about the definition of "market-rate homeownership units." For instance, the HABC website refers to for-sale units that were constructed with LIHTC or other public funds and sold to homebuyers with incomes under 60 or 80 percent (depending on the development) of the Area Median Income as "market-rate homeownership units." In this article, these units are referred to as subsidized homeownership units.

Sources: HABC (2006); Shea (2006)

Empowerment Zone [EZ] discussed later in the article) reinforce the assumption that observed differences in the changes in property values of the immediate surrounding neighborhood and properties in the same neighborhood farther away are likely attributable to HOPE VI redevelopment. Also, expert and public opinion is consistent with the differential spillover effects estimated in the empirical analysis and provides insight into why differences in spillover effects may exist.

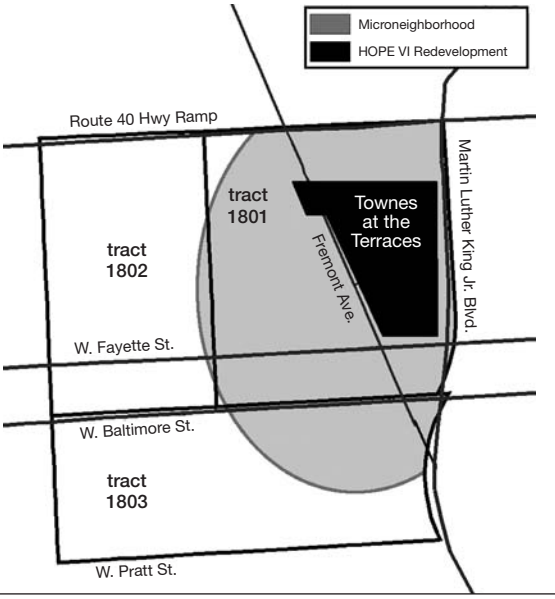
In summary, general impressions of HOPE VI's effect on surrounding neighborhoods from media coverage and experts were that Townes at the Terraces would have a limited effect on its surrounding neighborhood despite major investment in the area, Heritage Crossing could possibly affect its surrounding neighborhood because of its ability to attract homebuyers and investment interest, and Broadway Overlook would have a large effect on its neighborhood because of its strong management and design decisions and the nature of the neighborhood's housing market.

Townes at the Terraces

Townes at the Terraces is located on the west side of Baltimore (hereafter referred to as West Baltimore) in the East Poppleton neighborhood. I relied on the Census Bureau to define study neighborhood boundaries (that is, census tracts). As shown in exhibit 2, the microneighborhood (the area immediately surrounding the redevelopment, as explained in more detail below) is bordered to the north by the U.S. Route 40 ramp, to the east by Martin Luther King Jr. Boulevard

Exhibit 2

Townes at the Terraces



(a major road), to the south by the Hollins Market neighborhood (tract 1803), and to the west by the West Poppleton neighborhood (tract 1802). It replaced the public housing project called Lexington Terrace, which consisted of 667 units (housing 2,100 people) in five 11-story highrise and 22 lowrise buildings (Raffel et al., 2003). The buildings were razed in 1996 and, by 1999, the new lowrise HOPE VI redevelopment was open for occupancy. The new HOPE VI townhouses include 391 new units: 250 public housing units, 41 market-rate rental units, and 100 subsidized homeownership units. In addition, a 4-story building with 88 units for seniors housing and an office building with retail space were constructed as part of the redevelopment (HABC, 2006). An elementary school was demolished along with the highrises in 1996, and plans were to reopen it in 2004 (Raffel et al., 2003); however, the site remains a vacant lot to this day. Poe Homes, a lowrise public housing project to the west of Townes at the Terraces, was renovated before the HOPE VI redevelopment but was not demolished (JHU MPP, 2003).

The results of investment in the Poppleton area in the past decade and a half in general have been disappointing. Aside from the HOPE VI redevelopment, two major revitalization initiatives have been undertaken in Poppleton: an EZ and a University of Maryland (UMD) biotechnology park.

Poppleton was designated as an EZ in 1994.[5] This federal program funded tax incentives and grants to stimulate economic development in the area. Although this zone encompasses the HOPE VI neighborhood, much of the EZ's economic activity is focused on the UMD neighborhood across

[5] The City of Baltimore received an EZ grant of $100 million in 1994. This grant was allocated among six geographic areas in the city (managed by "village centers" that were created under the EZ program) that totaled 6.8 square miles (City of Baltimore, 2007).

from Martin Luther King Jr. Boulevard (JHU MPP, 2003). Press accounts indicate that Baltimore's EZ initiative has not been successful in stimulating business growth or developing job opportunities and placement (Anft, 1999, 2000).

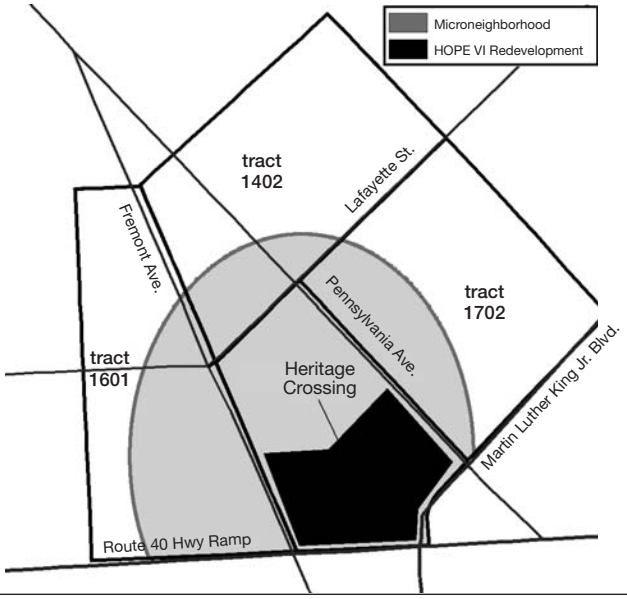
In 2002 UMD announced plans for developing its biotechnology park across from Martin Luther King Jr. Boulevard on West Baltimore Street. The project will include 10 buildings for lab and office space and 2 parking garages on 10 acres of land. Construction began in 2004, and, at the time of this writing, one building is complete and occupied and the second building is almost complete. Although the HOPE VI redevelopment was not an explicit reason for UMD to cross Martin Luther King Jr. Boulevard—cited by some as a symbolic divider between the more developed UMD neighborhood to the east and the more distressed neighborhood to the west—removing the highrise public housing buildings may have contributed to making way for this investment. City and community leaders have expressed high hopes for this revitalization effort by UMD (Beamon, 2004); however, it is still too early in the project's life to assess any neighborhood spillover effects.

Heritage Crossing

Heritage Crossing, also located in West Baltimore, is north of U.S. Route 40 and just southwest of Pennsylvania Avenue, a street with some commercial activity (exhibit 3). The neighborhood on the other side of Pennsylvania Avenue is Upton, known for its rich African-American heritage from decades ago but now, like the Poppleton neighborhood south of U.S. Route 40, an area with high crime and many vacant homes. Heritage Crossing is a sprawling 32-acre development consisting of 75 public housing units and 185 subsidized homeownership units. It replaced the four 14-story Murphy Homes public housing buildings, containing 781 units.

Exhibit 3

Heritage Crossing



Expectations for Heritage Crossing's spillover potential are mixed. The development is very large and appears isolated from the surrounding community. Although it has been able to attract low- to moderate-income homebuyers for its row homes, its inclusion of only public housing units and homeownership units has led to tension between the new homeowners and the returning public housing residents. Also, investor speculation was a major factor in this neighborhood (Seipp, 2007) and throughout Baltimore in the early 2000s (Dewar, 2003; Dolan, 2005). Although news of redevelopment piqued the interest of outside investors and attracted private investment into the neighborhood, it has also led to irresponsible investment decisions that may have hampered neighborhood improvements prompted by the HOPE VI redevelopment.

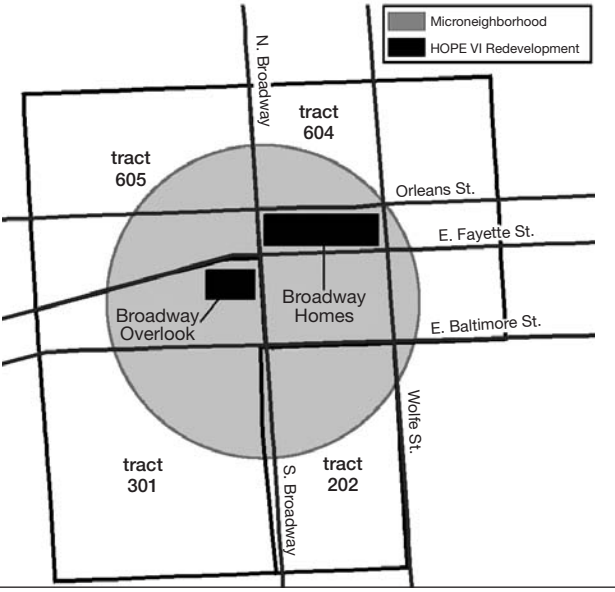
Broadway Overlook

Broadway Overlook sits at the northern edge of the Washington Hill neighborhood in East Baltimore. The original 22-story highrise and 14 lowrise Broadway Homes public housing buildings were located diagonally across the street from the new Broadway Overlook HOPE VI development. The Johns Hopkins Medical Institutions (JHMI), consisting of the Johns Hopkins University Hospital and its medical campuses, are just north of the new development and have a major presence in the neighborhood. During the HOPE VI planning process, JHMI made an agreement with HABC and the Broadway Homes residents to swap the land where Broadway Homes formerly was located with the land where Broadway Overlook is now situated. These locations are shown in exhibit 4.

JHMI and HABC found this swap to be mutually beneficial, because JHMI would be able to accomplish a geographically cohesive expansion of its medical campuses and the new HOPE VI development would be located closer to a desirable neighborhood. JHMI became a major investor

Exhibit 4

Broadway Overlook



in the Broadway Overlook HOPE VI project.[6] The new development consists of 166 new residential units: 84 public housing units, 5 subsidized homeownership units, 48 market-rate rental units, and 29 market-rate homeownership units.

Interviews with city experts and local press accounts reveal a positive and hopeful impression of the Broadway Overlook redevelopment (Brophy, 2006; Seipp, 2007; Shea, 2006). Because Broadway Overlook is the fourth HOPE VI development in Baltimore, the developer and the other stakeholders involved in its planning had the advantage of being able to learn from the experiences of the previous three HOPE VI projects. The Broadway Overlook architects made a concerted effort to integrate the building design into the diverse architectural landscape of Washington Hill (Gunts, 2003). In addition, the private developer of Broadway Overlook managed the project's community and social services, whereas HABC had controlled these in the other two study sites. Broadway Overlook's developer and tenant organization formed a partnership and created effective programs for employment and family support that dramatically increased the tenants' employment levels and median income (Shea, 2006). The developer also involved the tenant organization extensively in the planning process. Finally, Broadway Overlook has a wide range of housing types, including subsidized and market-rate rentals and subsidized and market-rate homeowner properties, which may help avoid tensions between homeowners and public housing residents. With nearly 30 percent of the units being market-rate rentals, there may be an added incentive to the project's management to maintain the property and keep it attractive to market-rate tenants. Public housing units are scattered throughout the development and are indistinguishable from market-rate units (Gunts, 2003).

The Broadway Overlook redevelopment also differs from the Townes at the Terraces and Heritage Crossing redevelopments because it is located in a neighborhood where revitalization efforts were already under way. In Washington Hill, homeownership and renovation initiatives were funded by the Maryland Department of Housing and Community Development and implemented through local organizations. Home prices were starting to increase, and JHMI was bringing investment into the community before the HOPE VI initiative. Therefore, it is difficult to be sure that observed improvements in neighborhood conditions are attributable to the removal of an element of blight in an otherwise up-and-coming neighborhood—thus allowing for the acceleration of neighborhood revitalization and improvement—or to positive spillovers from the HOPE VI redevelopment itself.

Data Sources

Data for this study come from the Baltimore Policy Project[7] and include the address, price, and date of all property sales in Baltimore City from 1990 through the end of 2006. These data were supplemented with data from Maryland Property View 2005, which includes structural characteristics of Baltimore City properties such as year of construction, lot size, structure size, number of

[6] JHMI invested $3 million in the HOPE VI redevelopment and other resources targeted at the surrounding community (JHU MPP, 2003).

[7] Professor Sandra Newman of the Johns Hopkins University graduate program in public policy developed and maintains this database.

stories, building type, and construction type.[8] The analysis is limited to single-family, arms-length[9] sales that occurred after 1990 and were more than $5,000. I also removed four outliers that sold for more than $800,000. Exhibit 5 reports the number of yearly sales by neighborhood for each of the three HOPE VI sites. For each of the three neighborhoods, the number of sales is shown separately for the microneighborhood and the area outside the microneighborhood, but in the same macroneighborhood. These neighborhood definitions are described further in the next section.

Exhibit 5

Number of Sales by Year in Microneighborhood and Outside Microneighborhood by Site

Year	Townes at the Terraces		Heritage Crossing		Broadway Overlook	
	Micro	Outside Micro	Micro	Outside Micro	Micro	Outside Micro
1990	19	57	34	24	16	72
1991	7	52	51	24	15	46
1992	4	47	32	14	12	44
1993	14	35	33	17	17	36
1994	8	28	20	60	16	42
1995	2	41	23	33	21	43
1996	8	30	25	30	24	43
1997	4	62	33	38	26	49
1998	9	74	46	66	20	72
1999	6	72	31	33	24	100
2000	15	69	23	30	29	92
2001	6	43	30	19	39	60
2002	8	33	21	18	25	71
2003	6	43	17	20	40	81
2004	12	82	32	19	46	111
2005	12	117	43	73	37	126
2006	9	92	67	62	31	118
Total	149	977	561	580	438	1,206

Note: All sales occurred in the Townes at the Terraces micorneighborhood in tracts 1801, 1802, and 1803; in the Heritage Crossing microneighborhood in tracts 1402, 1601, 1702, and 1703; and in the Broadway Overlook microneighborhood in tracts 202, 301, and 604.

Neighborhood Definition

A central aspect of this study's methodology is examining the extent to which price levels in the area immediately surrounding the HOPE VI sites deviate from price levels in the same neighborhood but farther away from the sites. Created for the study, microneighborhoods for the three HOPE VI sites served as impact areas around the projects. The first step in creating the microneighborhoods was to use geographically coded sales data to identify which sales fall

[8] Missing values in these data are imputed using a multiple imputation method. See Appendix A for a detailed description of how missing values are handled.

[9] Arms-length sales best reflect market values of properties. They exclude transactions between related parties (for example, spouses, relatives, and affiliated companies).

within a certain distance from each HOPE VI site. Like the Holin et al. (2003) study, this study used a single ring to define the microneighborhood for each project. For Townes at the Terraces and Broadway Overlook, the study used a 1,500-foot ring. For Heritage Crossing, which covers a substantially larger area, the study used a 2,000-foot ring.[10] Macroneighborhoods are full census tracts that contain property sales within this ring; therefore, the macroneighborhoods include sales within the microneighborhoods and sales outside them but within the same census tract.

For the two HOPE VI sites in West Baltimore, Heritage Crossing and Townes at the Terraces, the study further defined these neighborhoods to adjust for two additional neighborhood boundaries: (1) a highway ramp that cuts through the area south of Heritage Crossing and north of Townes at the Terraces and (2) a major road, Martin Luther King Jr. Boulevard, that runs along the eastern boundary of both neighborhoods.[11] All property sales south of the highway were excluded from the Heritage Crossing neighborhood, and all property sales north of the highway were excluded from the Townes at the Terraces neighborhood. In addition, few of the sales within 1,500 feet of Townes at the Terraces were located on the opposite side of Martin Luther King Jr. Boulevard. Therefore, these sales, along with the other sales in that census tract, were also excluded from the Townes at the Terraces neighborhood.

Exhibit 6 shows some key neighborhood characteristics from the census that differ from citywide characteristics. The neighborhoods in this study are worse off than the city average in terms of per capita income and rates of poverty, unemployment, housing vacancy, and homeownership. These neighborhoods also have a higher proportion of minority residents.

Exhibit 6

Neighborhood Characteristics by Site and Citywide

	Townes at the Terraces	Heritage Crossing	Broadway Overlook	Baltimore City
Total population	5,364	10,887	7,905	651,154
% White, non-Hispanic	15%	2%	23%	31%
% Black, non-Hispanic	82%	96%	63%	64%
Per capita income	$14,124	$11,181	$13,319	$16,978
% living in poverty	40%	48%	37%	23%
% unemployed	8%	10%	10%	6%
% housing units that are vacant	20%	25%	20%	14%
% occupied units that are owner occupied	23%	14%	24%	50%

Source: 2000 U.S. Census

[10] Previous studies used rings of 500 to 2,000 feet, sometimes further defined by 500-foot gradients (for example, Galster, Tatian, and Smith, 1999; Santiago, Galster, and Tatian, 2001). Studies of place-based interventions generally used rings of 1,000 or 2,000 feet (for example, Ellen and Voicu, 2006; Holin et al., 2003). I chose the ring size based on the size of the development.

[11] The Baltimore City Mayor's Office of Neighborhoods and the Baltimore Neighborhood Indicator Alliance also use these boundaries to define neighborhoods. The Poppleton/Terraces neighborhood lies south of U.S. Route 40, while the Upton/Heritage neighborhood lies north of it, and the Seton Hill and UMD neighborhoods lie east of Martin Luther King Jr. Boulevard.

Timing

This methodology requires identifying periods before and after intervention. It would be ideal to examine prices and trends during the time up to the grant award announcement, between the announcement and demolition, between demolition and project completion, and after completion. Although these milestones could potentially affect property values in the surrounding neighborhood, insufficient observations are available to reliably capture trends during each of these phases. The study used the project completion date as the intervention date, expecting that the greatest effect would occur after the project was completed. Because it is possible that the physical removal of the highrise public housing projects encouraged investment in surrounding properties and thus increased property values, the study tested the sensitivity of the main results, using the demolition date as an alternate intervention date. The study did not test the HOPE VI grant announcement dates, because they occurred very early in the study period and too few sales were completed before the announcement to produce reliable estimates.[12] Results from JHU MPP (2003) show evidence of very limited spillover effects for the announcement dates of the three redevelopments included in this study.

This study used the date the first unit became available for occupancy as the project completion date. Several different sources—newspapers, HOPE VI developer websites, the HABC website, and other HABC sources—reported different dates of project completion. This inconsistency likely occurred because of alternative definitions of project completion, ranging from the date that major construction is completed to the date that the last construction task is completed. This study defined completion date as the date the first unit became available for occupancy, reasoning that this date should best reflect the time that the HOPE VI project would begin to have its full effect, even if minor structural tasks were still in progress. In all three cases, these three dates coincided closely with completion announcements in local newspapers.

Methodology

This study used a difference-in-differences approach to test for spillover effects of HOPE VI redevelopment on surrounding neighborhoods. It is based on the premise that the sales price of a property is a function of both its structural characteristics (for example, age and size) and its neighborhood characteristics (for example, crime rate and school quality) and therefore reflects neighborhood quality and desirability. This idea that both physical and neighborhood characteristics are capitalized in the price of a property is grounded in traditional hedonics pricing theory (Rosen, 1974). By controlling for physical characteristics, microneighborhood characteristics, and fixed effects of census tracts, this method attempts to isolate the part of the sales price that reflects the property's proximity to the HOPE VI redevelopment.

[12] Announcement effects happened early in the study period, and the number of sales before the announcement is limited. For example, although demolition for all five buildings was announced for FY 1995, one Lexington Terraces building was already empty in March 1993. At this time, HABC started publicly deliberating options ranging from an $8.2 million renovation to total demolition. Approximately 25 sales were completed in the microneighborhood before 1993.

Difference-in-differences methods have been used extensively to measure neighborhood spillover effects of subsidized housing. Briggs, Darden, and Aidala (1999) evaluated neighborhood effects of dispersed subsidized housing in Yonkers, New York, by comparing differences in sales prices between properties one-fourth of a mile from the subsidized housing and properties farther away but within the same census tract. Using larger data sets and more sophisticated extensions of this approach, Galster, Tatian, and Smith (1999) compared both the level and trend of property sales prices in the surrounding neighborhood before and after Section 8[13] occupancy, and Ellen et al. (2001) measured the spillover effects—and their trajectories—of a homeownership program in New York City.

The intuition behind the difference-in-differences approach is that it compares changes in property values close to the HOPE VI site to changes in property values farther away from the site but in the same neighborhood before and after completion. The validity of the estimate hinges on the extent to which the change in property values before and after the redevelopment of the properties farther away from the site represents what the change in property values would have been for the properties closer to the site in the absence of HOPE VI redevelopment. It is important to note the possibility that the redevelopment affected property values outside the microneighborhood as well. If this were the case, the true spillover effect would be underestimated. One would expect that properties immediately surrounding the redevelopment, however, would be affected more directly than properties farther away from the site and that this difference would be reflected in the estimate. Equation 1 expresses a basic difference-in-differences model.

$$\text{Impact} = (\text{avg price}_{\text{post,micro}} - \text{avg price}_{\text{post,macro}}) - (\text{avg price}_{\text{pre,micro}} - \text{avg price}_{\text{pre,macro}}) \quad (1)$$

where *post* represents postredevelopment, *pre* represents preredevelopment, *micro* represents property located in the surrounding (micro) neighborhood, and *macro* represents property located in the macroneighborhood but outside the microneighborhood. Finally, *impact* is the estimate of the spillover effect—that is, the effect of redevelopment on the average housing price. To obtain standard errors to test whether this estimate is statistically significantly different from zero, equation 2 uses ordinary least squares (OLS) regression to estimate the model.

$$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 micro + \hat{\beta}_2 post + \hat{\beta}_3 post*micro + \varepsilon \quad (2)$$

where *micro* is a dummy variable that equals 1 if the sale occurred inside the microneighborhood and 0 otherwise, *post* is a dummy that equals 1 if the sale occurred after project completion and 0 otherwise, and *post*micro* is an interaction term between the two dummies. The variable *micro* serves as a control variable, and its coefficient can be interpreted as the baseline difference in price levels between the microneighborhood and outside-of-micro neighborhood. The impact variable in this model is *post*micro*. The coefficient on *post*micro* indicates any deviation from the overall difference in prices of the two time periods that the microneighborhood experienced. A statistically significant positive coefficient signals a positive effect of the HOPE VI project on sales prices of

[13] Section 8 is a federally funded rental assistance program for low-income households in which recipients use vouchers to choose privately owned rental housing. The program subsidizes the difference between 30 percent of the household's income and the total rent amount (determined by the public housing authority and the property owner based on Fair Market Rents).

surrounding property. *Y* is the property sales price, estimated in both linear and natural log form, adjusted for inflation to 2006 dollars using the Consumer Price Index. This model is referred to as the "basic difference-in-differences" model in the results section.

This basic model does not take into account any variation in the types of properties sold, either between those located in the microneighborhood and those located outside the microneighborhood, or over time. It also assumes that neighborhood characteristics—such as local crime and local services—do not differ between the microneighborhood and the macroneighborhood. The latter assumption seems plausible, given that each of the three analyses is limited to the larger neighborhood where the HOPE VI site is located, and property sales outside neighborhood boundaries (such as major roads and a highway ramp) are excluded from the analysis. Still, a second model, referred to as the "regression-adjusted difference-in-differences model," includes a dummy variable for each census tract to serve as localized fixed effects, which control for differences in unmeasured factors that affect the entire census tract, such as school quality, local amenities, crime levels, and demographics. It also includes property characteristics to control for the variation in the type and quality of properties sold in the microneighborhood compared with the rest of the macroneighborhoods and before and after completion of the project. Equation 3 expresses this model.

$$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 micro + \hat{\beta}_2 post + \hat{\beta}_3 post*micro + \hat{\beta}_4 [tract] + \hat{\beta}_5 [structure] + \varepsilon \quad (3)$$

where *[tract]* is a series of dummy variables indicating the census tract in which the sale is located and *[structure]* is a vector of structural property characteristics that controls for structural and tenure characteristics, including the building's age, lot size, structure size, number of stories, presence or absence of a basement, construction type (brick, wood, or other), building type (rowhouse, detached, or semidetached), quality of construction, and previous housing tenure (rented or owner occupied).

Exhibit 7 shows that average sales prices vary from year to year. This variation could yield misleading results if the volume of sales were not constant over time. If, for example, there were more sales in the microneighborhood in the earliest years of the study period before project completion than there were in the following years just before completion and if prices in the entire macroneighborhood increased steadily over time, if this ratio were reversed for the rest of the macroneighborhood (that is, if there were fewer sales in the earlier years of the study period when prices were lower than they were in following years just before project completion), the impact would be underestimated. Equation 4 accounts for this variation.

$$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 micro + \hat{\beta}_3 post*micro + \hat{\beta}_4 [tract] + \hat{\beta}_5 [structure] + \hat{\beta}_6 [year] + \varepsilon \quad (4)$$

where *[year]* is a vector of dummy variables representing the year of the sale. Results from this third model represent the most reliable estimates of HOPE VI spillover effects in each site. These *[year]* dummies after completion replace the *post* dummy, which captured the aggregate change in property values after project completion that would have increased property values even in the absence of HOPE VI redevelopment, and, in this third model, each year is captured separately.

For one site, Broadway Overlook, which showed evidence of positive spillover effects, this *post*micro* interaction was replaced with a series of *year*micro* dummies for each year after completion in a fourth model (equation 5), to examine whether the effect increased or decreased with time.

$$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 micro + \hat{\beta}_3 [year*micro] + \hat{\beta}_4 [tract] + \hat{\beta}_5 [structure] + \hat{\beta}_6 [year] + \varepsilon \quad (5)$$

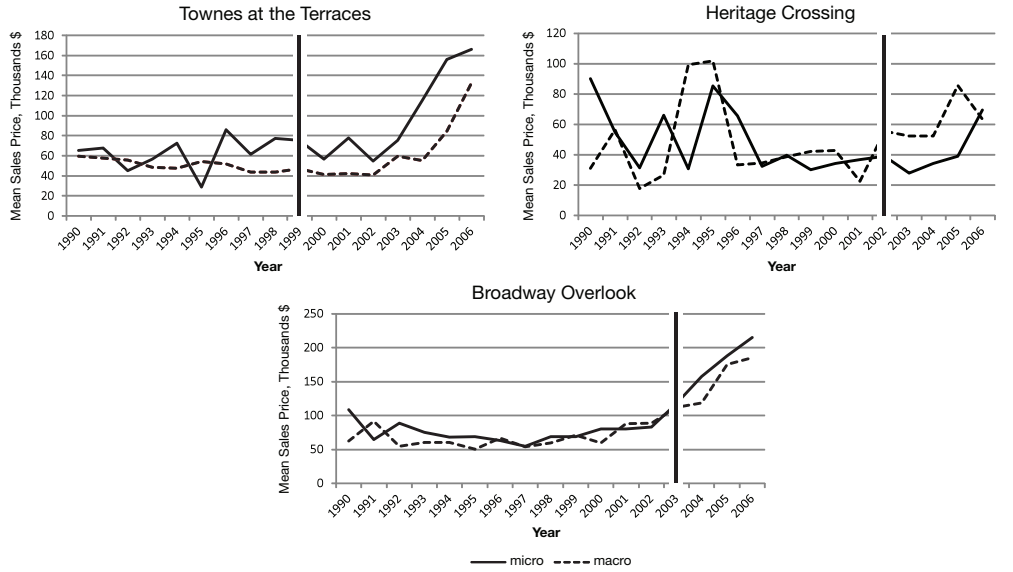
where *[year*micro]* is a series of interaction variables between each postcompletion year dummy variable and the *micro* dummy variable.

The credibility of these estimates relies on the assumption that sales prices followed the same trend over time in the microneighborhoods and macroneighborhoods before HOPE VI redevelopment. Spillover effects could be overestimated if prices in the microneighborhood were already rising at a faster rate than prices in the macroneighborhood, or underestimated if prices in the microneighborhood were increasing more slowly than prices in the rest of the macroneighborhood. Recent research measuring spillover effects of subsidized housing have used sophisticated methods to account for differing price trends of properties immediately surrounding subsidized housing compared with properties farther away. This method was first used in Galster, Tatian, and Smith (1999) to compare both the level and the trend of property sales prices in the surrounding neighborhood before and after Section 8 occupancy, and adapted in later studies that examined spillover effects of subsidized housing (for example, Santiago, Galster, and Tatian 2001).

In the context of the three Baltimore HOPE VI sites, the number of sales in each of the three samples is too few to reliably estimate different trends in each part of the neighborhoods separately, or to test the developments' impacts on trends. Estimating separate trends for the microneighborhood and macroneighborhood is important only if there are preexisting differences. Basing trend differences on the mean sales prices in exhibit 7, it seems very unlikely that these differences existed before HOPE VI redevelopment, because no difference in yearly sales price trajectories in the microneighborhoods and macroneighborhoods is evident before completion.

Exhibit 7

Mean Sales Price by Year, in Thousands of 2006 Dollars



Results and Discussion

The regression results of the three main models described in the previous section are shown in exhibit 8. The first pair of columns presents the results of the basic difference-in-differences model, the second pair presents the results of the difference-in-differences model controlling for structural characteristics and localized fixed effects, and the third pair presents the results of this model replacing the *post* variable with dummy variables for year fixed effects. Full results are presented by site in appendix exhibits B1 through B3.

The *micro* estimates represent baseline differences in price levels between the microneighborhood and the rest of the macroneighborhood. In the models using the linear form of sales price as the outcome, the coefficients on *micro* can be interpreted directly as estimates of this difference. In the models using the natural log of price as the outcome variable, where estimates are small (approximately 0.25 or less), the coefficients on *micro* multiplied by 100 can be interpreted approximately as the percent by which properties in the microneighborhood deviate from comparable properties

Exhibit 8

Estimates of HOPE VI Spillover Effects by Site

	Model (1)		Model (2)		Model (3)	
	Basic DID		Regression-Adjusted DID		Regression-Adjusted DID With Year Fixed Effects	
	Price ($)	ln(price)	Price ($)	ln(price)	Price ($)	ln(price)
Townes at the Terraces						
micro	15,424	0.295	30,589	0.485	26,591	0.432***
	(7,303)	(0.117)	(8,674)	(0.138)	(7,897)	(0.131)
post	22,157***	0.350***	21,294***	0.326***		
	(3,807)	(0.061)	(3,673)	(0.06)		
post*micro	12,862	– 0.107	3,309	– 0.257	13,088	– 0.125
	(10,512)	(0.169)	(10,273)	(0.164)	(9,405)	(0.156)
Heritage Crossing						
micro	– 2,185	– 0.027	3,696	0.008	5,537	0.046
	(5,171)	(0.071)	(6,648)	(0.090)	(6,580)	(0.089)
post	17,860***	0.458***	12,167*	0.351***		
	(6,374)	(0.088)	(7,375)	(0.095)		
post*micro	– 16,532	– 0.223*	– 10,877	– 0.136	– 12,050	– 0.139
	(9,119)	(0.126)	(9,695)	(0.129)	(9,435)	(0.127)
Broadway Overlook						
micro	8,064	0.237***	– 21,838***	– 0.214***	– 23,498***	– 0.227***
	(5,212)	(0.058)	(5,133)	(0.054)	(4,926)	(0.053)
post	88,123***	0.870***	88,513***	0.860***		
	(4,759)	(0.053)	(4,251)	(0.044)		
post*micro	7,989	0.007	8,901	0.044	16,699**	0.099
	(9,415)	(0.105)	(8,312)	(0.087)	(7,842)	(0.082)
Sample size	1,126	1,126	1,156	1,156	1,644	1,644

*DID = difference-in-differences. * = p < 0.1, ** = p < 0.05, *** = p < 0.001.*

Notes: Standard errors are in parentheses. Model (2) includes structural charactarestics covariates and census tract fixed effects. Model (3) includes structural charactarestics covariates, census tract fixed effects, and year fixed effects.

outside the microneighborhood but within the same macroneighborhood.[14] The coefficients on the *post*micro* variables can be interpreted as the amount by which property values in the microneighborhood increased (if the coefficient is positive) or decreased (if the coefficient is negative) for the models using price as the outcome, and multiplying the coefficient by 100 for the models using the log of price as the outcome gives the percent of increase or decrease.

The evidence weakly supports the hypothesis that properties in the microneighborhood surrounding the Townes at the Terraces redevelopment significantly increased in value after the project's completion. The coefficients on *micro* indicate that properties within the microneighborhood were already of higher value than similar properties outside the microneighborhood. Property values increased overall by about $20,000 after HOPE VI completion (40 percent, according the model specification using the log of sales price, translated using the Halvorsen-Palmquist equation shown in footnote 14). None of the coefficients on the *post*micro* interaction are significant, and the large difference in magnitude between the basic difference-in-differences model and the second model controlling for physical characteristics and localized fixed effects suggests that the composition of properties sold in this neighborhood before and after the HOPE VI redevelopment is not similar. It is possible that properties sold after redevelopment were of higher quality because of competition from the new HOPE VI units, but no such definitive conclusions can be drawn from these results. Note that the Townes at the Terraces site had the smallest sample size, with only a handful of sales in some years. It is therefore unclear if the positive coefficients on *post*micro* should be interpreted as an indication of positive spillover effects, or if the observed differences in property values are due to chance.

Heritage Crossing, with a larger sample size, shows no indication of positive spillover effects. In fact, the coefficients on the *post-micro* variables in all three models are negative. Although the initial difference-in-differences estimate is negative and statistically significant, the estimate becomes smaller and less statistically significant when we control for property characteristics and tract fixed effects, suggesting that the initial estimate was biased by the changing composition of properties for sale. The second model, controlling for property characteristics and tract fixed effects, shows that overall property sales prices after completion were on average about $12,000 higher than prices before completion (an increase of 40 percent, which is the Halvorsen-Palmquist-translated coefficient in the model using the log of sales prices as the outcome), but the increase was smaller for similar properties close to the HOPE VI redevelopment. Including year fixed effects, the estimate is still negative but not statistically significant.

Broadway Overlook is the only HOPE VI project that shows convincing evidence of positive spillover effects. The graph in exhibit 7 shows that sales in the microneighborhood and outside it followed a similar pattern from about 1995 until 2003, the year of HOPE VI completion, where property values in the microneighborhood began to grow a bit faster. The impact estimate from the basic difference-in-differences model is about $8,000, and this estimate does not change when structural characteristics and census tract fixed effects are included in the model, suggesting little variation in structural characteristics of the properties being sold before and after completion across the macroneighborhood and little difference across census tracts within the macroneighbor-

[14] In a log-linear model, coefficients on dummy variables are not accurate estimates of the relative effects when they are large. To get a more accurate estimate of the baseline percentage difference between the microneighborhood and macroneighborhood, the coefficient c must be used in the formula 100 X {exp(c) – 1} (Halvorsen and Palmquist, 1980).

hood. The large coefficient on *post* shows a large overall increase in property values, reflecting the fact that this was an up-and-coming neighborhood during the study period. On average, a property in the macroneighborhood sold for $88,000 more after completion than it had sold for before completion, which makes it especially important to account for the upward trend in sales prices with the year fixed effects. Different volumes in sales per year or variations in the types and quality of housing for sale from year to year could bias the impact estimate. Results from the model including year fixed effects, where similar properties are compared to one another within years, show a larger and statistically significant estimate of spillover effects. Properties close to the HOPE VI redevelopment experienced an additional $17,000 (10 percent, according to the model using the log of sales price) increase after redevelopment compared with properties farther away but in the same macroneighborhood.

It is possible that the positive effect of the Broadway Overlook redevelopment on surrounding property values is understated by this analysis. Unlike the Townes at the Terraces and Heritage Crossing HOPE VI sites, the new Broadway Overlook development did not directly replace public housing; because of the property swap, the new development was built diagonally across the street from Broadway Homes highrises, the original public housing projects. The old projects were demolished and replaced by JHMI buildings, and the Broadway Overlook project replaced a lower rise, low-income housing development. Because the former Broadway Homes site is included in Broadway Overlook's microneighborhood, some of the properties immediately surrounding the former public housing project are included in the area outside Broadway Overlook's microneighborhood. If the removal of the highrise public housing projects had a positive effect on surrounding property values independent of any positive effect of the Broadway Overlook redevelopment, the effect of the removal would be captured in the sales prices of some properties outside the microneighborhood, thus understating any relative difference between price changes in each part of the neighborhood.

Exhibit 9 presents results of the model replacing the *post*micro* dummy variable with a series of interactions between *year* and *micro* for all years after completion (2003–06). Disaggregating

Exhibit 9

Broadway Overlook Spillover Effects by Year

	Regression-Adjusted DID With Year Fixed Effects	
	Price ($)	ln(price)
Micro	– 24,334***	– 0.241***
	(5,121)	(0.055)
2003*Micro	– 921	0.067
	(13,454)	(0.142)
2004*Micro	33,254***	0.314**
	(12,455)	(0.131)
2005*Micro	11,353	0.037
	(13,065)	(0.138)
2006*Micro	19,445	0.025
	(13,990)	(0.147)

*DID = difference-in-differences. * = p < 0.1, ** = p < 0.05, *** = p < 0.001.*

Notes: Standard errors are in parentheses. Includes structural charactarestics covariates, census tract fixed effects, and year fixed effects.

the postcompletion period allows for effects to vary by year after redevelopment. The results of this model do not give a strong indication that the positive spillover effects are either growing or shrinking over time. The model shows no effects in the year of completion (the project was not completed until August of 2003), a very large and statistically significant effect the year after completion, and estimates in the following 2 years that are smaller but still sizable, although the standard errors are larger relative to the effect size.

Timing of Impacts

This comparison of before and after completion measures any impact of completion on prices. Personal interviews with city and neighborhood experts, however, indicated that part of the impact may be attributable not to the redevelopment, but to the removal of highrise public housing projects—the main source of blight, drug activity, and crime in the neighborhood (Seipp, 2007; Shea, 2006). To test this theory, I applied the same models using the demolition date instead of the completion date. This method cannot isolate the effects of each stage in the development on surrounding property values and thus does not answer the question of how much of the impact can be attributed to the removal of the public housing projects and how much to the development of the new mixed-income projects. Seeing how replacing the completion date with the demolition date changes our estimates, however, can provide some general insight into the matter.

If the positive spillover effects are due to the removal of blight rather than the development of the HOPE VI projects, then the impact estimates in the model using the demolition date as the intervention point should be larger (and possibly more statistically significant) than those in the model using the completion date. In the latter model, any positive impact occurring before project completion would be incorporated into the precompletion price level, thus underestimating the true impact of the HOPE VI project.

The data from the model using demolition dates (including all controls and fixed effects) do not provide support for this theory, as shown in exhibit 10. The estimated impact of Townes at the Terraces is smaller, the negative coefficient for Heritage Crossing is a bit less negative, and the positive coefficient for Broadway Overlook is smaller and no longer significant. These results could suggest that, regardless of the long-term effects of the removal of the public highrises, the empty lots or unfinished construction sites that replaced them in the interim did not lead to immediate neighborhood improvements. Also, as mentioned above, because the demolition in the case of Broadway Overlook was that of the public housing project across the street, we would not expect to see much larger impacts using this intervention definition, regardless of actual spillover effects.

Exhibit 10

Full Model Using Demolition Date for Each Site

	Townes at the Terraces		Heritage Crossing		Broadway Overlook	
	Price ($)	ln(price)	Price ($)	ln(price)	Price ($)	ln(price)
Micro	31,009***	0.452***	6,163	0.052	– 23,401 ***	– 0.255***
	(9,045)	(0.150)	(7,101)	(0.096)	(5,822)	(0.062)
Post*Micro	2,602	– 0.125	– 9,869	– 0.112	9,597	0.11
	(9,793)	(0.162)	(8,602)	(0.118)	(7,376)	(0.078)

* = p < 0.1, ** = p < 0.05, *** = p < 0.001.

Conclusion

This study evaluates whether the three completed HOPE VI redevelopments in residential neighborhoods in Baltimore contributed to the improvement of their surrounding neighborhoods. Heritage Crossing did not show any evidence of positive spillover effects, suggesting that investors and homebuyers may not have ventured too close to the HOPE VI site. Although Townes at the Terraces showed a hint of a positive effect on surrounding property values, Broadway Overlook was the only project with significant positive effects. Qualitative evidence of HOPE VI's effect on surrounding neighborhoods is fairly consistent with these empirical estimates.

Baltimore's experience with these three HOPE VI redevelopments suggests that, even within the same city and under a single housing authority, implementation varies greatly. All HOPE VI projects have in common the removal of highrise public housing projects and their replacement with lowrise, mixed-income developments. But beyond these similarities, differences in design and management resulted in very different projects.[15] Townes at the Terraces and Heritage Crossing are physically isolated from their surrounding neighborhoods, but Broadway Overlook's design integrates the development into its surrounding neighborhood. Townes at the Terraces and Heritage Crossing both include two housing types—public housing units and low- to moderate-income homeownership units—whereas Broadway Overlook has a more diverse mix of public housing units, subsidized rental and homeownership units, and market-rate rental and homeownership units. Social and community services in Townes at the Terraces and Heritage Crossing were designed and managed by the city housing authority, but in Broadway Overlook these services were designed and managed by a partnership between the private developer and the tenant organization. The fact that Broadway Overlook had the strongest evidence of a positive spillover effect raises the possibility that adherence to the HOPE VI Program's main principles may influence a project's ability to improve surrounding neighborhoods.

This study cannot tease apart the influence of implementation on spillover effects from that of another potential influence: neighborhood conditions at the time of redevelopment. The Broadway Overlook redevelopment occurred in a neighborhood that was less distressed and more stable than the West Baltimore neighborhoods where the Townes at the Terraces and Heritage Crossing redevelopments occurred. Unlike the neighborhoods in West Baltimore, Broadway Overlook's neighborhood was already improving before HOPE VI redevelopment. The evidence of positive spillover effects indicates that the surrounding neighborhood experienced even greater improvement due to the HOPE VI redevelopment. This evidence raises the question of how HOPE VI funding can best be targeted. On the one hand, it seems logical to give priority to the most distressed public housing projects, because they are most in need of physical redevelopment and their residents suffer most from the consequences of concentrated poverty. In fact, the idea of HOPE VI originated in response to the question of how to deal with the country's most distressed and deteriorated public housing projects. On the other hand, because the HOPE VI model relies heavily on attracting private investment and tenants willing to pay market-rate housing prices, the most efficient use of

[15] See Brophy and Smith (1997) for a case-study analysis of characteristics of successful mixed-income developments. The authors found that design, management, and location are primary factors for success.

its funding may be to target projects in neighborhoods that do not have overwhelming barriers to revitalization, such as problems with drugs, crime, and poverty. This question is part of a broader debate in urban policy about whether investment should target the neediest, most distressed neighborhoods or those neighborhoods that show some sign of stability or social organization, and therefore may have a greater capacity to take advantage of additional resources.[16]

Another important question raised by these results is one of cost effectiveness. Do the estimated positive spillover effects justify the 20 to 30 million dollar investments in each HOPE VI project? Improving the surrounding neighborhoods of former public housing projects is not the only goal of HOPE VI, and any weighing of costs and benefits should take into account the full range of potential benefits, including the improvement of living conditions for public housing residents. Still, the lack of strong evidence of substantial positive effects on surrounding neighborhoods, particularly in Townes at the Terraces and Heritage Crossing, should serve to caution policymakers that even a major redevelopment that replaces a dominant source of blight in a neighborhood with better quality housing and lower concentrations of poor households may not be enough to turn around a distressed neighborhood. Although we see more evidence of spillover effects in the Broadway Overlook site, it is unclear how central the role of HOPE VI redevelopment was in the overall improvement of the neighborhood, where property values were already on the rise when redevelopment began. Therefore, the question in the case of Broadway Overlook is whether the additional neighborhood improvement caused by HOPE VI (reflected in the additional jump in property values), along with other benefits not measured in this study, was worth the major investment required to redevelop a public housing project.

Although Baltimore's HOPE VI experience reveals potential relationships between positive neighborhood spillover effects and the project's implementation and the neighborhood's stability, conclusions about the independent effects of these factors, or about whether these patterns occur in other HOPE VI projects in other locations, cannot be drawn from the results of this study alone. We need comparable analyses of the effects of the HOPE VI Program in other cities that carefully take into account these different aspects of the program if we are to understand what is most important in meeting the goal of improving surrounding neighborhoods. In addition to learning what makes a HOPE VI project most effective, it is also important to consider evidence of positive spillover effects within a larger context of program costs and relative improvements within the surrounding neighborhood.

[16] See Sviridoff (1994) for a more detailed discussion of this debate.

Appendix A
Missing Values

Appendix A describes how missing values in the Maryland Property View 2005 and Baltimore City property sales 2006 data sets were handled in this analysis.

Missing Values

The Maryland Property View 2005 and Baltimore City property sales 2006 data sets were missing values for several variables. The percent of the 12,280 total observations (in the three study sites combined) that were missing a value for each variable are listed in exhibit A-1.

Exhibit A-1

Missing Values

Variable	Percent Missing
Age	20.71
Structure area (square feet)	24.58
Lot size (square feet)	3.54
Construction type	14.31
Number of stories*	24.16
Basement*	24.16
Quality of construction	26.40
Housing type (detached, semidetached, or rowhouse)	0.00
Tenure (rented or owner occupied)	0.03

** The variables* number of stories *and* basement *were created using the same variable in the original data set.*

There was no apparent pattern in these missing values. The lot size, housing type, and tenure variables originated from the Baltimore City 2006 property sales data set, and the remaining variables originated from the Maryland Property View 2005 data set.

Multiple Imputation

Because the missing values were scattered among the different variables (for example, observations missing a value for age were not necessarily also missing a value for lot size, observations missing a value for lot size were not necessarily also missing a value for construction type), excluding each observation with a missing value for at least one variable would have omitted almost two-thirds of the observations in the regressions. Therefore, instead of running the models on only those observations with no missing values, I imputed values for each missing value. A few exceptions include the following:

- All observations missing a census tract value were excluded from the analysis. Because the study was limited to certain census tracts, it was not possible to determine which neighborhood these observations belonged to. Less than 2 percent of all property sales in Baltimore City were missing a value for the census tract variable; however, it is not possible to determine exactly which of these sales pertain to the study sites in this analysis.
- Four observations were missing a value for the tenure variable, and these four observations were excluded from the analysis because it did not seem appropriate to predict whether a property is occupied by an owner or a renter based on the other structural characteristics.

I used multiple imputation by chained equations (MICE) to impute the remaining missing values. MICE produces additional data sets that replace missing values with imputed values using a multivariate switching regression. Although the more traditional way to deal with incomplete data is to replace missing values with means, this method may distort estimates and falsely increase their precision by yielding smaller standard errors. The correlation matrix in exhibit A-2 shows that the probability of having a missing value is correlated with property characteristics, so failing to account for this relationship may bias estimates.[17] MICE, on the other hand, takes into account the uncertainty of missing data by imputing values according to the predictive distribution of the data (Van Buuren, 2007).

I used the ice program in Stata® software to perform this multiple imputation method. I selected OLS regression to impute missing values for age, structure area, lot size, and number of stories; logit regression to impute missing values for whether the property has a basement; and multinomial logit regression to impute missing values for the construction type and quality. I imputed five data sets. To avoid imputing extreme values, I chose the match option so the imputed value is drawn from existing values in the original data.

After creating the imputed data sets, I estimated models for each imputed data set separately, then pooled them to integrate the results from all three data sets into one set of estimates. The estimates from this combined analysis are reported in the text of this article.

[17] As a sensitivity test, I ran each model replacing missing values with mean values and included a series of dummy variables indicating a missing value for the corresponding covariate. Estimates from these models were slightly different, but, overall, there were no qualitative differences.

Exhibit A-2

Missing Dummy Correlation Matrix (1 of 2)

	price06_ln	age	age2	lotsize_ln	lotsize	sqrftstrct_ln	sqrftstrct	stories	quality	brick
price06_ln	1.00									
age	– 0.14	1.00								
	0.00									
age2	– 0.11	0.95	1.00							
	0.00	0.00								
lotsize_ln	0.10	– 0.16	– 0.17	1.00						
	0.00	0.00	0.00							
lotsize	0.09	– 0.13	– 0.15	0.93	1.00					
	0.00	0.00	0.00	0.00						
sqrftstrct_ln	0.25	0.00	– 0.01	0.53	0.46	1.00				
	0.00	0.97	0.21	0.00	0.00					
sqrftstrct	0.25	– 0.01	– 0.04	0.55	0.51	0.95	1.00			
	0.00	0.23	0.00	0.00	0.00	0.00				
stories	0.19	– 0.02	– 0.07	0.27	0.26	0.58	0.59	1.00		
	0.00	0.03	0.00	0.00	0.00	0.00	0.00			
quality	– 0.12	0.08	0.04	0.12	0.11	0.01	0.03	– 0.04	1.00	
	0.00	0.00	0.00	0.00	0.00	0.25	0.01	0.00		
brick	0.09	0.29	0.21	– 0.08	– 0.07	– 0.01	– 0.01	0.06	– 0.53	1.00
	0.00	0.00	0.00	0.00	0.00	0.21	0.61	0.00	0.00	
wood	– 0.11	0.00	0.00	0.08	0.07	0.00	0.00	.	0.56	– 0.97
	0.00	0.93	0.73	0.00	0.00	0.84	0.99	0.00	0.00	0.00
otherconst	0.04	– 0.29	– 0.22	– 0.01	0.00	0.01	0.01	– 0.06	– 0.05	– 0.23
	0.00	0.00	0.00	0.33	0.83	0.22	0.61	0.00	0.00	0.00
basement	– 0.05	– 0.03	– 0.06	0.19	0.14	0.17	0.14	0.08	0.09	0.03
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
detached	0.01	– 0.08	– 0.05	0.00	0.01	– 0.01	0.00	– 0.04	– 0.03	0.03
	0.11	0.00	0.00	0.89	0.31	0.49	0.94	0.00	0.02	0.00
semidetached	0.05	– 0.01	– 0.02	0.05	0.06	0.00	0.03	0.05	– 0.05	0.03
	0.00	0.41	0.08	0.00	0.00	0.77	0.00	0.00	0.00	0.00
row	– 0.04	0.05	0.04	– 0.04	– 0.06	0.01	– 0.03	– 0.02	0.05	– 0.04
	0.00	0.00	0.00	0.00	0.00	0.52	0.01	0.03	0.00	0.00
HOcode1	0.19	– 0.09	– 0.08	0.08	0.06	0.13	0.12	0.10	– 0.09	0.06
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
miss	– 0.14	– 0.31	– 0.32	0.17	0.15	– 0.22	– 0.13	0.18	0.60	– 0.79
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Exhibit A-2

Missing Dummy Correlation Matrix (2 of 2)

	wood	other-const	basement	detached	semi-detached	row	HOcode1	miss
price06_ln								
age								
age2								
lotsize_ln								
lotsize								
sqrftstrct_ln								
sqrftstrct								
stories								
quality								
brick								
wood	1.00							
otherconst	– 0.03 0.00	1.00						
basement	 0.00	– 0.03 0.00	1.00					
detached	– 0.03 0.00	– 0.01 0.44	– 0.04 0.00	1.00				
semidetached	– 0.04 0.00	0.05 0.00	– 0.06 0.00	– 0.01 0.23	1.00			
row	0.05 0.00	– 0.03 0.00	0.07 0.00	– 0.64 0.00	– 0.76 0.00	1.00		
HOcode1	– 0.06 0.00	0.00 0.76	– 0.04 0.00	0.03 0.00	0.06 0.00	– 0.07 0.00	1.00	
miss	0.78 0.00	0.12 0.00	0.06 0.00	0.01 0.19	– 0.06 0.00	0.04 0.00	– 0.13 0.00	1.00

Appendix B. Full Results

Appendix B presents the full results for exhibit 8 by site.

Exhibit B-1

Full Results for Main Models, Townes at the Terraces (1 of 2)

	Model (1)		Model (2)		Model (3)	
	Basic DID		Regression-Adjusted DID		Regression-Adjusted DID With Year Fixed Effects	
	Outcome					
	Price ($)	ln(price)	Price ($)	ln(price)	Price ($)	ln(price)
micro	15,423**	0.295**	30,588***	0.485***	26,591***	0.432***
	(7,302)	(0.117)	(8,673)	(0.138)	(7,896)	(0.131)
post	22,157***	0.350***	21,294***	0.326***		
	(3,806)	(0.061)	(3,673)	(0.059)		
post*micro	12,861	– 0.107	3,309	– 0.257	13,088	– 0.125
	(10,512)	(0.169)	(10,273)	(0.164)	(9,405)	(0.156)
_year_1991					– 2,102	– 0.127
					(9,041)	(0.150)
_year_1992					– 7,013	– 0.177
					(9,676)	(0.161)
_year_1993					– 12,118	– 0.239
					(9,719)	(0.161)
_year_1994					– 20,801*	– 0.320*
					(10,705)	(0.178)
_year_1995					– 11,332	– 0.275
					(10,125)	(0.168)
_year_1996					– 7,025	– 0.349**
					(10,265)	(0.171)
_year_1997					– 18,078**	– 0.422***
					(8,800)	(0.146)
_year_1998					– 20,739**	– 0.285**
					(8,331)	(0.138)
_year_1999					– 15,041*	– 0.083
					(8,443)	(0.140)
_year_2000					– 20,712**	– 0.243*
					(8,449)	(0.140)
_year_2001					– 24,251**	– 0.394**
					(9,884)	(0.162)
_year_2002					– 27,598***	– 0.469***
					(10,307)	(0.171)
_year_2003					– 11,553	– 0.341**
					(9,715)	(0.161)
_year_2004					– 5,534	– 0.064
					(8,280)	(0.137)
_year_2005					25,200***	0.394***
					(7,768)	(0.129)

Exhibit B-1

Full Results for Main Models, Townes at the Terraces (2 of 2)

	Model (1)		Model (2)		Model (3)	
	Basic DID		Regression-Adjusted DID		Regression-Adjusted DID With Year Fixed Effects	
	Outcome					
	Price ($)	ln(price)	Price ($)	ln(price)	Price ($)	ln(price)
_year_2006					70,091***	0.817***
					(8,057)	(0.134)
_year_2007					66,292***	0.786***
					(17,423)	(0.290)
age			– 318	– 0.006	– 287	– 0.006
			(230.576)	(0.004)	(198)	(0.003)
age2			0	0.000	0	0.000
			(1)	(0.000)	(1)	(0.000)
sqrftstrct_ln			18,304*	0.218	13,471	0.167
			(9,477)	(0.159)	(8,601)	(0.164)
lotsize_ln			21,823***	0.332***	24,928***	0.367***
			(7,247)	(0.120)	(6,638)	(0.123)
stories			– 4,312	– 0.046	– 1,913	– 0.004
			(7,601)	(0.122)	(7,258)	(0.126)
quality			1,375	0.013	242	0.001
			(3,878)	(0.058)	(3,728)	(0.057)
brick			20,893*	0.281*	23,822**	0.333**
			(10,823)	(0.164)	(9,813)	(0.162)
basement			– 2,001	– 0.061	– 3,359	– 0.077
			(18,631)	(0.304)	(17,988)	(0.314)
detached			– 16,867	– 0.020	– 21,912	– 0.076
			(26,351)	(0.418)	(24,566)	(0.400)
semidetached			– 3,443	0.045	9,295	0.159
			(19,840)	(0.318)	(18,002)	(0.299)
HOcode1			16,043***	0.389***	12,550***	0.342***
			(4,100)	(0.066)	(3,768)	(0.062)
tract1801			0	0.000	0	0.000
			(0)	(0.000)	(0)	(0.000)
tract1802			36,358	0.237	39,942**	0.297
			(22,605)	(0.352)	(17,820)	(0.305)
tract1803			40,972***	0.530***	42,928***	0.559***
			(9,963)	(0.160)	(9,037)	(0.151)
Constant			– 252,774***	6.396***	– 235,747***	6.606***
			(54,653)	(0.856)	(48,509)	(0.808)
Observations			1,133	1,133	1,133	1,133
R-squared			0.153	0.143	0.320	0.258

*DID = difference-in-differences. * p < 0.1, ** p < 0.05, *** p < 0.01.*

Note: Standard errors are in parentheses.

Exhibit B-2

Full Results for Main Models, Heritage Crossing (1 of 2)

	Model (1)		Model (2)		Model (3)	
	Basic DID		Regression-Adjusted DID		Regression-Adjusted DID With Year Fixed Effects	
	Outcome					
	Price ($)	ln(price)	Price ($)	ln(price)	Price ($)	ln(price)
micro	– 2,185	– 0.027	3,695	0.008	5,536	0.046
	(5,170)	(0.071)	(6,647)	(0.090)	(6,579)	(0.089)
post	17,860***	0.458***	12,167*	0.351***		
	(6,37)	(0.088)	(7,374)	(0.095)		
post*micro	– 16,532*	– 0.223*	– 10,877	– 0.136	– 12,050	– 0.139
	(9,118)	(0.126)	(9,695)	(0.129)	(9,435)	(0.127)
_year_1991					– 12,269	– 0.115
					(12,447)	(0.171)
_year_1992					– 41,659***	– 0.617***
					(14,187)	(0.196)
_year_1993					– 15,187	– 0.253
					(13,585)	(0.188)
_year_1994					13,909	0.271
					(12,313)	(0.169)
_year_1995					29,262**	– 0.004
					(13,173)	(0.182)
_year_1996					– 17,449	– 0.247
					(13,380)	(0.184)
_year_1997					– 32,943***	– 0.426**
					(12,424)	(0.171)
_year_1998					– 27,737**	– 0.144
					(11,497)	(0.159)
_year_1999					– 31,600**	– 0.177
					(12,743)	(0.176)
_year_2000					– 28,836**	– 0.221
					(13,505)	(0.186)
_year_2001					– 37,495***	– 0.490***
					(13,921)	(0.190)
_year_2002					– 17,338	– 0.155
					(15,170)	(0.209)
_year_2003					– 24,642	– 0.445**
					(16,069)	(0.218)
_year_2004					– 23,554	– 0.260
					(15,605)	(0.209)
_year_2005					– 1,075	0.274
					(14,244)	(0.179)
_year_2006					4,720	0.432**
					(12,438)	(0.169)

Exhibit B-2

Full Results for Main Models, Heritage Crossing (2 of 2)

	Model (1)		Model (2)		Model (3)	
	Basic DID		Regression-Adjusted DID		Regression-Adjusted DID With Year Fixed Effects	
	Outcome					
	Price ($)	ln(price)	Price ($)	ln(price)	Price ($)	ln(price)
_year_2007					37,740	0.360
					(30,678)	(0.424)
age			182	– 0.001	120	– 0.002
			(575)	(0.007)	(546)	(0.006)
age2			0	0.000	0	0.000
			(2)	(0.000)	(2)	(0.000)
sqrftstrct_ln			9,482	0.102	6,985	0.073
			(24,865)	(0.252)	(26,325)	(0.283)
lotsize_ln			5,245	0.027	10,397	0.099
			(10,069)	(0.127)	(10,047)	(0.127)
stories			782	– 0.023	– 505	– 0.046
			(22,395)	(0.222)	(22,969)	(0.228)
quality			5,091	0.039	4,401	0.038
			(8,290)	(0.103)	(8,165)	(0.104)
brick			45,528	0.736*	44,930	0.716*
			(47,149)	(0.423)	(48,439)	(0.427)
basement			– 1,769	– 0.020	– 1,525	– 0.015
			(4,990)	(0.068)	(4,826)	(0.063)
detached			50,855	1.054	48,695	0.967
			(72,392)	(0.998)	(70,940)	(0.978)
semidetached			– 47,508	– 0.613	– 55,601	– 0.813
			(52,911)	(0.710)	(51,867)	(0.694)
HOcode1			4,409	0.223**	7,214	0.271***
			(6,495)	(0.089)	(6,413)	(0.088)
tract1402			14,392	0.126	12,899	0.092
			(42,272)	(0.555)	(47,208)	(0.629)
tract1601			30,636	0.425	20,752	0.254
			(41,049)	(0.363)	(45,292)	(0.393)
tract1702			– 18,948	– 0.103	– 16,724	– 0.054
			(32,973)	(0.285)	(31,891)	(0.270)
tract1703			– 21,477	– 0.215	– 25,336	– 0.276
			(38,323)	(0.346)	(38,329)	(0.353)
Constant			– 104,189	8.775***	– 94,961	8.830***
			(148,848)	(1.475)	(156,636)	(1.602)
Observations			1,147	1,147	1,147	1,147
R-squared			0.069	0.071	0.130	0.132

*DID = difference-in-differences. * p < 0.1, ** p < 0.05, *** p < 0.01.*

Note: Standard errors are in parentheses.

Exhibit B-3

Full Results For Main Models, Broadway Overlook (1 of 2)

	Model (1)		Model (2)		Model (3)	
	Basic DID		Regression-Adjusted DID		Regression-Adjusted DID With Year Fixed Effects	
	Outcome					
	Price ($)	ln(price)	Price ($)	ln(price)	Price ($)	ln(price)
micro	8,064	0.237***	– 21,838***	– 0.214***	– 23,498***	– 0.227***
	(5,212)	(0.058)	(5,132)	(0.054)	(4,926)	(0.053)
post	88,122***	0.870***	88,512***	0.860***		
	(4,759)	(0.053)	(4,250)	(0.044)		
post*micro	7,989	0.007	8,900	0.044	16,699**	0.099
	(9,415)	(0.105)	(8,311)	(0.087)	(7,841)	(0.082)
_year_1991					13,584	– 0.219*
					(11,166)	(0.119)
_year_1992					– 8,171	– 0.164
					(11,354)	(0.119)
_year_1993					– 13,946	– 0.311**
					(11,826)	(0.123)
_year_1994					– 19,282*	– 0.419***
					(11,287)	(0.118)
_year_1995					– 26,012**	– 0.438***
					(10,969)	(0.115)
_year_1996					– 12,181	– 0.299***
					(11,083)	(0.116)
_year_1997					– 31,487***	– 0.549***
					(10,419)	(0.111)
_year_1998					– 19,174*	– 0.384***
					(9,999)	(0.104)
_year_1999					– 16,679*	– 0.228**
					(9,399)	(0.099)
_year_2000					– 12,389	– 0.285***
					(9,590)	(0.099)
_year_2001					– 92	– 0.079
					(9,884)	(0.104)
_year_2002					7,707	– 0.129
					(10,034)	(0.106)
_year_2003					27,879***	0.211**
					(9,492)	(0.100)
_year_2004					45,597***	0.376***
					(9,272)	(0.097)
_year_2005					97,488***	0.804***
					(9,104)	(0.095)
_year_2006					108,937***	0.803***
					(9,298)	(0.097)

Exhibit B-3

Full Results For Main Models, Broadway Overlook (2 of 2)

	Model (1)		Model (2)		Model (3)	
	Basic DID		Regression-Adjusted DID		Regression-Adjusted DID With Year Fixed Effects	
	Outcome					
	Price ($)	ln(price)	Price ($)	ln(price)	Price ($)	ln(price)
_year_2007					101,282***	0.671**
					(25,863)	(0.273)
age			– 1,577***	– 0.026***	– 1,660***	– 0.027***
			(237)	(0.003)	(228)	(0.003)
age2			7***	0.000***	7***	0.000***
			(1)	(0.000)	(1)	(0.000)
sqrftstrct_ln			47,729***	0.481***	50,856***	0.499***
			(7,322)	(0.074)	(7,058)	(0.072)
lotsize_ln			20,039***	0.326***	15,411**	0.297***
			(7,571)	(0.077)	(7,413)	(0.076)
stories			9,767*	0.146**	11,197**	0.164***
			(5,147)	(0.057)	(4,954)	(0.057)
quality			122	– 0.045	1,555	– 0.033
			(2,680)	(0.032)	(2,581)	(0.033)
brick			– 118,596**	– 0.753**	– 123,763**	– 0.827**
			(49,117)	(0.334)	(49,734)	(0.338)
basement			– 2,644	– 0.033	– 2,849	– 0.030
			(5,327)	(0.050)	(4,880)	(0.048)
detached			– 44,183	0.096	– 73,312	– 0.068
			(68,396)	(0.712)	(65,575)	(0.690)
semidetached			– 18,257	– 0.133	– 11,279	– 0.049
			(14,475)	(0.151)	(13,972)	(0.147)
HOcode1			21,492***	0.372***	21,197***	0.366***
			(3,734)	(0.040)	(3,614)	(0.039)
tract202			29,185***	0.386***	25,201***	0.348***
			(5,598)	(0.058)	(5,376)	(0.056)
tract301			0	0.000	0	0.000
			(0)	(0.000)	(0)	(0.000)
tract604			– 515	– 0.162**	– 3,211	– 0.191***
			(6,901)	(0.072)	(6,701)	(0.070)
Constant			– 249,748***	6.747***	– 222,772***	7.161***
			(63,500)	(0.505)	(62,876)	(0.495)
Observations			1,652	1,652	1,651	1,651
R-squared			0.405	0.460	0.460	0.500

*DID = difference-in-differences. * p < 0.1, ** p < 0.05, *** p < 0.01.*

Note: Standard errors are in parentheses.

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