Development and Neighborhood Revitalization: The Effects of Residential Investment on Property Values in Durham, NC

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Abstract

Proponents of urban revitalization assert that neighborhood redevelopment is a win-win proposition for all stakeholders involved, as development creates positive externalities which resonate beyond the scope of each project. Property values for neighborhood residents improve, the local government enjoys the budget boost of a higher tax base, and developers collect well earned profits. This frequently studied and accepted line of thinking supports the use of measures such as tax increment financing, subsidized development, and lighter zoning standards in communities across America. This study examines the view that residential development creates positive externalities through the study of taxable values in the neighborhood surrounding Durham, North Carolina's Lyon Park. In 2008 a sustained neighborhood revitalization effort led by Self Help, a local non-profit, coincided with a county wide tax reassessment, providing a unique ability to quantify the effects of redevelopment on property values in Lyon Park. The results find no evidence of positive development externalities reflected in improved real estate values for surrounding properties, challenging many of the arguments used to champion urban revitalization initiatives.

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I. Introduction

Individuals promoting urban revitalization often claim that new residential development has spillover effects improving property values in surrounding areas. Those employing this line of thinking hold that benefits from construction starts or renovations do not accrue solely to developers and landlords. Instead, they believe that externalities resonate to surrounding properties and neighborhoods, improving land and building values for homeowners while increasing the tax base for municipal governments. If this is the case, municipal governments should enact policies and procedures creating incentives for new residential development in blighted areas. According to the theory of spillover effects, promoting development simultaneously raises the tax base for the local government while improving the financial and aesthetic well being of its citizens.

Recent changes in the way municipal governments view, promote, and finance urban revitalization efforts makes the question of positive residential investment externalities an important one for many of America's aging cities. Perhaps the best example of the need to accurately measure externalities in support of local policy is the growing use of Tax Increment Financing (TIF). Tax Increment Financing is a mechanism through which municipalities issue bonds against a predicted future growth in the tax base, or "tax increment," to fund current physical improvements. In theory, the positive externalities of a project should create a tax increment that covers the debt cost, making the redevelopment at worst economically neutral for a municipality while contributing to the revitalization of neighborhoods or infrastructure. Without an accurate estimate of the tax increment arising from a development or redevelopment, municipalities run the risk of issuing debt not serviced by the future tax base increase, which places a burden on future budgets and the programs they support. Other development-minded policies face similar measurement challenges and would benefit greatly from an understanding of the relationship between neighborhood development and property values.

Academics are responding to urban planner and policy maker interest in the effects of development through renovation, rehabilitation, and new construction with a number of empirical studies using hedonic price approaches to estimate property values. While academics seem to widely accept that residential investment creates positive effects for nearby property values (Simon et al., 1998) and approach the question of measuring these externalities from this perspective, their findings often demonstrate less definitive results. This paper seeks to assess and clarify the view that residential development raises values in surrounding properties through the study of the taxable values in the

neighborhood surrounding Durham, North Carolina's Lyon Park.

The median income and property value profile of Durham, the metropolitan area of Durham County, compares favorably to national figures. According to the Durham Chamber of Commerce, the median household income for Durham is $47,186 while citizens claim a per capita income of $26,188. The US Census Bureau published a national median income of $50,303 and per capita income of $26,964 for 2008, placing Durham's median and per capita incomes within 6.2% and 2.8% of the national average, respectively. More relevant to this study, Durham single family home values are representative of the median national home price. The National Association of Realtors (NAR) estimates the median average home price in the United States at $173,200 for 2009. By the same calculation, the NAR estimates the median value of a single family home in Durham at $176,900, within 2.1% of the national median value. These figures suggest that while the findings of this study are specific to Durham and its Lyon Park neighborhood, the city may serve as an accurate model of other communities.

It is important to empirically understand development externalities for neighborhoods so local governments can determine the best tools to foster urban growth and revitalization. The existence of positive externalities suggests the use of tax increment financing, subsidies or tax breaks for developers, and the loosening of zoning and permitting standards. On the other hand, if the benefits of development accrue largely to developers and landlords, municipalities may want to consider policies requiring those receiving financial support to make positive contributions to surrounding neighborhoods and properties. Several empirical studies have questioned whether small scale development increases values for nearby properties significantly enough to offset losses caused by the increase in housing supply. Recently, the nonprofit development lender Self Help has undertaken several projects on Kent Street in Durham. The scope of these projects, when combined with a county wide property revaluation in January 2008, makes the area ideal for a study of the effects of new residential investment. Through analysis of the Self Help Community Partnership developments on Kent Street and the use of hedonic price regression methods, I hope to determine the effect of development on the community and contribute towards a more complete understanding of the spillover effects of residential investment on surrounding property values.

II. A Review of Previous Literature

The prevalence of hedonic price models studying the effects of residential development has grown steadily over the past thirty years, reflecting increasing interest in the issue as well as a lack of consensus concerning results. Hedonic

price models estimate price based on both internal and external characteristics of a good and are useful in studying real estate as external factors like location can be significant drivers of home value. Relevant papers seek to understand and quantify public housing projects' ability to remove local diseconomies and increase neighborhood values (DeSalvo 1974), the differences between residential investment and new construction in small geographic areas of one to two city blocks (Simons et al., 1998), the effect of investment size on value increases and the geographical limitations of positive externalities (Ding et al., 2000), and the benefits of establishing tax increment financing (TIF) districts on nearby housing price appreciation (Weber et al., 2006). These works advance the understanding of the relationship between development investment and nearby residential property values. However, none provides a definitive understanding of the magnitude or limitations of development externalities.

DeSalvo (1974) studies the effect of New York City housing projects on yearly property value increases for neighborhoods throughout the city. Citing a belief that "housing projects upgrade the neighborhoods in which they are built" and a resulting push for publicly subsidized housing projects, he hopes to correctly measure improvements for surrounding properties. DeSalvo argues for the inclusion of indirect benefits alongside direct benefits for the development parcel when justifying the economics of a project. While DeSalvo's study was conducted in 1974, the questions posed by his paper, research methods, and characteristics of property markets and the drivers of value have not changed significantly.

DeSalvo (1974) believes that neighborhood upgrading and subsequent property value increases are a direct result of residential investment removing the "external diseconomies" of existing structures. To test this hypothesis, he takes a sample of 50 New York City housing project neighborhoods of several income levels and compares yearly valuation increases using each neighborhood's city borough as the control group. DeSalvo defines "neighborhood" in narrow geographic terms, believing the inclusion of large areas underestimates neighborhood effects and endangers the validity of results. The dependent variable for the regression is the percentage change in property values before announcement and after completion of each project.

The regression results support the idea that residential investment increases neighborhood property values. Residential values within the study group increase 9.39% per year while values in the control group increase by only 4.64% annually (DeSalvo 1974). By using dummy variables for market rent as a proxy for neighborhood income levels, DeSalvo also finds that value increases are greatest in "middle-income neighborhoods". DeSalvo's arguments concerning the appropriate size of a sampled "neighborhood" were

particularly influential in creating the methodology for this study. While his findings suggest benefits of residential investment, he does not develop an understanding of spatial effects, the removal of diseconomies, or the creation of positive externalities.

Simons et al. (1998) view the effect of development in "transition neighborhoods" as a central concern for city appraisers as well as construction and mortgage loan underwriters. To quantify the effects of neighborhood life cycles on property values, they seek to develop a model for understanding both neighborhood upgrading and structural decline within the city of Cleveland. Citing a consensus within economic literature that residential investment is most effective when concentrated within a city block, the authors focus their study on the effect of new development within one to two city blocks. The authors select variables that a priori are endogenous to negate the possibility of existing favorable neighborhood aspects determining the levels of new construction starts and investment.

Simons et al. (1998) view hedonic price coefficients as "shadow prices that reflect streams of returns from given attributes of the house" and seek to identify a return stream associated with nearby residential investment (Simons et al., 1998, 149). For the sake of thoroughness, the authors include detailed vectors of tract, structural unit, lot, sales, and new construction characteristics for each neighborhood.

Using a data set of over 12,000 homes in the Cleveland area and recent sales price as the dependent variable, the authors identify several statistically significant variables. The number of new construction starts and value of rehabilitation investment within one to two city blocks are both significant, but provide different coefficient signs. The authors find that each unit of new construction increases a nearby home's sale price by nearly $700, supporting the theory of positive externalities from residential investment. However, the regression coefficient for rehabilitation investment is strongly negative, challenging this interpretation. Simons et al. (1998) argue that in order to create a net gain, investments must be substantial to ensure that the positive externalities outweigh the negative effects of additional competitive supply. Moreover, Simons et al. assert that municipalities should focus residential investment on areas demonstrating rising demand to insure positive results.

Ding et al. (2000) explore the effects of residential investment size on the magnitude and geographic reach of property value increases within neighborhoods. Citing former empirical studies, the authors assume that "new construction and rehabilitation have a positive effect on nearby property values" (Ding et al., 2000, 24). Overall neighborhood values, the size of investment, and the spatial dispersion of development can reduce and hide these effects. To

understand the relationship between investment distance or size and positive externalities, the authors study a sample of nearly 8,000 homes in the greater Cleveland area. They create an extensive hedonic price model including nearly 100 endogenous and exogenous characteristics affecting a property's value, including the presence of new construction and investment in housing rehabilitation.

The authors use dummy variables to denote distance from both new development and renovation by creating "rings" of 100, 300, and 500+ feet (Ding et al., 2000). The regression results "overwhelmingly support the notion that residential investments increase nearby property values," but also suggest that these effects dissipate quickly over a short geographic area. Rehabilitation effects do not create significant increases in property values for homes further than 150 feet from the investment. New construction creates benefits for homes up to 300 feet before dissipating, but spillover effects are far less substantial outside of the initial 150 foot zone (Ding et al., 2000, 33). The coefficients used to determine the effect of investment size on surrounding property values yield significant and interesting results. Ding et al. determine that the marginal effect of new construction does not increase with size while the marginal effect of rehabilitation is highly correlated with size.

The authors implore policy makers to encourage new construction rather than supporting or subsidizing renovation and rehabilitation. They argue that concentrating their efforts on substantial and concentrated projects maximizes positive externalities from residential investment. Ding et al. (2000) believes that residential investment is optimal when city planning locates investment sites approximately 150 feet from one another, or right at the edge of the first "ring." Their interpretation of the results suggests heavy limitations on the geographic reach of development effects.

The use of a Tax Increment Financing (TIF) by municipal governments has resulted in both praise and controversy concerning residential price appreciation due to development. TIF is a useful tool for promoting development and neighborhood revitalization while maximizing a local government's limited resources. Weber et al. (2007) study the spillover effects caused by the creation of TIF districts in the Chicago area. Municipalities issue bonds for reinvestment in TIF districts based on the incremental increase in property taxes expected to accrue to the municipality upon completion of a development project. While most TIF districts focus on areas tagged for industrial or commercial redevelopment, the resulting elimination of blight within these areas is considered likely to increase property value appreciation for nearby residential areas. This benefits landowners, but rising values can negatively affect local renters. The authors seek to quantify the effect of establishing TIF

districts to determine the proper role for increment financing.

Weber et al. (2007) attribute the majority of property value appreciation to demand increases created by a growing amenity base. The authors use a hedonic price model, regressing characteristics of the TIF district, structural characteristics of the home, neighborhood characteristics, and initial value on the dependent variable last observed sale price. To confirm the results for distance from the TIF district, the model uses both interval measures of distance as well as a dummy variable for rings of .5 miles from each district. Regressions use three sample sets ranging from 990 to 5852 homes, with the smaller samples increasingly eliminating houses with structural characteristics deviating from the average (Weber et al., 2007). Results are mixed and suggest that price appreciation for surrounding residential properties is heavily dependent on the type of development. Mixed-Use developments generate price appreciation, proximity to industrial TIF districts reduces home price appreciation, and proximity to commercial districts had little or no measurable effect on price appreciation (Weber et al., 2007).

Weber et al. (2007) conclude that being near a TIF district has a significant impact on the appreciation of nearby residential units. Due to a high level of variance between the type of TIF district created, policy makers and concerned citizens should avoid uniform criticism or praise of TIF. The authors do not find evidence that spillover effects from TIF districts are a leading cause of housing price appreciation and argue that the magnitude of their effects are relatively small.

III. Background and Data Collection

This paper studies properties to the west of Lyon Park in Durham, NC to assess the effects of Kent Street residential investment on property values in surrounding neighborhoods. The data set contains 203 properties within the 12 block area bordered by Rosedale Avenue on the west, Fairview Street on the east, W Lakewood Ave to the south, and Morehead Ave to the north. I collected data for this analysis from real property tax information catalogued by the Durham County Government Tax Administration. The tax administration maintains detailed information concerning building and land characteristics as well as taxable property values for each land plot within the study area. The existence of detailed property data provides reliable estimates for several variables.

North Carolina State law requires all counties to revalue property every eight years to determine the effects of changing market conditions, structural alterations, and depreciation. This process redistributes the tax burden from less desirable to high demand properties and allows Durham County to collect

the appropriate tax revenues given current market valuations. Durham completed this process in January of 2008 and conducted the previous round of appraisals in January of 2001. Up-to-date appraisals realize the effect of conditions accruing during this seven year period. As a result, taxable property values do not reflect the effects of recent development until January 2008. The infrequency of these adjustments creates significant changes in taxable property values between 2007 and 2008, allowing for convenient study of the effect of development on property values. Since values realize all new conditions between year end 2007 and January 2008, the percentage change in taxable property values between these two periods is an ideal dependent variable measuring the externalities arising from new development. A property's 2008 taxable value also serves as a dependent variable within the hedonic price model for assessing the effect of the independent variables on the current value of the unit. Values for 2008 Land Value, 2008 Building Value, and 2007 Taxable Value are included in the data set.

The Durham County Government Tax Administration's records provide reliable estimates for a number of independent variables concerning each property within the study area. In order to set up a hedonic price model, several measures denote internal characteristics of individual properties. This includes a binary variable for the current existence of a structure. Additional independent variables denoting endogenous characteristics include building age, size, number of bedrooms, number of bathrooms, and land acreage. Most importantly, several variables measure the effect of distance from development on both the current and percentage change in assessed value. The first is a dummy variable indicating whether a property is located within 1 block of development. This captures spillover effects in the event that their geographic reach is highly limited. The second is a measure of distance from development providing a more specific measure of positive externalities. In the absence of accurate distance measurement, distance is calculated as the difference in address number between developed and undeveloped plots. As an example, 1004 Kent Street has a distance value of 16 from the nearest development at 1020 Kent Street. Added values account for the distance between addresses on neighboring streets. In an attempt to make these values proportionate to the actual distance between each neighboring street, I create several iterations of the variable. In the first iteration, addresses one street from Kent receive an additional distance value of 10 while addresses more than one street from Kent receive an additional distance value of 20. As an example, 1021 Cornell Street has distance value of 11 from the closest development at 1020 Kent Street since it is one street parallel to Kent. The methodology section of this paper describes additional measurement concerns in detail.

Creating variables measuring the effect of distance from development on property values allows for the assessment of the development externality hypothesis. If development increases the value of surrounding properties, I expect to find a significantly positive value for the coefficient denoting location within one block of development. Conversely, if these effects resonate beyond the development block, the coefficient for the effect of distance from development on value should be negative as well as numerically and statistically significant. There is no need for inclusion of independent variables measuring community attributes since the same external characteristics affect all houses within the neighborhood. Hedonic models encompassing larger areas would include variables accounting for differences in amenities, externalities, and costs related to location.

IV. Data Restrictions

While Durham County's tax records provide many benefits to data collection and accuracy, there are several restrictions to the availability of information. Property tax records only include current building information and calculate taxable values based on existing and completed structures. As a result, the county does not record land values for incomplete buildings. This significantly undervalues developments currently underway, taxing several projects at levels well below what similar projects are worth upon completion. Second, the county collects square footage, bedroom, and bathroom information only for residential dwellings. As a result, several churches and commercial properties with high property values record no values in these three areas. High valuations for buildings demonstrating undesirable residential characteristics reduce the accuracy of coefficients for these variables. The following section addresses several examples of these outliers. Finally, tax information does not provide data on independent variables linked to external environmental factors. This project, focused only on properties affected by nearly identical external factors, does not require these data. However, studying the effects of development on any larger scale necessitates the inclusion of variables accounting for external factors affecting property values. This paper does not study the effects of exogenous economic variables with important implications for the change in property values during the seven year period between 2001 and 2008. Population and income growth as well as rising demand are likely to have profound effects on property values. This paper focuses only on endogenous characteristics within the Lyon Park area affecting both current assessed value and the percentage change in value.

V. Methodology

This project seeks to create hedonic price models assessing the effect of plot characteristics on both a property's assessed value in 2008 as well as the percentage change in value between 2007 and 2008. In doing so, I hope to determine if residential investment on Kent Street significantly improves the value of nearby plots in Durham's Lyon Park Neighborhood. Hedonic price models attempt to capture both internal and external characteristics affecting the price of an asset, in this case the current value and percentage change in value of a property. However, the study area for this project encompasses a small geographic neighborhood in which external characteristics affecting price are homogenous across property plots. As a result, the effects of exogenous characteristics on taxable values are ubiquitous, making the inclusion of these variables in the regression model unnecessary for the purpose of understanding development spillover effects. The two equations used for linear multiple regression in this study include only endogenous traits of properties in the Lyon Park neighborhood.

The data collected through the Durham County Government Tax Administration provides reliable estimates for a number of endogenous variables contributing to current property values and the percentage change between revaluations in the 12 block study area. Analysis of available data yields the following equation assessing the effect of the independent variables on 2008 value:

$$(Y_{2008} - Y_{2007}) / Y_{2007} = B_e x_e + B_v x_v + B_a x_a + B_s x_s + B_r x_r + B_f x_f + \alpha + \varepsilon \quad (1)$$

Where: x_e = existence of a building (dummy); x_v = distance from development; x_a = building age (yrs); x_s = building area (sf); x_r = bedrooms; x_f = bathrooms; x_c = land acreage

The coefficients within this equation represent the percentage effect of a unit change in each independent variable on the overall change in the property's value between 2007 and 2008. The incremental change between these two periods includes all "shadow price streams" accruing to a property over a seven year period. The results of this hedonic price model help determine the magnitude of the spillover effects caused by residential investment.

In the above equations, the binary variable xe represents whether a property contains an existing building, The presence of the characteristic results in a value of 1 for the variable, and a 0 otherwise. The remaining variables represent distance from development (x_v), building age measured in years (x_a),

building area measured in square feet (x_s), number of bedrooms (x_r), number of bathrooms (x_f), and land acreage (x_c), respectively. These variables can take on any integer value, depending on the characteristics of each property. I initially intended to include a binary variable denoting the existence of development on a property. However, since this project seeks only to determine whether development affects surrounding properties, the inclusion of this variable is unnecessary and necessitates the inclusion of data points that are outliers in many cases. A constant α and error term ε are also included.

Variable x_v, distance from development, is not easily determined for each plot. I use two different measures for this variable to capture the effects of development spillovers. The first is a dummy variable denoting whether a property is on the same block as a new development. Houses within this zone receive values of one while all other houses take on a value of zero. The creation of an accurate integral measure of distance is difficult. Short of individually measuring the distance between each property and the nearest development, there is no reliable measure of precise value for the distance variable. It is also necessary to account for the increase in distance between addresses located on the same numbered block on different streets. The property 1021 Cornell Street is clearly further from Kent developments then 1021 Kent Street. A review of the data provides no clear indication of a realistically proportionate value for the distance between parallel and perpendicular streets. To account for this ambiguity, there are several iterations of this variable within my regression analysis. In the first, I add the value 10 to the calculated distance from development for addresses on Cornell and Moreland, located next to Kent. The parallel streets Rosedale and Fairview, two blocks parallel to Kent, receive additional distance values of 20. Addresses on the perpendicular streets W Lakewood and Morehead receive additional values according to the location of their numbered block. Addresses located within one block of Kent Street receive additional values of 10 while those located more than one block from Kent receive values of 20. The second iteration doubles each value, using 20 for addresses one block from Kent and 40 for those further away. The final iteration uses values of 40 and 80, respectively. This paper will note the method of measurement and iteration used for each regression within the results section.

To properly assess the effect of each endogenous characteristic, not every variable in the above equation is included in every regression analysis. Regressions are run in a piecewise manner. The presentation of results demonstrates which variables are run against the dependent variables, 2008 value and the percentage change in value. The Self Help developments are significant outliers within the data set and are unnecessary for determining the effect of residential investment spillover effects. As such, they are removed from the data

set. As noted above, there is subsequently no use for an existence of development variable in the regression equations. Church owned buildings and land, commercial properties, and significantly negative outliers resulting from recent demolition are also subject to exclusion. Elimination of these data points reduces the overall number of observations from 203 to 178.

The variable x_v is the measure of development spillover effects within this study. I use hedonic regression techniques to study the effect of the independent variables described above on the 2008 assessed value of each home as well as the change in taxable property value between 2007 and 2008. These methods provide a measure of the effect of new development on property values and the dissipation of these effects throughout the surrounding area.

VI. Results

My initial regression uses the 2008 property value dependent variable to measure the effects of each independent variable on current valuations within the Lyon Park neighborhood. The initial (10, 20) iteration of distance from development provides a reasonable starting point for understanding the effects of residential investment on property values. Regressing the seven independent variables listed above on the natural log of 2008 taxable property value for the 178 properties in the Lyon Park neighborhood yields the following equation:

$$\ln(Y_{2008}) = 1.275x_e + .004x_v + -.0058x_a + .0004x_s + .062x_r + -.0523x_f + .782x_c + 9.400 + .253 \qquad (2)$$

Where: x_e = existence of a building (dummy); x_v = distance from development; x_a = building age (yrs); x_s = building area (sf); x_r = bedrooms; x_f = bathrooms; x_c = land acreage

The equation is significant at the 5% level with an r-squared value of .837. This suggests that the independent variables chosen explain a significant percentage of a property's assessed value in 2008. Each variable except the number of bathrooms (x_f) has a P value large enough to disprove random chance and is significant at the 5% level. The variable needed to measure the result of development on neighborhood property values is significant. Below are the results as well as a scatter plot of each address' distance from development and 2008 taxable value.

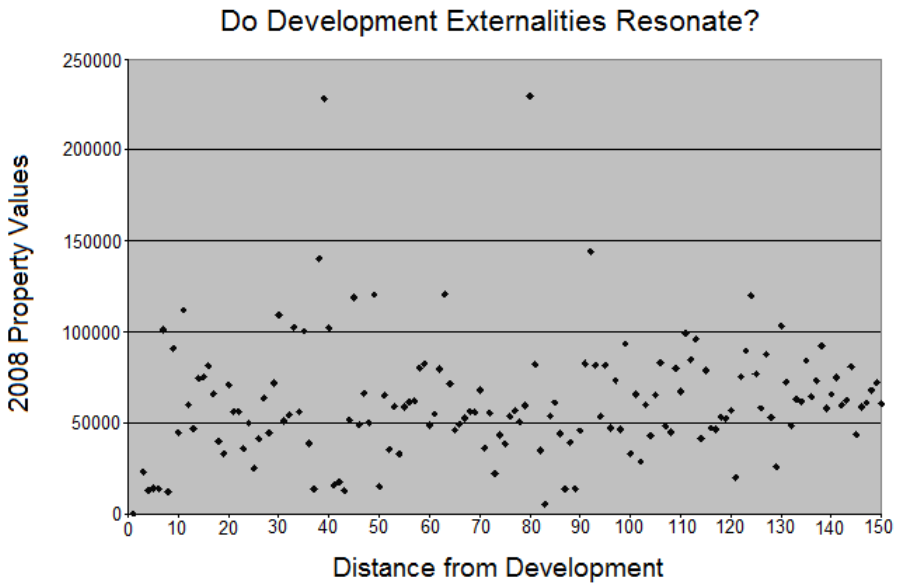
Figure 1: Linear Multiple Regression of Endogenous Property Attributes to Taxable Property Value in January 2008.

Source	SS	df	MS
Model	56.1315178	7	8.01878826
Residual	10.9035768	170	.064138687
Total	67.0350946	177	.378729348

Number of obs =	178
F(7, 170) =	125.02
Prob > F =	0.0000
R-squared =	0.8373
Adj R-squared =	0.8306
Root MSE =	.25326

ln2008value	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
distanc~1020	.004122	.0009245	4.46	0.000	.0022971	.005947
building	1.275289	.1402305	9.09	0.000	.9984715	1.552106
buidlingag~s	-.0058577	.0009574	-6.12	0.000	-.0077476	-.0039678
heatedareasf	.0004171	.0000453	9.20	0.000	.0003277	.0005066
bedrooms	.0620694	.0237391	2.61	0.010	.015208	.1089308
bathrooms	-.0523665	.0314004	-1.67	0.097	-.1143515	.0096184
acres	.7852828	.1754113	4.48	0.000	.4390178	1.131548
_cons	9.400502	.0662788	141.83	0.000	9.269667	9.531338

Figure 2: Plot of Address Distance from Development and 2008 Taxable Value



The regression equation yields several predictable results as well as a surprising finding concerning the spillover effects of new development. As expected, the structural and plot characteristics of a house contribute significantly to the value of residential real estate. Existence of a building (x_e), build-

ing age measured in years (x_a), building area measured in square feet (x_s), number of bedrooms (x_r), and land acreage (x_c) are all significant at the 5% level. Building age, a negative structural characteristic due to depreciation and aesthetic concerns, is the only variable with a negative coefficient. Each additional year reduces the value of a property by .58%, so a $100,000 property loses $580 each year as the building grows older. Each additional bedroom within a house is attributable to a 6.2% increase in property value while an increase in lot size of one acre improves the property value by over 78%. An additional square foot of building space creates a negligible gain in property value, but this gain is significant as the size of the structure increases. Adding 1,000 square feet to a structure results in a value increase of over 40%. The presence of a structure on a property significantly boosts property value, contributing to gains of nearly 128%.

The independent variable for distance from development tests the hypothesis that new development increases the values of surrounding properties. If the hypothesis is correct, we would expect to find a significantly large negative coefficient for distance from development, indicating that properties close to new developments receive a boost in taxable value. However, the independent variable for distance from development (x_v) returned a positive coefficient of .004. This finding suggests that each address further from development improves a property's 2008 value by .4 percent. According to this finding, new development creates negative effects on surrounding property values, disconfirming the hypothesis that development benefits accrue to neighborhood individuals and municipal governments. However, the flexible way in which distance from development is measured in the regression necessitates testing additional methods of measurement. The iterations of the distance from development variable as well as the binary variable denoting whether a property is located within one block of development described above serve this function.

Due to the way in which the first iteration accounts for distances of properties off of Kent Street, it is possible the variable does not properly reflect the real distance from development for addresses on neighboring streets. In order to determine whether the coefficient returned in the equation is accurate or the result of a measurement error, I test several other iterations of the distance from development measurement. The second iteration doubles each value in the first, using 20 for addresses one block from Kent and 40 for those further away. As shown in exhibit A1 of the appendix, this measurement returns a significant positive coefficient, but one that is smaller in magnitude than the first iteration. This suggests that a measurement error may contribute to the result of the initial regression. To test this theory I extend the analysis to the third iteration of the distance from development variable, one using values of 40 and

80 for neighboring streets. Further increasing the effect of distance from Kent makes the magnitude of the positive coefficient negligible, as shown in exhibit A2 of the appendix. Note that these changes in measurement have little effect on the coefficients returned for the other independent variables. Altering the scale of distance from development reduces but does not eliminate the apparent negative externalities of residential investment.

To confirm these findings, I test the regression analysis using the dummy variable denoting whether a property is located within one block of a recent development. If nearby investment in fact harms the 2008 taxable value of a property, the coefficient of this variable will be significantly negative. The regression included in exhibit A3 of the appendix does not significantly alter the coefficients of the other independent variables and does not return a statistically significant coefficient for the dummy variable. Note that while the variable is not significant at the 5% level, the coefficient returned is highly negative. From the results of my analysis, it appears that recent developments on Kent Street negatively affect the current value of surrounding properties. I address the possible explanations for these surprising results later in this section.

As previously discussed, Durham County's methods for revaluing properties provide an advantage in studying the topic of spillover effects of residential investment. The reassessment of appraisals every seven years means the change in taxable value between the years on either side of a revaluation includes the effect of any new construction or rehabilitation completed during the period. While the above analysis suggests that proximity to investment creates negative externalities on the current price of homes, it is possible that distance from investment positively effects the percentage change in property values over the seven year period. I test this hypothesis by studying the effect of the seven independent variables from the previous study on the percentage change in taxable value between 2008 and 2007. Again, the initial (10, 20) iteration for distance from development serves as a logical starting point for studying these effects. Regressing the seven independent variables on the percentage change in value yields the following equation:

$$(Y_{2008} - Y_{2007}) / Y_{2007} = \beta_e x_e + \beta_v x_v + \beta_a x_a + \beta_s x_s + \beta_r x_r + \beta_f x_f + \beta_c x_c + \alpha + \varepsilon \quad (3)$$

Where: x_e = existence of a building (dummy); x_v = distance from development; x_a = building age (yrs); x_s = building area (sf); x_r = bedrooms; x_f = bathrooms; x_c = land acreage

The equation is significant at the 5% level and has an r-squared value of .204.

This suggests that the independent variables explain only a partial amount of the change in taxable value. In addition, only three variables possess high enough P-values to discount the possibility of random chance. The number of bathrooms (X_f) and acres (X_c) are both significant, as is distance from development (X_v). A unit increase in acreage again creates a large change in the dependent variable. An additional acre is attributable to a 62% increase in value between 2001 and 2008. Though not significant in previous regressions, the number of bathrooms has a high P-value in this study. Each additional bathroom within a residence contributes a reduction in value of 8.7% during the period. Upon consideration, it is logical that the majority of the variables prove insignificant in this instance. Structural characteristics for homes not experiencing residential investment during the period are likely included in the 2001 assessed value. It is possible the significance of acreage and number of bathrooms is the result of changing consumer preferences for these two variables. The significance of the distance from development variable in this study makes it useful in advancing our understanding of the effects of development in the Lyon Park area. The regression results are below.

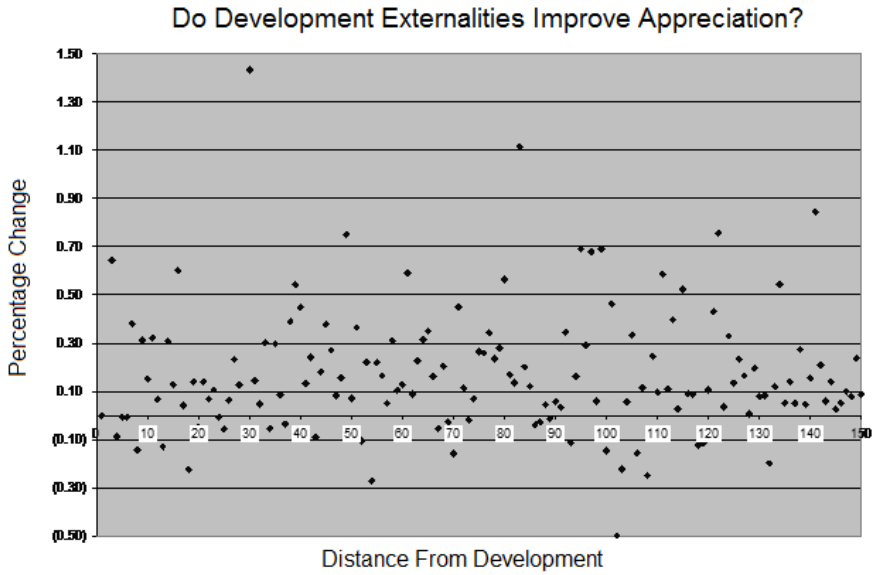
Figure 3: Linear Multiple Regression of Endogenous Property Attributes to Percentage Change in Taxable Property Value Between 2007 and 2008.

Source	SS	df	MS
Model	2.60034965	7	.371478522
Residual	10.1474689	170	.059690993
Total	12.7478185	177	.072021574

Number of obs =	178
F(7, 170) =	6.22
Prob > F =	0.0000
R-squared =	0.2040
Adj R-squared =	0.1712
Root MSE =	.24432

percentage~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
distanc~1020	.0025378	.0008919	2.85	0.005	.0007773	.0042984
building	-.0380431	.135281	-0.28	0.779	-.3050902	.2290039
buidlingag~s	.0009174	.0009236	0.99	0.322	-.0009058	.0027406
heatedareasf	.0000379	.0000437	0.87	0.387	-.0000484	.0001242
bedrooms	.0205393	.0229012	0.90	0.371	-.0246681	.0657466
bathrooms	-.0875212	.0302921	-2.89	0.004	-.1473184	-.027724
acres	.6209691	.1692201	3.67	0.000	.2869257	.9550125
_cons	.0311755	.0639395	0.49	0.626	-.0950421	.1573931

Figure 4: Plot of Address Distance from Development and the Percentage Change Between 2008 and 2007 Taxable Value



The coefficient for the distance from development variable is .0025, suggesting the existence of development diseconomies over the seven year period. The further a residence is from recent residential investment, the greater the change in its value after the reassessment in 2008. These findings coincide greatly with those of the previous study, reinforcing the notion that proximity to the Self Help developments reduces the financial well-being of nearby landowners. To check for the possibility that measurement errors for the distance variable skew the results, I repeat the regression using the second and third iterations as well as the one block dummy variable. Use of the second (20, 40) iteration reduces the magnitude of the coefficient but does not change its sign as detailed in exhibit A4. Application of the third (40, 80) iteration or replacement of the distance variable with the binary variable both yield regressions in which the coefficients are not significant at the 5% level (exhibit A5, exhibit A6). Note that once again alteration of the distance variable does not greatly alter the coefficients of the other six independent variables. It appears that Lyon Park homes near recent residential investment experience negative externalities affecting changes in valuation.

VII. Conclusion: The Bottom Line for Policy Makers and Urban Planners

This paper seeks to identify and understand the positive spillover effects accruing to properties located near the Self Help developments on Durham's Kent Street. The two studies described above produce results calling into question the nature of these effects. The regression equations for both current valuation and the percentage change in valuation over the last seven years suggest that residential investment within the neighborhood creates negative externalities for neighboring properties. There are several possible explanations for these surprising results. The most likely reason for negative effects on values of homes near development is described in detail within the review of current literature. Increasing the housing stock in an area not experiencing rising demand can lower prices in the neighborhood. If the scale of new investment is not large enough to create significant positive externalities, this price suppression effect trumps the positive spillovers resulting from development. The scattered nature of the Self Help projects lacking significant differentiation from current supply may create this effect near Lyon Park.

A second explanation concerns the desirability of older housing stock. New construction or renovation increases the aesthetic value of a structure. This may decrease the likelihood that nearby undeveloped homes are perceived favorably or call into contrast structural flaws. As a result, both consumers and appraisers lower their value assessments of older homes. There are also some possible methodological issues which may skew the regression results. While the 12 block area is relatively small and homogenous, it is possible that some areas of the neighborhood are more desirable than others. If these areas happen to be further from the Kent Street projects, development will appear to have negative effects. There are a number of amenities and diseconomies with the possibility of altering consumer preferences. The inclusion of variables accounting for external factors may reduce errors concerning the effect of development on values.

The results of this regression analysis do not support the hypothesis that new development has benefits for surrounding property owners or municipalities through improvement of neighborhood property values. On the contrary, the Kent Street developments appear to create diseconomies for nearby homes. If negative development effects reduce surrounding property values by more than the gains of individual properties, policies promoting development reduce a municipality's tax base. The topic requires further study of a variety of neighborhoods, developments, and cities to reach a definitive conclusion concerning the effects of new construction and renovation. Academics and city

officials alike should seek to clarify these effects in order to create effective policies supporting urban revitalization and economic growth.

The data set for this study was culled from one neighborhood in Durham, NC. As a result, there are limitations on how one can extrapolate the findings for other locations and policy decisions. However, the demographic and home value profile of Durham is highly representative of national averages, improving the data set's relevance to other locations. The methodology of this paper builds upon previous literature on the topic, seeking to create a framework for accurately measuring the externalities arising from neighborhood redevelopment. DeSalvo (1974) measured the magnitude of removing "diseconomies" on neighborhood values without measuring the effect of distance on an individual property, a key goal of this paper. By focusing only on new single family construction within established neighborhoods, this paper addresses the questions of rehabilitation versus new construction and project size raised by Simons et al. (1998) and Ding et al. (2000) respectively. The methodological framework of this paper is scalable and can be applied to any neighborhood undergoing redevelopment once property values have been re-assessed for tax purposes.

A greater understanding of the variables contributing to home valuation has gained new importance in the wake of the "Great Recession" of 2007-2009. As one of the earliest bellwethers of and contributors to the economic collapse of the past several years, the housing market has become a focal point of fiscal, academic and public policy debate. The rapid devaluation of homes across America has called some of the fundamental assumptions concerning real estate markets into question. Reductions in GDP coincide with shrinking tax bases, adversely effecting budgets at the federal, state, and local level. As a result of these forces, municipalities now face difficult choices concerning the allocation of limited tax dollars and increased uncertainty regarding the social and economic returns of neighborhood redevelopment. The study of residential investment has applications not just at the municipal level, but also for lenders, issuers and owners of mortgage backed securities, and federal institutions such as Fannie Mae and Freddie Mac. This paper seeks to encourage dialogue concerning home values, the positive externalities arising from development, and the value of hedonic price models.

Development increases property values within the site of new construction or renovation and can improve the aesthetics and character of urban neighborhoods. However, this project does not find evidence that these positive effects are reflected in increases of surrounding property values within Durham's Lyon Park neighborhood. Further study outside of the small geographic area near Lyon Park and uniform low-income Self Help developments

is needed to clarify the magnitude of financial externalities resulting from development. Until the nature of property value effects are determined, municipal governments should be wary of policies and legislation intended to support development through tax breaks or financial incentives for developers. Officials intend for these policies to grow the property tax base while promoting the economic well being of a city's citizens. However, the financial gains of these policies and resulting development activities may be limited, allocated elsewhere, or misunderstood. Additionally, the results of this study raise new questions concerning the optimal size and spacing of investment discussed in previous works. City officials must understand how best to deploy their limited resources to subsidize and encourage projects creating the largest and most diffusive economic gains. If further study confirms the results of this hedonic price regression, municipalities must seriously reconsider the structure of urban revitalization initiatives.

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Appendix

A1. Regression of Independent Variables to 2008 Taxable Value Using Second Iteration of Distance From Development

Source	SS	df	MS
Model	55.4080201	7	7.91543144
Residual	11.6270746	170	.068394556
Total	67.0350946	177	.378729348

Number of obs = 178
F(7, 170) = 115.73
Prob > F = 0.0000
R-squared = 0.8266
Adj R-squared = 0.8194
Root MSE = .26152

ln2008value	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
distanc~2040	.0017898	.0006303	2.84	0.005	.0005457	.003034
building	1.305031	.1447735	9.01	0.000	1.019246	1.590816
buidlingag~s	-.0063441	.0009774	-6.49	0.000	-.0082736	-.0044146
heatedareasf	.0004085	.0000467	8.74	0.000	.0003163	.0005007
bedrooms	.0588213	.0245698	2.39	0.018	.0103201	.1073225
bathrooms	-.0522713	.0324279	-1.61	0.109	-.1162845	.0117419
acres	.8970388	.1782617	5.03	0.000	.5451473	1.24893
_cons	9.412163	.0703532	133.78	0.000	9.273284	9.551041

A2. Regression of Independent Variables to 2008 Taxable Value Using Third Iteration of Distance

Source	SS	df	MS
Model	55.1265631	7	7.8752233
Residual	11.9085316	170	.070050186
Total	67.0350946	177	.378729348

Number of obs = 178
F(7, 170) = 112.42
Prob > F = 0.0000
R-squared = 0.8224
Adj R-squared = 0.8150
Root MSE = .26467

ln2008value	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
distanc~4080	.0008798	.0004481	1.96	0.051	-4.66e-06	.0017643
building	1.324048	.1463501	9.05	0.000	1.03515	1.612945
buidlingag~s	-.0065489	.000984	-6.66	0.000	-.0084913	-.0046065
heatedareasf	.0004055	.0000473	8.58	0.000	.0003122	.0004988
bedrooms	.0558796	.0248646	2.25	0.026	.0067964	.1049629
bathrooms	-.0525781	.032819	-1.60	0.111	-.1173634	.0122071
acres	.951045	.1786165	5.32	0.000	.5984531	1.303637
_cons	9.431177	.0716718	131.59	0.000	9.289696	9.572658

A3. Regression of Independent Variables to 2008 Taxable Value Using Dummy Variable for Distance from Development

Source	SS	df	MS
Model	54.8855659	7	7.84079513
Residual	12.1495287	170	.071467816
Total	67.0350946	177	.378729348

Number of obs	178
F(7, 170)	109.71
Prob > F	0.0000
R-squared	0.8188
Adj R-squared	0.8113
Root MSE	.26733

ln2008value	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
v12	-.0339628	.0532211	-0.64	0.524	-.1390222	.0710965
building	1.365541	.1469133	9.29	0.000	1.075532	1.655551
buidlingag~s	-.0068177	.0009881	-6.90	0.000	-.0087683	-.0048672
heatedareasf	.0004005	.0000479	8.35	0.000	.0003059	.0004952
bedrooms	.0494699	.024877	1.99	0.048	.0003622	.0985776
bathrooms	-.05338	.0331481	-1.61	0.109	-.1188149	.0120549
acres	1.010946	.1780306	5.68	0.000	.6595112	1.362382
_cons	9.491972	.0682954	138.98	0.000	9.357156	9.626789

A4. Regression of Independent Variables to the Percentage Change in Value Between 2007 and 2008 Using the Second Iteration for Distance

Source	SS	df	MS
Model	2.40670439	7	.343814913
Residual	10.3411141	170	.060830083
Total	12.7478185	177	.072021574

Number of obs	178
F(7, 170)	5.65
Prob > F	0.0000
R-squared	0.1888
Adj R-squared	0.1554
Root MSE	.24664

percentage~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
distanc~2040	.0012971	.0005944	2.18	0.030	.0001238	.0024704
building	-.0257286	.1365329	-0.19	0.851	-.2952469	.2437897
buidlingag~s	.0006657	.0009218	0.72	0.471	-.0011539	.0024854
heatedareasf	.0000331	.0000441	0.75	0.453	-.0000538	.0001201
bedrooms	.0196038	.0231713	0.85	0.399	-.0261367	.0653443
bathrooms	-.0873077	.0305821	-2.85	0.005	-.1476772	-.0269382
acres	.6755011	.168115	4.02	0.000	.3436393	1.007363
_cons	.0305317	.0663487	0.46	0.646	-.1004416	.1615051

A5. Regression of Independent Variables to the Percentage Change in Value Between 2007 and 2008 Using the Third Iteration for Distance

Source	SS	df	MS
Model	2.30515034	7	.329307191
Residual	10.4426682	170	.06142746
Total	12.7478185	177	.072021574

Number of obs	178
F(7, 170)	5.36
Prob > F	0.0000
R-squared	0.1808
Adj R-squared	0.1471
Root MSE	.24785

percentage~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
distanc~4080	.0007343	.0004196	1.75	0.082	-.000094	.0015625
buidlingag~s	.000543	.0009214	0.59	0.556	-.001276	.0023619
building	-.0159006	.1370471	-0.12	0.908	-.2864338	.2546327
heatedareasf	.0000312	.0000443	0.70	0.482	-.0000562	.0001186
bedrooms	.0182213	.0232841	0.78	0.435	-.0277419	.0641844
bathrooms	-.0874077	.0307328	-2.84	0.005	-.1480748	-.0267406
acres	.7061903	.1672623	4.22	0.000	.3760117	1.036369
_cons	.0385181	.0671158	0.57	0.567	-.0939696	.1710058

A6. Regression of Independent Variables to Percentage Change in Taxable Between 2007 and 2008 Value Using Dummy Variable for Distance from Development

Source	SS	df	MS
Model	2.13368149	7	.304811642
Residual	10.614137	170	.0624361
Total	12.7478185	177	.072021574

Number of obs	178
F(7, 170)	4.88
Prob > F	0.0000
R-squared	0.1674
Adj R-squared	0.1331
Root MSE	.24987

percentage~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
v12	-.0256909	.0497447	-0.52	0.606	-.1238878	.0725059
building	.0182983	.1373169	0.13	0.894	-.2527675	.289364
buidlingag~s	.0003214	.0009236	0.35	0.728	-.0015018	.0021445
heatedareasf	.0000273	.0000448	0.61	0.543	-.0000612	.0001158
bedrooms	.0128399	.0232521	0.55	0.582	-.0330601	.0587398
bathrooms	-.0881013	.0309828	-2.84	0.005	-.1492619	-.0269406
acres	.7575106	.1664015	4.55	0.000	.4290312	1.08599
_cons	.0886259	.0638343	1.39	0.167	-.0373841	.214636