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Abstract

Public housing has long been a contentious issue for cities and regions. On one hand, there is an acute need for affordable housing in low- and moderate-income communities. But the massing of public or otherwise subsidized housing in disadvantaged neighborhoods has given rise to concerns that “public housing” has led to decay in these communities. The purpose of this paper is to use analytical tools to evaluate the “conventional wisdom” that lower-income housing developments lead to decay the lower-income communities in which they generally are placed. I use a highly unique dataset on property conditions for tens of thousands of individual land parcels and an approach for estimating count data models based on the Conway-Maxwell-Poisson (CMP) distribution. The CMP is useful for estimating models with underdispersed data, which is uncommon. Results suggest that while large rehab developments tend to enhance property conditions nearby, the effects of other types of developments generally are negative.

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Low-Income Housing Tax Credit Developments and Neighborhood Property Conditions

Public housing has long been a contentious issue for urban areas. On one hand, there is an acute need for affordable housing for low- and moderate-income community members. But the massing of public or otherwise subsidized housing in disadvantaged neighborhoods has given rise to concerns that “public housing” has led to decay in these communities (see Scally, 2013; Ruming, 2014). The purpose of this paper is to use analytical tools to evaluate the “conventional wisdom” that lower-income housing developments have led to decay in the lower-income communities in which they generally are placed. Specifically, the analysis examines the impact of proximity to low-income housing tax credit (LIHTC) developments on the physical condition of nearby properties. I use a highly unique dataset on property conditions for tens of thousands of individual land parcels and an approach for estimating count data models based on the Conway-Maxwell-Poisson (CMP) distribution to complete my analysis. I am able to exploit reevaluations of properties to assess changes in property conditions

The analysis focuses on LIHTC because it has been the primary federal program for producing affordable rental housing for low-income people since the late-1980s. Much of the traditional “public housing” is being demolished, with the subsidies largely being shifted to the Housing Choice Voucher program (formerly Section 8) (Goetz, 2011).¹ However, some demolished public housing has been replaced under the HOPE VI program, which largely develops mixed-income properties of single-family, duplex, or row houses under the “new urbanism” mantra. Consideration is given to existing affordable housing in the analysis. The U.S. Department of Housing and Urban Development has not constructed a “housing project” since the 1970s, and little or no Section 8 housing construction since the 1980s.

¹This process has been challenged by many residents of traditional public housing projects. See Goetz (2013).

An analysis that separates LIHTC developments by type and size suggests that large rehab developments positively impact neighborhood property conditions, while others, including new large rehab developments, are associated with poorer property conditions.

The analysis is novel in several ways. First, it is the first to examine the impact of low-income housing developments on nearby property conditions. Virtually all of the existing literature that investigates the neighborhood effects of LIHTC developments, or assisted housing in general, examines nearby property values. Property values provide a good summary measure of overall neighborhood impact, but they do not provide much insight into the specific ways in which proximity to low-income housing might affect neighborhoods. For example, differences in property values may reflect crime rates, traffic congestion, physical condition of properties, school quality, or a host of other factors. There is a very limited literature on the effect of subsidized housing on these factors individually.

Another contribution of this study is to examine differences in the neighborhood effects of subsidized housing by type and size of the development. In a study of St. Paul, MN, Lyons and Loveridge (1993) find that Section 8 site-based housing reduces the assessed values of nearby residential properties, but the presence of Section 8 voucher-holding tenants does not. Although a substantial literature relating proximity to subsidized housing and neighborhood quality exists, few, if any, other studies examine differences in results between scattered site and concentrated publicly assisted housing units (Galster, 2002). The presence of LIHTC developments in a wide variety of sizes in my study area allows for that comparison.

Finally, my analysis exploits a Conway-Maxwell-Poisson distribution to address an issue of underdispersion in a count data model. To date, this useful tweak of the standard count data regression models has been little deployed in economics underdispersed data is uncommon.

The paper proceeds as follows. Section 1 outlines the conceptual underpinnings of the analysis. Section 2 highlights important literature that underlies the paper. Section 3 provides a brief overview of the LIHTC program, which has been the standard method of financing low-income housing since the mid-1980s. Section 4 discusses the mechanisms whereby low-income

housing developments might affect property conditions. Section 5 discusses the data and methodology, followed by results in Section 6.

1. Conceptual Framework

Galster (1981) develops a model where consumers maximize utility over two goods: housing and a composite of all other goods. The housing good (H) is a function of three attributes, the level of housing services provided (HS), the locational/physical attributes of the neighborhood (HN), and the level of “socio-psychological attachment” to the neighbors and neighborhood (HA). HS embodies the physical characteristics of the property, including both the structure and the parcel. The data I utilize on physical conditions of properties reflects HS . HN includes aspects of the neighborhood in which the property exists, including socioeconomic composition, racial composition, accessibility, environment, and so on. Finally, HA reflects such factors as the homeowner’s identification with neighbors and the neighborhood and pride in the neighborhood.

Surveys have shown that the physical appearance of the neighborhood is a critical component of neighborhood satisfaction (Hur and Morrow-Jones, 2008). The conceptual framework that underpins the relationship between proximity to LIHTC developments and the physical condition of neighboring properties hinges largely on the response of HS to changes in HA and HN : $H = H[HS(HN, HA), HN, HA]$. The homeowner has direct control only over HS and faces two possible strategies. The first is to make no effort to maintain or improve the condition of his property. In this case, HS will gradually deteriorate over time. The second option is to make a maintenance effort, which involves sacrificing non-housing consumption in favor of additional expenditure on housing (such as painting, repairing, etc.). This effort can work to maintain the existing level of HS or increase the level of HS .²

² Unlikely is an effort by the homeowner to physically reduce HS , for example, by removing a porch. Galster considers this case, however, in his analysis.

Previous work by Dildine and Massey (1974) suggests that deteriorating neighborhood conditions (a decline in *HN*) would result in less expenditure on maintenance and a resulting decline in *HS*. They derive a maintenance rule that equates current marginal costs to the present value of all future rents derived from a marginal unit of maintenance input. Anything that diminishes future rents would reduce maintenance expenditure, all else equal. In contrast, Galster suggests that declining neighborhood quality should lead to *increased* maintenance/improvement expenditures for the non-elderly (the opposite likely would be true for elderly homeowners). The increase in *HS* would represent an effort to compensate for the decline in *HN*. On the other hand, Galster asserts that neighborhoods experiencing “rapid population turnover, increased heterogeneity, or other factors which may erode homeowner’s attachment to the neighborhood,” or a decline in *HA*, should reveal lower maintenance/improvement expenditures (44).

The natural follow-up question is whether we should expect increases or decreases in *HA* and/or *HN* with the location of nearby LIHTC developments. Conceptually, either could be the case. The question is then whether any changes in *HA* or *HN* have affected *HS*.

2. Related Literature

Only one study known to the author evaluates the impact of existing housing on property conditions. In a study of about 13,000 properties in Phoenix, AZ, Guhathakurta and Mushikatel (2002) find that housing quality tends to decrease near Section 8 housing voucher residents except when the property is rented by a female head of household, in which case there are improvements in the physical condition of nearby housing.

A critical difference between my analysis and the Guhathakurta and Mushikatel study is the type of program that is evaluated. I evaluate proximity to publicly subsidized housing *developments* rather than proximity to units built without public assistance but occupied by rent-subsidized residents. Although housing voucher recipients have been shown to cluster (Wang and Varady, 2005; Metzger, 2014; Schwartz et al., 2017), LIHTC-financed developments, which are often occupied by housing voucher recipients themselves, by definition concentrate low-income residents, at least within the development. In general, most of the literature shows little

effect on neighborhood quality from voucher residents (Carlson et al., 2012), and focus groups suggest that in some cases, unsubsidized neighbors do not realize they are there (Santiago et al., 2001). For this reason, a study of subsidized housing developments is more likely to identify a significant effect.

A more loosely related study by Van Ryzin and Genn (1999) shows a significant decrease in the number of buildings boarded-up following a ten-year housing program in New York City that commenced in the 1980s, but an increase in the number of maintenance deficiencies. Their study exploits administrative data from the New York City Department of Housing Preservation and Development rather than a detailed survey of the physical condition of all properties.

In addition, a number of studies relating foreclosed properties to nearby property values suggest that potential neglect of foreclosed properties is one causal mechanism that can erode property values (Harding et al., 2009; Hartley, 2014; Gerardi et al., 2015), although in weaker housing markets, such as the market analyzed in this study, foreclosed homes are a small fraction of vacant and neglected properties (Whitaker and Fitzpatrick, 2013). In addition to foreclosed properties, Whitaker and Fitzpatrick use tax-delinquent and vacant properties as indicators of distressed property conditions.

3. Overview of the LIHTC Program

While an extended discussion of the LIHTC program is beyond the scope of this paper, some description is important for providing context to the results. The Low-Income Housing Tax Credit Program was created under the *Tax Reform Act of 1986* as an alternative way of financing the development of affordable rental housing. The program replaced a variety of existing tax provisions and became the principal federal subsidy for producing affordable rental housing for low-income people. The program authorizes selected state and local agencies to issue federal tax credits for the construction, acquisition, or rehabilitation of affordable rental housing. The credits cover either 30 percent or 70 percent of the present value of qualified costs. Since the credit is allocated over a 10-year period, this results in an annual credit of either 4 percent (for 30 percent

projects) or 9 percent (for 70 percent projects) for investors (McClure, 1990). The 30 percent tax credit is given to projects that use tax free bond financing or acquire existing buildings, while the 70 percent tax credit is provided for new construction or projects with no other subsidies. The credits are used by outside investors, who provide developers with initial funds in return. These outside investors cannot claim the credit unless the development meets LIHTC requirements, which provides a strong incentive for the outside investor to ensure compliance with program requirements.

Income and expenditure thresholds are based on the U.S. Department of Housing and Urban Development's (HUD) fair market rent calculations. To qualify for the low-income housing tax credit, at least 20 percent of the units must be affordable to households that earn 50 percent or less of the area median income, or 40 percent of the units must be affordable to households that earn 60 percent or less of the area median income. A household qualified for a particular unit must spend no more than 30 percent of its income on rent in order for the unit to be considered affordable.

In addition to being largely controlled by private investment, LIHTC developments differ from more traditional public housing, such as Section 8, in terms of the location of developments and households served. For example, LIHTC developments are more likely to be located outside the urban core than other public housing developments (Freeman, 2004). LIHTC developments are also more likely to be built where land costs are lower relative to market rate rents set by HUD. This enables development owners to capture a greater amount of revenue relative to project costs than if these units were located in higher cost areas. Finally, residents living in LIHTC developments are more likely to be employed and less likely to receive public assistance than Section 8 residents. LIHTC households also have higher incomes on average than Section 8 households (Burton et al., 2000).

4. Mechanisms for LIHTC to Affect Property Conditions

Crime

Crime is a critical concern for those in low-income neighborhoods, especially those around assisted housing developments (DeLone, 2008). The research on this issue is substantial, but results are mixed. If there is a consensus on the Housing Choice Voucher Program/Section 8, it is that there is a weak association between housing vouchers and crime (Lens, 2014).³ The preponderance of studies of low-income housing *developments* and crime show some association between low-income housing developments and crime, but LIHTC housing may be different.

Griffiths and Tita (2009) suggest that “public housing developments are hot beds of violence involving predominantly local residents,” with little coming into or out of the general area of the development and associated neighborhood (474). Galster et al. (2002) conclude that the crime occurs not because of a significant criminal element within the subsidized housing, but because the larger-scale housing provides a “pool of potential victims” and/or makes it “difficult for the neighborhood to maintain collective efficacy” (311).⁴ This finding conflicts to some degree with Griffiths and Tita (2009), of course. The primary objective of the Galster et al. paper was to study the effect of project size on crime. They find that a higher incidence of crime is associated with the development of large (> 53 units) assisted housing developments, but not for smaller developments (see also Agnew, 2010).

Woo and Joh (2015) examine crime specifically around LIHTC developments, finding that LIHTC housing tends to be developed in neighborhoods where crime is already prevalent, but LIHTC developments mitigate crime once in place. Freedman and Owens (2011) find a significant reduction of crime, measured at the county level, associated with a LIHTC development. Diamond and McQuade (2016) and Freedman and Owens (2011) also find a decline in crime associated with the placement of LIHTC developments.

³See Ellen et al. (2012), Lens (2013), Van Zandt and Mhatre (2013), and Hayes et al. (2013) for background on the relationship between housing *vouchers* and the incidence of crime.

⁴ “Collective efficacy” refers to the exploiting of social ties among neighborhood residents to achieve collective goals, typically in an effort to maintain public order or control crime (Samuelson et al., 1997).

Education

Another potential negative impact of proximity to subsidized housing is a deleterious effect on schools. There is surprisingly little research on this issue. Students living in subsidized housing have been shown to perform less ably on standardized tests than other students, even within the same school (Schwartz et al., 2010; Duke-Lucio et al., 2010). Moreover, peer performance has been shown to influence students' performance (Epple and Romano, 1998). The possibility exists, then, that poor performance of subsidized housing residents could generate diminished performance on the part of existing students. Nevertheless, the limited literature to date does not support that view. Di and Murdoch (2013) find no evidence of a relationship between LIHTC developments and school performance.

Neighborhood Transition

Other potential negative (from some owners' perspectives) neighborhood impacts of proximity to subsidized housing have also permeated the conventional wisdom – specifically, racial and income transition and/or concentration. Nevertheless, in reviewing the literature, Freeman and Botein (2002) find that the development of subsidized housing generally does not lead to neighborhood racial transition. Horn and O'Regan (2011) echo this finding, suggesting that LIHTC developments do not contribute to increased segregation, even in high poverty neighborhoods. Although existing studies generally have found a relationship between the development of subsidized housing and poverty concentration (Freeman and Botein, 2002; Delang and Lung, 2011; Horn and O'Regan, 2011), an arguably more generalizable study by Freeman (2003) and recent research from Freedman and McGavock (2015) find no such relationship.

Another, related factor is “putative character defects” of tenants in public housing (Freeman and Botein, 2002, 362). If these assumed character defects are in some way more severe than those of residents in the neighborhood more generally, the effect would be to diminish neighborhood quality. Such a result would not require public housing tenants to have character defects, but merely for that to be the perception of them. A similar thought process

could be applied to the maintenance of property. The perception of character defects on the part of tenants may lower the status of the neighborhood, and hence the pride in which people view their neighborhoods. Ellen et al. (2007) and Funderberg and MacDonald (2010) provide some indirect support for this view. Both studies find that subsidized housing for seniors has a more positive initial effect on nearby property values than does subsidized housing for low-income people. The most negative effects on nearby property values are associated with the lowest income residents.⁵

Subsidized housing may also change the status of and attachment to the neighborhood. Freeman and Botein (2002) note that “one’s home, including its neighborhood characteristics, is a key marker of social status in America” (361). They further note that such status relies in large part on exclusivity. The presence of subsidized housing is perceived by many to diminish the exclusivity and status of a neighborhood (Schively, 2007). By its nature, subsidized housing allows residents into the neighborhood who otherwise would not be able to afford it. Indeed, 45 percent of tenants have “extremely low incomes” and an “overwhelming majority” receive some form of rental assistance (O’Regan and Horn, 2013, 597). Moreover, affordable housing is perceived by many to house largely poor, minority people who are thought to be more prone to crime (Tighe, 2010). Residents near subsidized housing may in some sense care less about their property knowing it commands less status than it otherwise would.

LIHTC Benefits

Conceptually, LIHTC developments may also generate benefits to the neighborhood, increasing *HN* and *HA*. Baum-Snow and Marion (2009) note that to the extent they replace vacant buildings or unsightly empty lots, they may represent amenity improvements. Santiago et al. (2001) find a positive effect of scattered-site subsidized housing on property values, which they attribute to “the replacement of a negative externality generator with a positive externality generator” (83). Specifically, they note a typical acquisition of vacant, small-scale properties and

⁵ Nevertheless, they do find a positive impact on nearby property values of proximity to LIHTC developments specifically.

subsequent rehabilitation, as well as “consistently good management, tenant monitoring, and property upkeep” (83). Ezzet-Lofstrom and Murdoch (2006) find a small, positive significant effect on the price of single family homes near LIHTC developments. They also note that acquisition and rehabilitation of existing housing likely plays a significant role in their findings, as 94 percent of LIHTC developments in Dallas fit that characterization. Schwartz et al. (2006) suggest “disamenity removal” was an important factor in their finding of positive effects of proximity to low-income housing in New York City (703).

The ambiguity in the likely neighborhood effects of proximity to subsidized housing on *HN* and *HA*, along with mixed expectations on the response of *HS* to changes in *HN*, logically lends itself to an empirical investigation. The remainder of the paper investigates the impact of LIHTC developments on a novel characteristic of neighborhood quality: the physical condition of properties.

5. Data and Methodology

Data

The analysis in this paper seeks to determine the relationship between the physical condition of property parcels and proximity to LIHTC housing developments in a systematic way. The primary data set used in this analysis is derived from a GIS-based survey of property conditions for roughly 80,000 parcels in Kansas City, Missouri. These parcels represent about 45 percent of all Kansas City parcels, but are concentrated in the relatively low-income area east of Troost Boulevard and south of the Missouri River (Figure 1). The initial survey was conducted in 2000 and 2001 by the Center for Economic Information at the University of Missouri – Kansas City. Most of the LIHTC developments located in Kansas City are located in this study area, as are most HUD-subsidized housing developments. Property conditions were resurveyed in following years, beginning in 2003 and ending in 2012 (Table 1). There were no evaluations in 2010 and few in 2006.

The survey classifies each parcel by structure type (intended use), use type (actual use), and structure profile (e.g., number of stories). Then, for each parcel, ratings are provided for a variety of structural features (e.g., roof, foundation, exterior paint), grounds features (e.g., litter, lawn), and infrastructure features – 15 in total. The ratings range from 1 = severely deteriorated to 5 = excellent. I reduced the number of factors to those in which the homeowner has control, removing public sidewalks, curbs, street lights, catch basins, and street conditions. A total score was computed by adding up scores from each of the categories; thus, the total score ranges from 0 to 50. The mean composite property condition in the study area for all years was 42.2. The standard deviation was 4.7. Figure 2 provides a histogram for the data. Property condition scores were fairly concentrated around the mean. Still, the pattern of property conditions, even within neighborhoods, showed significant variation (Figure 3).

To account for proximity to LIHTC housing developments, I geocoded all developments within the Kansas City, MO area using GIS and established rings for 500 foot distances around the developments. I identified LIHTC development by year placed in service so that I could isolate developments placed in service before 2000 and in each individual year between 2001 and 2012 (none were placed in service in 2010 in Kansas City). I also identified which developments were newly constructed and which were acquired and rehabbed. Finally, I recorded which developments were small (< 9 units) or large (9+ units). Parcels were identified as proximal to LIHTC developments if they fell within the 500-foot boundaries (Figure 4).

There are proximity measurements for LIHTC developments in the base year (2000 or 2001) for all parcels, represented by LIH_B . The indicator is binary, taking a value of unity if any LIHTC development was within 500 feet of the parcel in the base year and zero otherwise. When account is taken for the type of construction and size of the development, the resulting variables

also are binary. Specifically, $LIH_B^{NL} = 1$ if a LIHTC development that was new construction (N) and large (L) was within 500 feet of the parcel in the base year and $LIH_B^{NL} = 0$ otherwise. Similar binary indicators are constructed for large rehab developments LIH_B^{RL} , small new construction developments (LIH_B^{NS}), and small rehab developments (LIH_B^{RS}). There were 343 LIHTC developments placed in service in the study area by 2000, with an average size of 21 units. Roughly 28.6 percent of parcels were within 500 feet of some kind of LIHTC development in the base year.

Additional proximity measures, LIH_T^j , were calculated to account for proximity to LIHTC developments that were placed in service between the base year ($t = 0$) and the year the property was resurveyed ($t = T$). Because the reevaluations occurred over separate years, I needed to count only LIHTC developments placed in service between the base year and the year of the reevaluation. Specifically, for a parcel resurveyed in year T ,

$$(1) \quad LIH_T^j = \sum_{t=0}^T LIH_t^j \quad \forall j$$

where $j \in \{NL, RL, NS, RS\}$. Finally, parcels were identified by their proximity to HUD-sponsored housing developments, again at 500 feet (7.8 percent of parcels).

Other data used in the analysis as controls were collected at the census block or census block group. A block group is a combination of census blocks and a subdivision of a Census tract. Data sources and sample statistics are provided in Table 2.

Empirical Strategy

The data on property conditions are best considered as counts, and a preferred approach with count data is Poisson regression, which is a nonlinear regression method specified by its probability density

$$(2) \quad \Pr(Y_i = y_i) = \frac{e^{-\lambda} \lambda^{y_i}}{y_i!}$$

and conditional mean parameter:

$$(3) \quad E(y_i | \mathbf{x}_i) = \lambda_i = \exp(\mathbf{x}\boldsymbol{\beta}).$$

Here I simplify notation by letting all LIHTC proximity variables be represented by the vector \mathbf{L} and control variables by the vector \mathbf{C} so that

$$(4) \quad \mathbf{x}\boldsymbol{\beta} = \mathbf{L}\boldsymbol{\Gamma} + \mathbf{C}\boldsymbol{\Delta}.$$

Further, y is the dependent variable, which is the condition of the parcel when reevaluated.

The Poisson is characterized by a single parameter λ . By properties of the Poisson,

$$(5) \quad E(y_i | \mathbf{x}_i) = \lambda = V(y_i | \mathbf{x}_i).$$

Thus the conditional variance is not a constant and the regression is intrinsically heteroscedastic. The requirement that the conditional mean and variance be equal (or at least close) in the Poisson model is restrictive and often violated. Those estimating count data models most commonly are faced with overdispersed data, where the conditional variance significantly exceeds the conditional mean. In most cases of overdispersion, the negative binomial model is an attractive alternative because mean and variance equality is relaxed by introducing an individual unobserved effect into the conditional variance [i.e., $V(y_i | \mathbf{x}_i) = \lambda + \alpha\lambda$]. Overdispersion can be tested in a negative binomial estimation with a likelihood ratio test for hypothesis $H_0: \alpha = 0$ against the alternative hypothesis $H_1: \alpha > 0$. In these tests with my model and data, $\hat{\alpha} \approx 0$ and the p-value was near 1.

These results are not surprising in the case of underdispersion, where the conditional variance is much smaller than the conditional mean. Indeed, my data are characterized by underdispersion. The negative binomial is not well suited for this case. The Conway-Maxwell-

Poisson (CMP) distribution is a generalization of the Poisson distribution that enables one to model both overdispersed and underdispersed data (Shmueli et al., 2005).⁶ Its probability function is

$$(6) \quad P(Y = y) = \frac{\lambda^y}{(y!)^\nu} \frac{1}{Z(\lambda, \nu)}$$

$$(7) \quad Z(\lambda, \nu) = \sum_{j=0}^{\infty} \frac{\lambda^j}{(j)^\nu}$$

for $\lambda > 0$ and $\nu \geq 0$ (individual subscripts are dropped). Again, λ is the conditional mean. The CMP collapses to the ordinary Poisson distribution when $\nu = 1$. The Bernoulli and geometric also are special cases. The CMP does not have closed-form solutions for its moments but can be approximated. $Z(\lambda, \nu)$ can be approximated by truncating the series at some k th term such that $\frac{\lambda}{k^\nu} < 1$ (Shmueli et al., 2005, Appendix B). I estimate the model using a Guikema and Coffelt (2008) reparameterization where the approximate solutions are

$$(8) \quad E(y) \approx \lambda + \frac{1}{2}\nu - \frac{1}{2} \quad \text{and}$$

$$(9) \quad V(y) \approx \frac{\lambda}{\nu}.$$

A number of control variables are included in C. The most important of these is the condition of the property in the base year. All else equal, I expect that property condition, when reevaluated, would be better the better it was in the base year. I would not expect, for example, to see a house that was dilapidated in the base year to receive a high score in the subsequent years, although that is certainly possible in some cases. Because reevaluations of the properties occurred over several years, I also include the number of years between the initial evaluation of the property and the subsequent evaluation of the property. Holding all else fixed, like

⁶For additional applications, see Lord, Geedipally, and Guikema (2010); Lord, Guikema, and Geedipally (2008); Sur et al. (2015), and Francis et al. (2012).

maintenance, my expectation is that homes would deteriorate over time. Thus, I would expect this variable to be negatively correlated with property condition in the reevaluation.

A number of block-level statistics are included as controls. Demographic variables are included to control for any possible influences of race (share nonwhite), ethnicity (share Hispanic/Latino), and age (share 75+). I have no *a priori* expectations for these variables, except for age. My expectation is that older residents may be less able to physically do the work that is required to properly maintain a home. Begely and Lambia-Hanson show that, in Boston, “older” adults spend half as much on repairs and about 40 percent less on improvements than do younger homeowners. I expect the share 75 and older is negatively associated with lower property condition scores.

The owner-occupancy rate is expected to be positively correlated with property condition, all else equal. The presumption is that one would take better care of his/her home, and more likely to make improvements, if an owner. Renters would not likely invest anything substantial in a home that is not their own because it is the landlord who would reap the gains. Further many renters fail to properly inform their landlord of maintenance issues until these issues affect the renters directly and could be costlier.

Vacant properties, especially in low-priced areas, are much more likely to fall into disrepair, and literature suggests it can reduce values of nearby homes (Frame, 2010). Literature also suggests a likely contagion effect (Harding, Rosenblatt, and Yao, 2009). Kelling and Wilson (1987) note in their well-known article outlining the “broken windows” theory that “vandalism can occur anywhere once communal barriers – the sense of mutual regard and the obligation of civility – are lowered by actions that seem to signal that nobody cares.” While their article spoke specifically to the role that community policing, a similar argument can be applied to the

tendency to maintain or improve the condition of real property. That is, residents are more likely to maintain their properties when the neighborhood surrounding them is well-maintained (see, e.g., Lambie-Hanson, 2015). Additional evidence of this proclivity exists in other contexts. For example, Brown and Werner (1985) find that residents are more likely to set out Halloween and Christmas decorations on blocks where other homes are decorated.

Low-rent units are not expected to be well-maintained, relative to units with higher rents, as the marginal benefit of maintenance expenditure is lower, and one can command a higher rent for a higher quality dwelling. I include in the analysis the share of dwellings in the block group that rent for less than \$300. In 2000, the median gross rent in the City of Kansas City, MO was \$548 (2000 Census). On average, 26 percent of rental units in the study area rented for less than \$300 in 2000-2001.

A final variable included in the analysis is the share of households in the block group with incomes less than \$25,000 annually, the idea being that costly maintenance would be less manageable for those with relative low incomes. In the study area, 46 percent of households had annual incomes of less than \$25,000.

6. Empirical Results

Conway-Maxwell-Poisson estimates are provided in columns 1 and 2 of Table 3, along with marginal effects in column 3, and OLS estimates in column 4. The AIC for the Poisson model was 172,511 and 166,355 for the CMP model (column 2). The McFadden pseudo R^2 is 0.04. The adjusted R^2 from the OLS regression is about 0.11, which is not surprising given the many idiosyncrasies one might expect with home maintenance decisions. However, if estimated in first differences the adjusted R^2 is 0.43.

The marginal effect of each variable j is

$$(10) \quad \hat{\delta}_j = \frac{\partial E(y_i | \mathbf{x})}{\partial x_{ji}} = \exp(\mathbf{x}_i \boldsymbol{\beta}) \beta_j$$

I report the marginal effects at the average:

$$(11) \quad \hat{\delta}_j = \bar{y} \hat{\beta}_j$$

Most of the marginal effects are around 1.5 property condition points or less. While the numbers may seem economically small in the context of the mean property condition score 42.2 – 43.1, they are economically very significant when compared to the small standard deviation of property scores, which is 4.7.

Proximity to LIHTC Developments

The results of the empirical analysis suggest that, generally, proximity to LIHTC developments has little association with neighborhood property conditions, as the result (model 1) is statistically insignificant. However, once the type of development (new construction or acquisition and rehab) is considered, along with the size of the development (8 units or less or more than 8 units), the results are both statistically and economically significant (model 2). Looking at the marginal effects (model 3), large rehab developments existing in the base year are significantly positively correlated with the physical condition of properties nearby. Specifically, proximity to a large rehab development in the base year is associated with an increased average property score of 1.409 points, which is about 0.3 standard deviation. The result is especially significant, in terms of magnitude, when put in the context of the highly idiosyncratic property scores.

The effect is also statistically and economically significant when considering large rehab developments put in place between the base year and the subsequent evaluation, but the correlation is negative (-1.532), meaning that proximity to new large rehab developments negatively affects surrounding property conditions. This result may reflect more intensive effects of LIHTC developments on *HA* and *HN* immediately after being placed in service. For example, a development recently placed in service may reduce attachment initially because the

homeowner feels that the status of the neighborhood is changed. But this feeling may wane over time as the homeowner grows accustomed to the development and the effects of, say, replacing a disamenity become relatively stronger. Large, newly constructed LIHTC developments are negatively associated with nearby property conditions whether existing in the base year or put into place between the initial property condition assessment and the second evaluation. These developments likely would reduce *HA* and *HN* but are less likely to come with the benefits of a rehab development, such as the removal of a disamenity.

Small LIHTC developments also are statistically significant and negative whether existing in the base year or placed in service in intervening year between assessments, but unsurprisingly, the marginal effects are smaller. The exception is small newly constructed developments placed in service after the base year, which is statistically insignificant but very large in magnitude: -6.7 points, or 1.4 standard deviations. The likely explanation is that only a few parcels (0.003 percent of all parcels) were near a single newly constructed development between the survey years. There were no small rehab developments put into service between survey years.

The positive relationship between property conditions and proximity to large rehab LIHTC developments in the base year suggests that the benefits of proximity, such as removal of nearby blight or utilization of nearby vacant lots, may outweigh the potential costs of proximity, such as neighborhood detachment or disamenities such as congestion and (possibly) crime. These effects of proximity are associated with property conditions through their correlations with neighborhood quality and attachment, which, in turn, influence maintenance effort. Because the neighborhoods in which LIHTC developments are located in the study area are predominantly low- and moderate-income, where abandoned and dilapidated properties are more common, disamenity removal is likely especially impactful.

For other developments, the presumably deleterious effects of the developments, such as the potential for reduced neighborhood status, neighborhood detachment, an influx of subsidized

renters, or (possibly) increased crime, likely are much more pronounced and outweigh the removal of disamenities.

Existing empirical studies of the effects of subsidized housing developments on neighborhoods, which have focused almost exclusively on property values, are mixed (see reviews in Galster, 2002 and Nguyen, 2005), and thus no consensus has been reached. One reason why results have been mixed across studies is that property value, the neighborhood indicator in most studies, provides a summary measure of neighborhood effects, which possibly tends toward zero. The overall effect of proximity to low-income housing on property values likely depends on which of many different neighborhood effects dominate. Property condition is a specific facet of neighborhood effects for which consistent results may be easier to derive. Further, when developments of different types and sizes are lumped together, as is the case in most studies, empirical results can vary widely depending on which types and sizes of developments are located in the study area.

Control Variables

The parameters on control variables mostly aligned with expectations. Proximity to a HUD public housing project is probably the most interesting, as a comparison can be made to the LIHTC results. The empirical results uniformly show a significant negative relationship between HUD housing projects and property conditions. Most HUD projects were put in place well before the 1980s, and the pattern of property conditions has likely changed considerably since, over both time and space. Most HUD housing projects are comparable in size to larger LIHTC developments, and thus we might expect to see similar results. But many HUD projects have deteriorated significantly, or at least, have not been substantially rehabilitated in recent years. In contrast, in 2000, the initial year of this study, LIHTC developments were at most 13 years old.

If housing services is a normal good, one would think that higher incomes would allow for greater upkeep of the property, but higher incomes are associated with *lower* property condition scores. Nevertheless, the results are statistically insignificant. Income falls within a relatively tight spectrum within the study area.

Owner-occupants consistently have been shown to maintain properties better than renters (see, e.g., Galster, 1983). While owner-occupancy was included for the block group, one might expect that across all data, the tenure of any one property would be correlated with tenure of the block group. However, the empirical results show no statistically meaningful relationship.

A higher vacancy rate on the block is associated with a lower property condition score, as expected. The magnitude is -0.836 points, or about 0.2 standard deviations. The parameters associated with most other determinants were statistically insignificant with the exception of Hispanic/Latino, which was negative but relatively small in magnitude.

7. Conclusions

Public housing is a contentious issue. Clearly there is an acute need for affordable housing for low-and-moderate income community members. House prices have risen significantly in recent years, and, at least until recently, rent prices have surged in some cities and become unaffordable to low- and moderate-income renters (Edmiston, 2016). But the massing of public or otherwise subsidized housing in disadvantaged neighborhoods has given rise to concerns that “public housing” has led to decay of these communities. This paper asks whether this conventional wisdom is true and finds that the answer is “it depends.” If LIHTC developments consist of large acquisition and rehabilitation projects the result is likely to be a moderate boost to surrounding property conditions unless it was very recently placed in service. For other types of development, however, the negative perceptions seem to outweigh the benefits.

Important is that the results of this analysis do not necessarily apply to higher income neighborhoods. The study area, located in Kansas City, MO, is predominantly low- and moderate-income neighborhoods with an average median household income of \$29,010 (at the time of the study). By comparison, median household income is \$47,489 for the City of Kansas City at large. About 45 percent of households in the study area have incomes below area median

income, which is \$63,082 for the Kansas City MSA. Similar work, although difficult given the costly nature of the data, would add more credibility to these findings.

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TABLES

Table 1: Observations by Year

Year	Number of Parcels	Year	Number of Parcels
2000	34,873	2007	20,121
2001	48,141	2008	15,612
2002	3,470	2009	3,756
2003	7,967	2010	-
2004	8,704	2011	8,082
2005	13,681	2012	5,956
2006	60		
Observations in 2000 and 2001 are initial appraisals. Later years are the number of parcels where property conditions were reevaluated in that year.			

Table 2: Sample Statistics

Variable	Source	Mean (Std. Dev.)
Property Condition, initial evaluation	Center for Economic Information (CEI), University of Missouri Kansas City (UMKC)	42.2 (4.7)
Property Condition, Second evaluation	CEI-UMKC	43.1 (5.3)
Within 500 feet of LIHTC development existing in the base year (new, large)	CEI-UMKC	1.6%
Within 500 feet of LIHTC development existing in the base year (rehab, large)	CEI-UMKC	2.7%
Within 500 feet of LIHTC development existing in the base year (new, small)	CEI-UMKC	5.8%
Within 500 feet of LIHTC development existing in the base year (rehab, small)	CEI-UMKC	11.7%
Within 500 feet of LIHTC development placed in service after the base year (new, large)	CEI-UMKC	0.6%
Within 500 feet of LIHTC development placed in service after the base year (rehab, large)	CEI-UMKC	0.6%
Within 500 feet of LIHTC development placed in service after the base year (new, small)	CEI-UMKC	0.003%
Within 500 feet of LIHTC development placed in service after the base year (rehab, small)	CEI-UMKC	None
Within 500 feet of HUD development	CEI-UMKC	9.4%
Number of years between property evaluations	CEI-UMKC	6 (2)
Percent of homes vacant on the block	2000 Census	13.0% (13.0%)
Percent of homes on block that are owner-occupied	2000 Census	56.4% (27.3%)
Share on block that is nonwhite	2000 Census	62.9% (36.8%)
Share on block with Hispanic/Latino ethnicity	2000 Census	7.3% (16.8%)
Share on block aged 75 or older	2000 Census	7.9% (0.9%)
Share of rents less than \$300 in block group	2000 Census	26.0% (19.8%)
Share with income at \$25,000 or below	2000 Census	45.9% (15.2%)

Table 3: Regression Results

	Conway-Maxwell Poisson (1)	Conway-Maxwell Poisson (2)	Marginal Effects* (3)	Ordinary Least Squares (4)
Intercept	3.473*** (0.006)	3.480*** (0.006)	146.9	30.98*** (0.252)
Property Condition in Base Year (2000 or 2001)	0.007*** (1.2E-4)	0.006*** (1.2E-4)	0.273	0.271*** (0.005)
LIHTC in Base Year (Any)	0.002 (0.002)			
LIHTC in Base Year† (New Construction, Large)		-0.030*** (0.005)	-1.251	-1.232*** (0.215)
LIHTC in Base Year (Rehab, Large)		0.033*** (0.004)	1.409	1.429*** (0.164)
LIHTC in Base Year (New Construction, Small)		-0.009*** (0.003)	-0.362	-0.364*** (0.114)
LIHTC in Base Year (Rehab, Small)		-0.003 (0.002)	-0.139	-0.138* (0.083)
LIHTC in succeeding years‡ (New Construction, Large)		-0.015* (0.009)	-0.649	-0.615* (0.352)
LIHTC in succeeding years (Rehab, Large)		-0.036*** (0.008)	-1.532	-1.561*** (0.333)
LIHTC in succeeding years (New Construction, Small)		-0.159 (0.115)	-6.709	-6.290 (4.449)
HUD Housing Development	-0.023*** (0.002)	-0.021*** (0.002)	-0.907	-0.897*** (0.085)
Years between Property Assessments	-1.5E-4 (3.2E-4)	7.2E-5 (3.1E-4)	0.003	0.002 (0.013)
Block Vacancy Rate (percent)	-0.020*** (0.005)	-0.020*** (0.005)	-0.836	-0.839*** (0.214)
Owner-Occupancy (percent)	-0.001 (0.002)	-0.002 (0.002)	-0.069	-0.072 (0.103)
Nonwhite	0.001 (0.002)	0.001 (0.002)	0.056	0.054 (0.082)
Hispanic/Latino	-0.011*** (0.004)	-0.010** (0.004)	-0.420	-0.411** (0.164)
Age 75+, block (percent)	-0.011 (0.008)	0.008 (0.008)	-0.354	-0.345 (0.317)
Rent < \$300, block group (percent)	-0.008* (0.004)	-0.009** (0.004)	-0.373	-0.370** (0.175)
Income < \$25,000, block group (percent)	-0.006 (0.006)	-0.005 (0.006)	-0.221	-0.222 (0.230)
	ln(v) = -0.732***	ln(v) = -0.737***		Adj. R ² = 0.11
McFadden Pseudo R ²	0.036	0.038		

† “LIHTC” and “HUD” mean that a development is within 500 feet of the parcel
‡ “Succeeding years” indicates that the development was placed in service between 2000 and the year of the reappraisal. Thus, for a parcel appraised in 2007, “LIHTC in succeeding years” is LIHTC developments placed in service between 2000 and 2007.
* Marginal effects are calculated at the average.
***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.1 levels.

FIGURES

Figure 1. Project Study Area

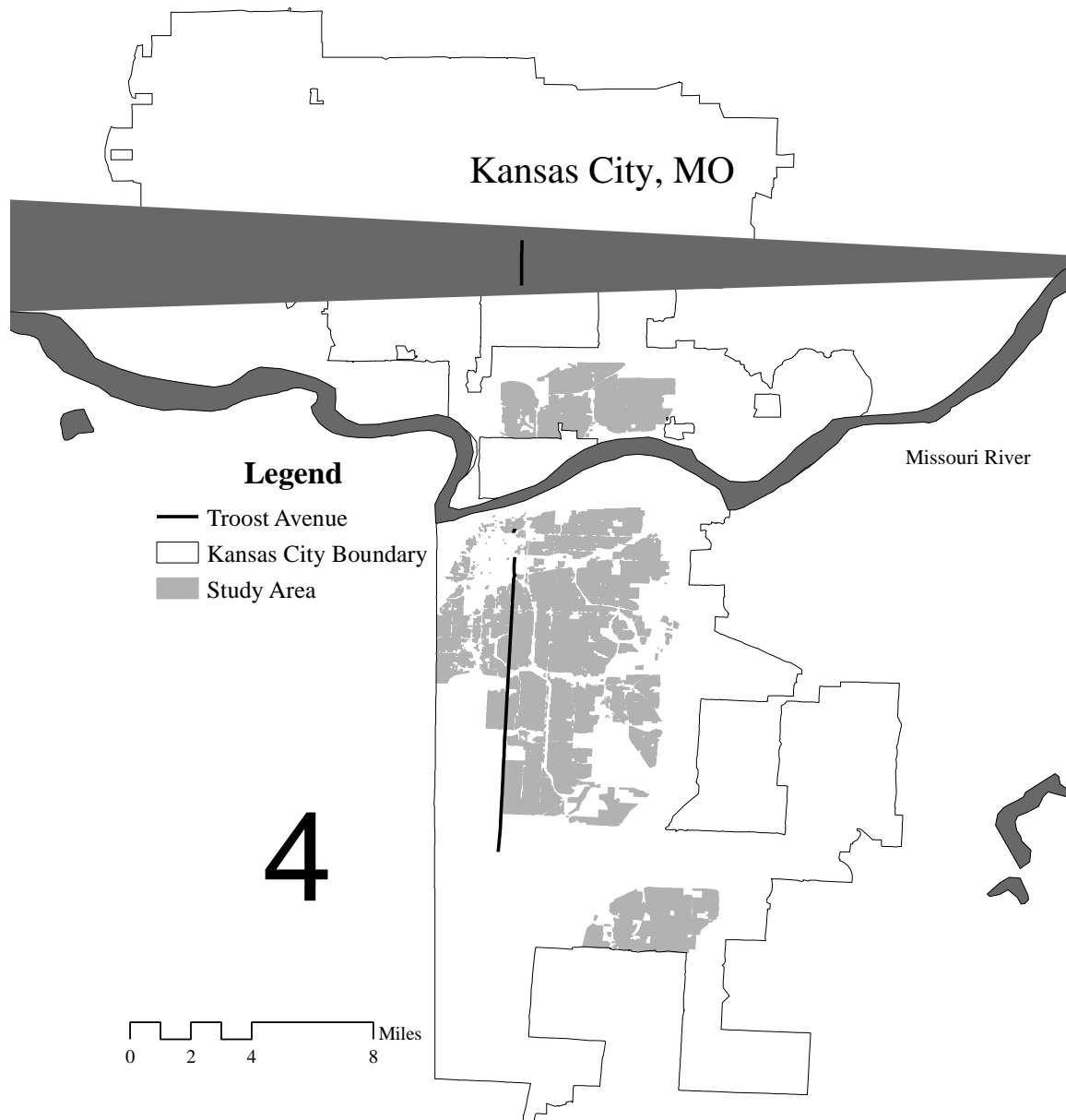


Figure 2. Histogram for Property Condition Score with Fitted Poisson Distribution

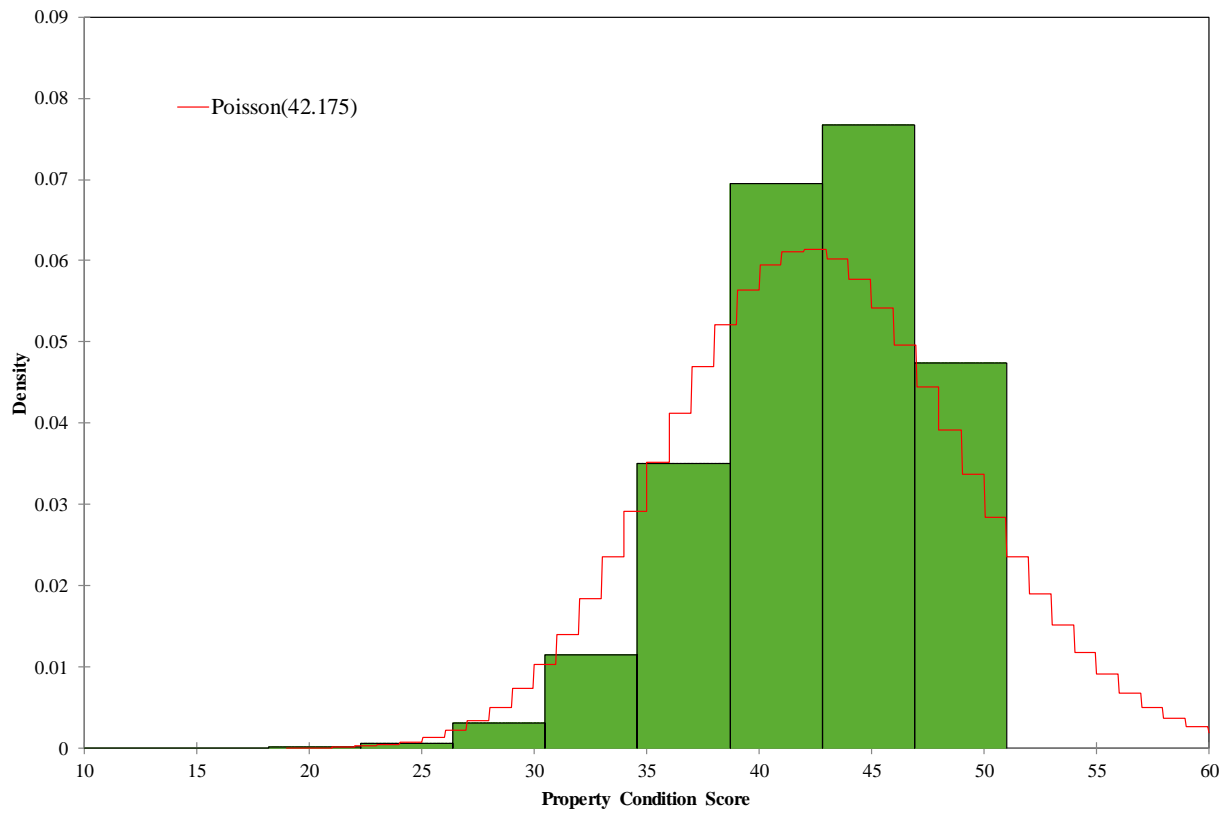


Figure 3. Property Conditions, Ivanhoe Southeast Neighborhood, Kansas City, MO



Figure 4: Parcels Proximal to LIHTC Developments, Key Coalition Neighborhood, Kansas City, MO

