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Zoning – Neighborhood Character and Historic Overlays in Lexington, KY

Abstract

Zoning has a significant impact on our built environment. Overlay zoning, an additional form of restrictive zoning, is a tool that municipalities utilize to control development and changes to neighborhoods. This study analyzes the impact that historic district (H-1) and neighborhood character (ND-1) overlays have on home sale prices in Lexington, KY. Results suggests that overlays have a significant positive impact on home values. Results also suggest that that overlays exhibit spatial impacts that extend further than the homes included in the overlay.

Keywords Zoning, Housing, Lexington, KY, Restrictive Zoning, Historic district, Housing prices,

Abstract

Zoning has a significant impact on our built environment. Overlay zoning, an additional form of restrictive zoning, is a tool that municipalities utilize to control development and changes to neighborhoods. This study analyzes the impact that historic district (H-1) and neighborhood character (ND-1) overlays have on home sale prices in Lexington, KY. Results suggests that overlays have a significant positive impact on home values. Results also suggest that that overlays exhibit spatial impacts that extend further than the homes included in the overlay.

Introduction

Zoning shapes our lived urban and suburban environments. Zoning is what allows a business district to develop, a shopping mall to form, and an apartment complex take shape. Because zoning shapes how our built environment develops it is not surprising that zoning is a tool that is utilized to prevent or restrict certain types of development. Zoning is inherently restrictive, but increasingly restrictive zoning, including increasingly prescriptive zoning is wielded as a tool of restriction. Overlay zoning, which is an overlay of additional zoning restrictions on top of preexisting zoning, is a more extreme example of restrictive zoning. Restrictive zoning is harmful to inter-metropolitan upward mobility and contributes significantly to neighborhood racial and income segregation. (Papke; 2009). Lexington-Fayette (the city of Lexington and Fayette County are consolidated) currently have two overlay zones that residential neighborhoods may petition for. The first type of overlay is the Neighborhood Design Character Overlay (ND-1). The ND-1 overlay was first implemented in 2004 by the Greenbrier Area.¹ The stated policy of the ND-1 overlay, is “to preserve, protect and conserve the beauty and heritage of the county; to improve the quality of its environment through identification, conservation and maintenance of neighborhoods, non-residential areas, or places that constitute or reflect distinctive features of the architectural or cultural traditions of the city.”² The second, the H-1 overlay was originally implemented in the mid-1950’s. H-1 overlays have a similar designated purpose as ND-1 overlays, but with H-1 overlays focusing more significantly on preserving “...visible reminders of the history and heritage of this country, state or nation.”³ Historically the phrase ‘neighborhood character’, which is referenced in both ordinances, is a coded phrase that has come to include people of color and individuals of lower socioeconomic stature. (Brooks and Rose, 2013).

Overlays in Lexington-Fayette serve as an excellent test case for the impact restrictive zoning has on sale prices. The overlays in Lexington-Fayette will also enable us to deconstruct the overlays impact on property sale price. What impact have the ND-1 and H-1 overlays had on home value, in single family homes that have been sold within the overlays. Importantly, this analysis seeks not only to analyze if the homes that are in overlays sell for a premium but to deconstruct the price premium or discount that overlays have on property prices. If overlays impact sale price what is their premium on price and are nearby homes impacted by overlay zoning?

Restrictive zoning is something that the United States has dealt with since the first zoning law was passed in Los Angeles in 1908.⁴ Zoning was enshrined as legally permissible by the United States Supreme Court Case of *Village of Euclid v. Ambler Realty Company (Euclid)*.⁵ This case served to boost and legitimize zoning ordinance law throughout the United States. Zoning has since been used as either a direct or indirect method to segregate or de facto segregate neighborhoods based on class and race.

¹ Lexington-Fayette Urban County, Kentucky Ordinance. §42-2004. (2004).

² ZONING ORDINANCE LEXINGTON-FAYETTE URBAN COUNTY, KENTUCKY, Neighborhood Design Character Overlay Zone, Article 29, 29-1(c), July 2012.

³ ZONING ORDINANCE LEXINGTON-FAYETTE URBAN COUNTY, KENTUCKY, Historic Preservation, Article 13, 13-1(c), May 2012.

⁴ <https://la.curbed.com/2012/3/19/10387248/for-better-then-worse-la-legalized-sprawl-in-1908>

⁵ 272 U.S. 365 (1926)

Residential segregation by race and class in the United States is one of the few areas that the federal government has relatively little control over, due to the legal permissibility of municipal zoning as enshrined in *Euclid*. Therefore, it is critically important that we understand the impacts that restrictive zoning has and if restrictive zoning has an impact on nearby properties as well. It is particularly pertinent in the context of increased housing costs and the impact that restrictive zoning has in keeping neighborhoods racially and classificatory segregated.

Literature Review

The justification for both overlay ordinances is a desire to keep the neighborhood character unaltered from its current composition. The purpose of zoning is to protect property owners from negative externalities that may arise from negative nearby spatial impacts. These negative impacts usually come in the form of incompatible land use, such as a large factory next to single family homes, as well as a large housing project next to high value single family homes. Though the latter situation is only viewed as undesirable for the high value single family home residents.⁶ While there is an extensive literature on zoning the literature has uncertain results regarding zoning and its impact on home values. This is partially a causality dilemma since most of our datasets about home value begin robust collection after zoning was widely implemented in the United States. Glaeser, Gyourko, and Saks (2005) see zoning as the most important driver in home price increases. Zoning and specifically restrictive zoning have a significant impact in shaping neighborhoods and controlling how a neighborhood develops.

Rolleston (1987) argues that zoning is a tool that is utilized at the local level simply beyond the legitimate limits of land-use planning and general welfare considerations. Land use is a tool that municipalities can use to restrict undesirable types of zoning. In addition, Rolleston (1987) and Adang (1964) argue that zoning is something that is not simply restricted to the municipality trying to increase its tax haul but can and is utilized for social considerations which are targeted to preserve the existing neighborhood's status quo.

A home's value is influenced by the surrounding land and its desirability. If you are concerned about the surrounding land somehow changing, then land-use restrictions (i.e. zoning) are an excellent source of stability. Speyrer (1989) finds that there are substantial premiums in home value when the home has a restrictive zoning overlay. The value premiums are potentially a result of the additional risk management that zoning restrictions give to properties protected by the additional restrictive zoning. But many recent studies argue that zoning restrictions give home buyers an entirely different signal. Zoning is a measure to protect property values and exclude undesirable elements. Zoning is inherently social. Zoning was originally developed as a method to exclude undesirable social and racial groups from neighborhoods. (Silver, 1997; Nelson, et al., 2004; Papke, 2009). The primary purpose of zoning was its use as an exclusionary tool. (Nelson, et al., 2004 and Papke, 2009). Restrictive single-family zoning is a tool that signals to other home buyers that a neighborhood's character will not change. More specifically restrictive zoning ensures that current and future home buyers can guarantee that their neighborhood will continue to be segregated by class and race. (Speyrer, 1989)

Overlay zoning first arose through a desire for preservation of areas of historic importance. (Leichenko, Coulson, and Listokin, 2001 and Zahirovic-Herbert and Chatterjee, 2012). Historic zoning protections were significantly encouraged by the passage and upholding of the National Historic Preservation Act in 1966. The purpose of historic zoning overlays is to protect historic neighborhoods, specifically from significant changes to existing structures and to prohibit the existing structures from being altered. Historic preservation is also designed to keep the neighborhood unmolested from the march of time. It is important to note that historic districts have been traditionally applied unevenly and do not protect all historic neighborhoods equally. Many historic neighborhoods that are not considered historic by the majority of the population have been demolished in the name of urban renewal, while wealthier communities have been able to utilize historic preservation to effectively halt neighborhood changes. (Weyeneth, 2005).

⁶ <https://www.nytimes.com/2017/12/01/business/economy/single-family-home.html>

Historic districts were not intended to increase property values, but the general consensus is that historic districts and restrictive zoning overlays more broadly effectively function as a form of stability that buyers look upon favorably when purchasing a home. (Leichenko, Coulson, and Listokin, 2001; Zahirovic-Herbert and Chatterjee, 2012; and Cebula, 2010). When implementing historic overlays in New York City the New York Landmarks Conservancy (1977) cited strengthening property values, pride, and increases in the neighborhood's social fabric. Mason (2005) confirms that "virtually every analysis that has been done on the economic impact of protection has indicated that values have maintained at worst and are usually enhanced." Additional restrictive zoning increases property values by signaling to home buyers that their neighborhood will remain the same as the neighborhood they choose to move into. (Speyrer, 1989 and Zahirovic-Herbert and Chatterjee, 2012). This study along with previous studies will show that restrictive zoning has a significant positive impact on home values. In line with previous studies we will show that additional zoning restrictions have a significant positive impact on home values in the overlaid zones. We will also show that there is generally a positive spatial decay from nearby overlay zones.

Exploratory Data Analysis

Data

This study uses home sale data between 2008-2019 provided by David O'Neill from the Fayette County, Kentucky Property Valuation Administrator. The geospatial data was obtained from Lexington, KY government dataset (<https://data.lexingtonky.gov/>). A geographic information system (GIS) was used to calculate the distance of each home from parks, fire stations, hospitals. A GIS system was also utilized to add overlay zoning data to the home as well. This study used only single-family residential homes and excluded all other types of sales, as overlays are specifically designed to be implemented over single family home zoning. Census Tract data was obtained from the 2015 American Community Survey.

The implementation dates for both H-1 and ND-1 are listed in Table 1. Implementation dates are important, specifically because some overlays were implemented prior to the study period, between Q1 2008 and Q2 2019. This is mainly true of the H-1 overlay, all except one H-1 overlay were implemented prior to 2013. The only ND-1 that was implemented prior to the study period was Greenbrier 1, all other ND-1 were implemented during the study period.

Table 1

Implementation Year	Overlay Zone Type	Overlay Zone Name
1958, 1965	H-1	Gratz Park
1972, 1976	H-1	South Hill
1975, 2014	H-1	Western Suburb
1976	H-1	Constitution
1976	H-1	Elsmere Park
1985	H-1	Fayette Park
1985	H-1	Mulberry Hill
1987	H-1	Woodward Heights
1989	H-1	South Ashland/Central Avenue
1990	H-1	Bell Court
1997	H-1	Seven Parks
1998	H-1	Aylesford
2001	H-1	Cadentown
2004	H-1	Northside 1
2004	H-1	Northside 2
2004	ND-1	Greenbrier 1

2008	ND-1	Chevy Chase
2008	ND-1	Greenbrier 2
2011	ND-1	Montclair
2012	ND-1	Meadowthorpe
2013	H-1	Ashland Park
2013	ND-1	The Colony
2016	ND-1	Clinton Road

ND-1 zones are implemented through a process that requires significant neighborhood support. This support is usually in the form of a petition that is signed by a substantial portion of the neighborhood. When the petition is submitted to the City Planning office the application is then processed and public hearings are held. The average timespan for implementation of a ND-1 zone from the collection and submission of appropriate signatures is between 6-9 months.

H-1 zones are established through a similar process. The application for the establishment of a historic district must be filed by the Lexington-Fayette Urban County Council, by the Planning Commission, and then the Historic Preservation Commission transmits the request to the Board of Architectural Review for its review and recommendation. A study and review are conducted and once the study has been conducted a public hearing is held and then the Board of Architectural Review will recommend to the Planning Commission that the application be approved or disapproved. This timeframe for approval is similar to the approval process H-1 zoning.

Summary Statistics

Variable	Description	Mean	Std. Dev.	Min.	Median	Max.
PRICE	Sale price	\$209,940.	\$143,379	\$10	\$169,750	\$2,905,000
PRICE_New	Log of Sale price	12.087	0.577	2.303	12.042	14.882
SALE_TYPE_CODE	Type of sale					
ACRES	Number of acres	0.222	0.206	0.002	0.180	10.400
STORIES	Number of stories	1.42	0.46	0	1.20	3
YEAR_BUILT	The year the home was built	1983	25.51	1798	1991	2019
NEW_WITHIN_LAST_5_YEARS	If the home was built in the within the last 5 years (0=No, 1= Yes)	.06144	0.23954	0	0	1
FIXBATH	The number of full bathrooms	2.04	.75	1	2	10
FIXHALF	The number of half bathrooms	0.52	.54	0	0	9
FIXTOT	The total number of physical property that is permanently attached to the property	10.97	3.59	3	11	43
FINISHED_BASEMENT_AREA	The area of a finished basement	249.60	478.24	0	0	5443
SQ_FT	The square feet of the home	2134	1041.56	468	1850	14061
BSMTCAR	If the basement is also the garage of a home how many cars it can fit	0.14	.51	0	0	27
1ST_FLOOR_AREA	The number of square feet on the first floor	1191.00	NA	152	1125	6604
GARAGE_SQ	The number of square feet on the garage floor	63.88	173.96	0	0	3200
FLOOD_ZONE	If the home is in a flood zone (0= No, 1=Yes)	0.006	.078	0	0	1
PARK_100	If the home is within 100 feet of a park (0= No, 1=Yes)	0.02049	0.14167	0	0	1
PARK_300	If the home is within 300 feet of a park (0= No, 1=Yes)	0.04338	0.20372	0	0	1
PARK_500	If the home is within 500 feet of a park (0= No, 1=Yes)	0.057	0.232	0	0	1
FIRE_STATION_500	If the home is within 500 feet of a fire station (0= No, 1=Yes)	0.004	0.061	0	0	1
HOSPITAL_500	If the home is within 500 feet of a hospital (0= No, 1=Yes)	0	0	0	0	0
ELEMENTARY_SCHOOL	The elementary school zone the home is in					
MIDDLE_SCHOOL	The middle school zone the home is in					
HIGH_SCHOOL	The high school zone the home is in					
Basement.r	If the home has a basement (0=None, 1 = Crawlspace, 2= Full)	0.88	NA	0	0	2
Zoning.r	The type of zoning the home is in					

SALE_DATE_YEAR	The sale year of the home	2013	3.42	2008	2013	2019
SALE_DATE_MONTH	The sale month of the home	6.54	3.09	1	6	12
ND_1_Overlay	If the home is in a ND-1 overlay (0= No, 1=Yes)	0.0183	0.1341	0	0	1
H_1_Overlay	If the home is in a H-1 overlay (0= No, 1=Yes)	0.0118	0.1080	0	0	1
ND_1_100	If the home is within 100 feet of a ND-1 overlay (0= No, 1=Yes)	0.01935	0.13775	0	0	1
ND_1_300	If the home is within 300 feet of a ND-1 overlay (0= No, 1=Yes)	0.004717	0.06852	0	0	1
ND_1_500	If the home is within 500 feet of a ND-1 overlay (0= No, 1=Yes)	0.004957	0.07023	0	0	1
H_1_100	If the home is within 100 feet of a H-1 overlay (0= No, 1=Yes)	0.01268	0.11189	0	0	1
H_1_300	If the home is within 300 feet of a H-1 overlay (0= No, 1=Yes)	0.003125	0.05581	0	0	1
H_1_500	If the home is within 500 feet of a H-1 overlay (0= No, 1=Yes)	0.003696	0.06068	0	0	1

Notes: Summary statistics of base model dataset showing a wide range in prices and attributes. Sample size for full dataset is 31,751.

The dataset was first filtered by screening out all properties that did not have the LUC (Land Use Code) of 510, which denotes single family dwellings on platted lots. 510 properties are single-family homes that are on land that has been divided and has a fixed boundary. The data was then filtered based on the type of sale. Sales were filtered to make sure that they were representative of a fair market transaction. The following codes were included in the study: zero, which represents valid arm's length transaction; six, which means the property has been sold twice within the same year; eight, the property has been significantly remodeled since the most recent sale; and nineteen, which represents other types of sales. Other types of sales were included in the model based on discussions with the Fayette County Property Valuation Administrator David O'Neill, as usually other types of sales represent sales similar in type to an arm's length transaction.

The total number of single-family residential transactions that were analyzed over the period were 31,751. Out of the 31,751 total sales in Lexington-Fayette, 610 sales were in a ND-1 overlay and 392 sales were in a HD-1 overlay. In the study timeframe sales were fairly evenly distributed and as expected sales volume tends to be most active during the summer quarter and the least active during the winter quarter.

While sale date is an important factor in the price of a home the year a home was constructed is also important in a home's value. Newer construction tends to sell for more than a comparable home, normally due to newer homes possessing more modern amenities and being more up to date with current consumer standards. (Rehm, 2006). In Lexington the mean year of a home constructed during study period was 1983, but the median was 1991. This reflects a negative skew and is likely reflective of the rapid growth experienced by Lexington-Fayette, KY after the 2007-2009 recession, as well as the large expansion of the urban services boundary in 1996 which enabled new land to be brought into development. This also reflects the recession that began during 2007-2009, which effectively halted most new residential construction between 2008-2010.⁷

Residential property sale prices were not adjusted utilizing the CPI or the price index for single family homes. Currently the literature deals with changes in homes valuation in two manners. One method adjusts prices based on a price index. (Cebula, 2010; Taylor 2003). The other method, utilized in this study, utilizes a time variable, which similar to the price index method adjusts for fluctuations and overall price changed in the residential property market. (Hoen and Atkinson-Palombo, 2016; Seo, Salon, Kuby, and Golub, 2018; Zahirovic-Herbert and Chatterjee, 2011; Taylor, 2003).

Comparing sales price does not give us any detailed information about the unique characteristics of each home and property. Therefore, a simplistic method that allows us to compare price is to breakdown the price into a price per square foot and the price per acre. Overall properties that are not in an overlay have a significantly lower price per acre and price per square foot.

⁷ <https://www.nber.org/cycles.html>

	Sales Price	Median Acres	Price Per Acre
Lexington-Fayette, KY Sales	\$209,940	.222	\$46,676
ND-1 Sales	\$332,883	.334	\$111,090
H-1 Sales	\$361,959	.193	\$69,841

	Sales Price	Residential Square Feet	Price Per Square Foot
Lexington-Fayette, KY Sales	\$209,940	2,134	\$98
ND-1 Sales	\$332,883	2,665	\$125
H-1 Sales	\$361,959	2,674	\$135

Traditionally hedonic home price studies utilize five broad categories of data: characteristics of the home, neighborhood characteristics, time characteristics, geospatial characteristics, and other characteristics (such as zoning characteristics). (Goodman and Thibodeau, 1998; Rosen, 1974).

Methods

Hedonic pricing models decompose the impact that various factors have on the transaction price of a residential property. (Rosen, 1974). The hedonic pricing model is designed to breakdown the transaction price of a residential property into the various components that affect the sale price, both negatively and positively. This paper utilizes a traditional hedonic pricing model and spatial control variables to obtain the relationship between zoning and residential property values.

Figure 1

The semi-log form of the hedonic pricing model was chosen due to its common utilization in most literature. (Taylor, 2003; Cebula, 2010; Zahirovic-Herbert and Chatterjee, 2011). The semi-log form is also commonly utilized in hedonic pricing analysis due to the ease of interpretation, specifically because the coefficient can be interpreted as the percentage change in the residential sale price associated with the independent variable.

Initial variable selection was derived from testing for AIC and BIC with forward and backward selection. Multicollinearity was tested for by analyzing the VIF of the variables that were selected in AIC and BIC test. R² values of the tested models were compared and the semi-log function was selected. The function is expressed as:

$$\ln H_p = \alpha + \beta_1 C_p + \beta_2 N_p + \beta_3 Z_p + \beta_4 T_p + \beta_5 G_p + \varepsilon$$

where H indicates the log price of single family residential property p ; α is a constant; C is the interior and exterior characteristics; N is the neighborhood characteristics; Z is the zoning characteristics; T is the time variables; and G is a spatial control variable characteristics that are commonly included in hedonic pricing models. $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ represents the coefficients of C_p, N_p, Z_p, T_p, G_p and ε is the error term.

To determine if there was spatial correlation between the variables the first test utilized is Moran I. Moran I allows us to determine if the price is randomly distributed among the properties in Lexington. The Moran I p-value was statistically significant ($p < 0.000$) and the difference between the observed value of I was significantly greater than the expected value of I ($\hat{I} = .2955$ versus $I_0 = -0.0005$). Therefore, the values are positively correlated and most likely the spatial distribution of the high and low values are more spatially

clustered than would be expected if the values were distributed normally. Figure 1 shows the plot of the spatial weights neighbors list of single family residential properties over the period.

Spatial correlation was also tested utilizing the Lagrange Multiplier (LM) statistic using the spatial weight matrices (Anselin and Rey, 2014). To identify and select an appropriate spatial regression model continuity was tested using the rook and queen continuity method. The LM error test (11,703; $p < 0.0000$) demonstrates that there is a spatial dependence in the error term. The LM lag test (11,803; $p < 0.0000$) allows us to reject the presence of spatial dependence in the dependent variable. The RLM error test (2,490.1; $p < 0.0000$) and the RLM lag test (2,589.5; $p < 0.0000$) allows us to test for the presence or inclusion of a missing lagged variable. Both tests confirm that there is not a missing or included lagged variable. The robust test for the error (14,293; $p < 0.000$) is very significant which indicates that there is spatial dependence in the prices. This also demonstrates that the LM lag and LM error models are appropriate. (Kelejian and Prucha, 2001). The Breusch-Pagan test confirms that heteroscedasticity exists (2,145.9, $p < -0.0000$) in the dataset. Heteroscedasticity-consistent standard errors allow heteroskedasticity to be unencumbered by faulty structural assumption.

While there are many functions of a home's value, in reality homes in a similar geographic area may differ significantly in various attributes such as characteristic of the lot and improvements. Many models obtain very specific details about each individual property, such as floor size, lot size, number of bedrooms, number of bathrooms, and other various property specific attributes. While this study was able to obtain many specific home attributes it was unable to obtain all types of data that could influence the property's valuation. The Fayette PVA does not have accurate information about bedrooms, fireplaces, pool, and if the property had central air and heat. It is impossible to obtain every variable that gives a home its value and in prior studies other variables included in this study were omitted in previously mentioned studies as well. (Taylor, 2003). The significance of the omitted home characteristic variables did not negatively impact the significance of the model. These are important features and should not be discounted, but the geographic area a home is in has a stronger determinate in the home's value than specific home characteristics. (Orford, 2017; Kane, Reigg, Staiger, 2005; Glaeser, Gyourko, and Saks, 2005).

This model utilized Census Tracts as a method to test for socioeconomic impacts of neighborhoods. Racial demographics are important when analyzing home values; many studies that have been conducted have determined that the racial makeup of a particular neighborhood can have a significant impact on home values. (Silver, 1997; Nelson, Dawkins, Sanchez, 2004; Papke, 2009). One method to ensure that a neighborhood and school stay demographically constant is to enact restrictive zoning, specifically zoning that could allow for construction of non-single-family homes. Non-single-family homes encourage a more diverse and different socio-economic group of residents to live in the neighborhood. This is particularly true because multifamily homes are significantly more affordable than single family homes. Census Tracts offer a fairly detailed method that allows us to include socioeconomic impacts in the study. Census tract data along with geospatial controls included in this model are frequently utilized as proxies for more specific racial demographics. (Taylor, 2003).

Finally, due to the nature and small number of sales within the ND-1 and H-1 overlays it was not possible to construct a regression with sales before and after implementation for the overlays. The amount of properties in overlays before and after were of a small enough amount (less than 10) that made this not a productive method for study. For example, there was one home sale prior to the implementation of the Chevy Chase overlay and ten sales after implementation. Therefore, this method was not utilized due to the small amount of valid data points.

Results

Appendix 1 shows the results of the regression, which has a fairly high degree of explanatory power, with an adjusted R^2 of .845 for the elementary school model, .841 for the middle school model, and .838 for the high school model. Appendix 1 represents the three regressions constructed for the model. The model was run separately for elementary, middle, and high schools. Running the model with separate educational attendance

zones was a deliberate decision due to the recent changes in the past ten years to the attendance zone boundaries in Lexington-Fayette. The school attendance boundaries that were the most unchanged over the past ten years were high school boundaries. The model results for selected interior and exterior, zoning, spatial variables are presented in Table 2 below.

Table 2

Selected Non-Factor Variables			
Variables	(Elementary School Attendance Zones)	(Middle School Attendance Zones)	(High School Attendance Zones)
Interior & Exterior Variables (C)			
ACRES	0.1185*** (0.0077)	0.1126*** (0.0077)	0.1096*** (0.0077)
STORIES	0.0728*** (0.0069)	0.0815*** (0.0070)	0.0854*** (0.0070)
YEAR_BUILT	0.0024*** (0.0001)	0.0023*** (0.0001)	0.0023*** (0.0001)
NEW_WITHIN_LAST_5_YEARS	0.0130* (0.0069)	0.0132* (0.0070)	0.0094 (0.0070)
FIXBATH	0.0039 (0.0056)	0.0052 (0.0057)	0.0103* (0.0057)
FIXHALF	0.00001 (0.0046)	0.0015 (0.0046)	0.0051 (0.0047)
FIXTOT	0.0228*** (0.0015)	0.0237*** (0.0015)	0.0225*** (0.0015)
FINISHED_BASEMENT_AREA	-0.0002*** (0.00001)	-0.0002*** (0.00001)	-0.0002*** (0.00001)
SQ_FT	0.0003*** (0.000005)	0.0003*** (0.000005)	0.0003*** (0.000005)
BSMTCAR	0.0039 (0.0030)	0.0026 (0.0030)	0.0026 (0.0030)
`1ST_FLOOR_AREA`	0.0001*** (0.00001)	0.0001*** (0.00001)	0.0001*** (0.00001)
GARAGE_SQ	0.0001*** (0.00001)	0.0001*** (0.00001)	0.0001*** (0.00001)
Basement.r	0.0363*** (0.0017)	0.0376*** (0.0017)	0.0377*** (0.0018)
Zoning Variables (Z)			
ND1_OVERLAY	0.0413 (0.0265)	0.0773*** (0.0257)	0.0647** (0.0260)
H1_OVERLAY	0.2780*** (0.0344)	0.2662*** (0.0348)	0.1812*** (0.0352)

Spatial Variables (G)

PARK_100	-0.0031 (0.0091)	-0.0110 (0.0092)	-0.0133 (0.0093)
PARK_300	0.0137** (0.0064)	0.0109* (0.0065)	0.0076 (0.0065)
PARK_500	-0.0097* (0.0056)	-0.0147*** (0.0057)	-0.0172*** (0.0057)
ND_1_100	0.0482** (0.0233)	0.0505** (0.0235)	0.0661*** (0.0238)
ND_1_300	0.0392* (0.0205)	0.0497** (0.0206)	0.0594*** (0.0209)
ND_1_500	0.0386* (0.0199)	0.0407** (0.0201)	0.0665*** (0.0203)
H_1_100	0.2105*** (0.0341)	0.2252*** (0.0345)	0.2100*** (0.0347)
H_1_300	0.1181*** (0.0265)	0.1350*** (0.0268)	0.1065*** (0.0270)
H_1_500	0.1530*** (0.0229)	0.1593*** (0.0231)	0.1371*** (0.0233)
FIRE_STATION_500	0.0207 (0.0211)	0.0096 (0.0213)	0.0147 (0.0215)
HOSPITAL_500	-0.0839 (0.1590)	-0.0784 (0.1612)	-0.0990 (0.1625)
FLOOD_ZONE	-0.0450*** (0.0164)	-0.0568*** (0.0166)	-0.0496*** (0.0167)

Based on the model the sale price (expressed in log form) is a positive function of the acres, stories, year built, the number of total fixtures, the number of square feet, if the home was constructed within the last five years, the number of square feet of the home, the first floor square feet, the square feet of the garage, the square feet of the basement, if the property is in a H1 or ND1 overlay, if the property is within 100, 300, or 500 feet of a ND1 or H1 overlay, and if the property has a basement. Variables that negatively impacted a properties sale price were the area of a finished basement, if the property is in a flood zone, and if the property is within 500 feet of a park.

In the model most control variables positively impacted the property's value. Important variables and the impact they had on the model are noted in the below section. The type of transaction a property was sold via had a significant impact on the property's value. The property sale code variable represents the increase or decrease in price from a property that is a regular arm's length transaction. If the property was sold twice within the same year (-3%) and other types of sales (-39%) had a significantly negative impact on the value of a property. Frequent sales can indicate a distressed property and other types of sales can indicate the property was sold under its market value for some unknown reason. Properties that were sold after a significant remodel had a significantly positive impact on price (10%), significant remodels add newer more modern features to property's which positively impacts valuation.

The only interior room variable that positively impacted price was the number of fixtures a property had. Fixtures are physical items in the property that are affixed to the property. Fixtures do not change when ownership of the property changes. It would be expected that an additional room in a home would increase sale price by about 2%. The number of full and half bathrooms in a home positively impact its price. But all of the bathroom variables did not have a statistically significant impact on sale price.

While having a basement increases the value of the home, larger finished basements (by a single standard deviation from the mean) have a slight negative impact on the value of a home (-.02%). The small negative impact of finished basements is likely due to the significant difference in quality between finished basements. A finished basement may mean it is suitable for storage or that it is fully finished and has similar quality features as the rest of the home. Homes that have basements, finished, unfinished, or simply a crawlspace sell for a premium of about 3.7% over homes that do not have a basement.

The number of acres a property has was associated with a positive increase in value between 10-12% for each additional acre a property has. Each additional story a property has is associated with a positive increase in value between 7.3-8.5%.

The time period when a home was constructed had a slight positive impact on home value of about .23% across all models. Newer homes are expected to have a higher value as they have more modern amenities. The study included two variables that account for homes that were constructed more recently. Homes constructed within the last five years positively impact a sale price by 0.94-1.3%. This positive value is expected for newer homes and mirrors prior studies that find that newer homes sell for a premium over older homes.

In most prior hedonic valuation studies proximity to a park has a positive impact on a home's value. (Cebula, 2009; Hoen and Atkinson-Palombo, 2016). This study included three park variables, within 100 feet of a park, within 300 feet of a park, and within 500 feet of a park. The 500 feet proximity variable was statistically significant in all models. If a property was located within 500 feet of a park the model predicted that would negatively impact sale price by slightly over 1.0%. This is potentially due to the small number of properties that were tagged with this variable. The total number of sales during this period that were sold within 500 feet of a park were only 98 properties. Spatial decay may be a factor in that the positive impact of a park decreases rapidly as one moves further and further away.

Historic overlays have a significant impact on property values. Properties that lie within a historic overlay can expect a sale price that is between 18-27% higher than comparable properties located outside of the overlay. If a property was within a historic zoning overlay this has a significant large positive impact on the sale price of the home. This impact was highly significant and is in line with other studies that find that properties within historic districts have higher values than homes that are not within historic overlay districts. Neighborhood character overlays were significant in two of the three models, middle and high school models. In the two models, homes sold within the ND1 overlay can expect about a 6% increase in price compared to homes not within the overlay.

Three final spatial control variable that were included in the study were proximity to a fire station, hospital, or flood zone. Due to the lack of homes within 100 and 300 feet of a fire station or hospital only the 500 feet proximity variable was used for this study. Close proximity to a hospital or a fire station was not likely to impact sale price. The sample for fire stations included 122 sales over the period and the sample for hospitals included two homes. It is likely that with a larger sample of homes one would find that fire stations and hospitals do have an impact on sale price. Flood zones as expected have a negative impact on sale price, negatively impacting sale price by about 4.5-5.7%. The negative impact of flood zones on sale price is expected and mirrors the findings of other studies that utilized flood zones.

Prior studies have also included a spatial lag to test if there is spillover from historic or neighborhood character overlays districts. (Zahirovic-Herbert and Chatterjee, 2012; Smith, 2001; Pascal, et al., 1984; Ryberg-Webster

and Kinahan, 2016). This study utilized three spatial variables to test if there is a positive impact on home values being in close proximity to a H1 (historic overlay) or ND1 (neighborhood character design overlay) at intervals of 100, 300, and 500 feet. All of the spatial proximity variables were positively significant across all models. The impact of ND1 and H1 proximity variables mirrors the impact that being within a H1 and ND1 overlays have on sale price. In addition, in keeping with prior studies there is a clear spatial decay in the positive impact of proximity to H1 overlays. As a home sold is farther and farther away from a H1 overlay a smaller and smaller positive impact is exhibited on the sale price of the home. ND1 overlays do not exhibit a clear spatial decay in the increase in sale price, which is likely due to the smaller positive impact proximity to a ND1 overlay has on a home's sale price.

This study analyzes two types of zoning, the overlay zone and the zone of the property. The model's default is a single-family home on land zoned for rural agricultural. Nine zones had a significant impact across at least two models. Single family homes that were on neighborhood business (3), expansion area residential 1 (8), Luigart planned unit development (planned development that promotes redevelopment of older property into live/work units) (14), single family residential (1C (17), 1D (18), 1E (19)), planned neighborhood residential (22), and high density apartments (23) see a positive impact from their respective zoning. Growth zoning, the ability to increase the value of your property by adding additional units, explains the significant value gain single family homes can expect if they are zoned for zones 3, 8, 14, 22, or 23. The positive impact on value ranges from a low of 3.3% for planned neighborhood residential to 33.61% for a Luigart planned unit development. Single family homes on land zoned for single family residential (17, 18, and 19) can expect to see a positive increase in sale price compared to the default. As single-family homes are designed to be built on single family zoned lots this result is expected. The positive increase over the default make sense as homes closer to amenities such as commercial districts and governmental services elicit higher sale prices. The only zone that negatively impacts single family home values are single family homes sold on two-family residentially zoned land. Land zoned for two-family residential only negatively impacts two of the models and have a small negative impact of between 2.7-3.2%. This may be due to the density bonus that positively impacted aforementioned properties not positively impacting these homes due to the small increase in potential density. This small increase in density may not provide as much of a valuation boost as land zoned for larger multi-family buildings.

Census Tracts and school attendance zones were utilized as a method to control socioeconomic differences among neighborhoods. Appendix 3 details Lexington-Fayette, KY racial and poverty data by Census Tract. The default Census Tract has a significantly higher poverty rate than the average Lexington-Fayette Census Tract. The default Census Tract is more diverse than the Lexington-Fayette, KY average. For example, sale prices in Census Tract 200 are between 30-65% less than comparable homes in the default Census Tract 101. Figures 2-4 display the relationship between the model's coefficients and the percent poverty in each Census Tract. There is no clear relationship between the coefficients and percent poverty in a Census Tract.

Figure 2

Percent Poverty in Census Tract vs. High School Attendance Zones Coeff.

Figure 3

Percent Poverty in Census Tract vs. Middle School Attendance Zones Coeff.

Figure 4

Percent Poverty in Census Tract vs. Elementary School Attendance Zones Coeff.

Census tracts with a higher poverty rate than 101 were 200, 300, 400, 700, 801, 802, 900, 1800, and 1900. Census Tracts 200, 400, 900, 1800, and 1900 all had a negative impact on sale price versus the default Tract. Census Tracts 700, 801, and 802 all had a significant positive impact on sale price versus the default Tract. The likely reason for the positive impact of 700, 801, and 802 is these Tracts are close to the University of Kentucky's campus and therefore have elevated poverty rates due to the large number of students living in these Tracts. This would also explain the positive impact on price, as homes sold in proximity to a large institution of higher education sell for a higher value due to the large captive rental population. (Rivas, et al., 2019). Census Tracts 900, 1800, and 1900 are also located close to the University, but these Tracts also had a smaller sales volume than the average Census Tract, which increases the likelihood of outliers impacting the results. A final note on Census Tracts is that of the Census Tracts that were majority or close to majority black, 300, 400, 1100, 3102, and 3804, majority black Census Tract did not have a uniform negatively impact on sale price. In all models if the Census Tract was majority black and had an elevated poverty rate that Census Tract's sale prices were lower by 22%-99% across all models. Majority white Census Tracts that had elevated poverty rates did not have the same consistent negative impact on sale price as did majority black Census Tracts.

Due to significant changes in school attendance zones over the study period elementary, middle, and high school attendance zones were separated to analyze their individual impact on sale price. Appendix 4, 5, and 6 includes elementary, middle school, and high school testing data from the State of Kentucky's standardized exam. Some school zone tracts were omitted due to their perfect overlap of a Census Tract. For example, elementary school zone four perfectly overlaps Census Tract 1100. The results for elementary schools were fairly inconsistent, this was unsurprising as the elementary school attendance zones have changed dramatically over the study period. Over the study period elementary school attendance zones were altered twice. The default middle school is one of the best performing middle schools in the Lexington-Fayette school district. All middle school, except schools six and nine negatively impact sale price. Middle schools six and nine are two other well performing middle schools in the Lexington-Fayette school district. The default high school is an average performing high school. Therefore, all other high school attendance zones aside from four and five had a negative impact on sale price. High school zones three, four, and five are above average schools in state test

results, therefore it was surprising to find a negative impact associated with zone three. This may be due to the change in attendance zone boundaries, as previously school zone three included an area of Fayette County with high poverty rates.

The two time variables included in the study were year and month of sale. The default variable for year was the first year of study data or 2008. Homes sold between 2009-2010 had higher sales values than homes sold in 2008 and this result was highly significant across all models. Homes sold between 2011-2013 did not have a statistically significant impact on home valuation. After 2014 homes values were positively impacted by year and every year was significant, with homes in the final year of the study increasing in value by 22% compared to 2008 values. The default month for sales was January, which is historically the slowest period of homes sales. Figure 5 presents the percent change in price by model per month versus the default month. In all models, all months besides February could expect an increased value over January values ranging from a maximum of over 4% in July to a minimum of a little over 2% in November.

Figure 5

Conclusion

Overlay and restrictive zoning is increasingly utilized by neighborhoods and communities as a method of historic preservation or as a means to stop a neighborhood from changing characteristics. This study considered the impact of overlay zoning on single family residential property in Lexington-Fayette, Kentucky. Results suggest that overlay zoning has a significant positive impact on property values and specifically historic designation is associated with a positive increase in sale price between 18%-27% above a similar property that is not in a historic overlay zone. These results support the general consensus in economics literature that historic overlay zoning has a positive impact on property values. Furthermore, the effect that overlay zoning has on nearby properties is clearly positive and significant. While properties that are the closest to and furthest away from the historic overlay have a positive impact on the property value, properties in a mid-range distance from the overlay have a smaller but still positive impact on value. Therefore, it is possible to definitively conclude that historic overlay zoning has a positive impact on single-family residential sale price.

The impact of neighborhood character overlays is also clearly positive, being located within a neighborhood overlay zone does have a statistically significant impact on property prices. Historic overlays have a positive spillover effect on nearby single-family residential home sale price. But neighborhood character overlays have an unambiguously positive spillover impact on nearby homes. Single family homes sold within 100 feet of a ND-1 overlay positively impacts sale price by about 6%, homes sold within 300 feet of an overlay positively impacts sale price by between 4-6% and homes sold within 500 feet of an overlay impact prices positively by between 5-6%.

This study contributes to the growing literature that analyzes the impact that additional restrictive zoning has on single family residential home property sale prices. Overlay zoning has an unambiguous positive impact on the value of a home.

The results are consistent with a newly developing consensus in economic literature studying zoning in which the positive sale price impact of restrictive zoning is clearly understood. Restrictive zoning should be viewed cautiously by policy makers as it is a method that homeowners may employ to halt neighborhood socioeconomic changes. While homeowners are acting in their economic best interest when they pursue restrictive zoning local community members should be exceedingly cautious when confronted by restrictive zoning proposals. Restrictive zoning, in areas with already elevated property prices should be viewed cautiously and hesitantly by local policy makers. Policy makers should understand that the likely outcome of restrictive zoning is to elevate existing property prices of homes in the overlay above the local market baseline.

This study shows that restrictive zoning positively influences property values. Restrictive zoning's impact on property values likely varies across space as well as between non-single-family homes. Future research should focus on adding racial variables to the study data, as census data did not fit with the overlay zones. Further study should also be dedicated to analyzing the spatial decay impact that overlay zoning has on properties and specifically analyzing their impact at a micro level. Finally, this study suggests that policy makers should seriously consider the impact that restrictive zoning has on new individuals and their desire to move into better socio-economic neighborhoods. As neighborhoods implement restrictive zoning policy makers should carefully consider the exclusionary impact that restrictive zoning will have and the likely positive spillover effect that may contribute to additional displacement of less-affluent residents.

Appendix 1

Regression Models Output

	<i>Dependent variable:</i>		
	(Elementary School Attendance Zones)	log(PRICE) (Middle School Attendance Zones)	(High School Attendance Zones)
CENSUS_TRACT_ID101	Omitted (dummy)	Omitted (dummy)	Omitted (dummy)
CENSUS_TRACT_ID102	-0.2461*** (0.0500)	0.0815* (0.0443)	-0.1551*** (0.0490)
CENSUS_TRACT_ID200	-0.6561*** (0.0467)	-0.3080*** (0.0408)	-0.5757*** (0.0458)
CENSUS_TRACT_ID300	-0.9980*** (0.0760)	-0.5025*** (0.0402)	-0.5126*** (0.0468)
CENSUS_TRACT_ID400	-0.6936*** (0.0730)	-0.1164*** (0.0418)	-0.2354*** (0.0479)
CENSUS_TRACT_ID500	0.7498*** (0.0456)	0.3939*** (0.0378)	0.6257*** (0.0436)
CENSUS_TRACT_ID600	0.4607*** (0.0502)	0.1974*** (0.0494)	0.9236*** (0.0441)
CENSUS_TRACT_ID700	0.3832*** (0.0515)	0.1364*** (0.0502)	0.8166*** (0.0467)
CENSUS_TRACT_ID801	0.3492** (0.1388)	0.1257 (0.1400)	0.8672*** (0.1388)
CENSUS_TRACT_ID802	0.5107*** (0.1097)	0.1363 (0.1081)	0.4551*** (0.1116)
CENSUS_TRACT_ID900	-0.4300*** (0.0551)	-0.1152** (0.0509)	-0.3571*** (0.0557)
CENSUS_TRACT_ID1000	-0.6229*** (0.0675)	-0.2949*** (0.0524)	-0.4688*** (0.0507)
CENSUS_TRACT_ID1100	-0.7000*** (0.0697)	-0.7274*** (0.0563)	-0.8053*** (0.0494)
CENSUS_TRACT_ID1300	-0.4068*** (0.0716)	0.3145*** (0.0544)	-0.1126** (0.0535)
CENSUS_TRACT_ID1400	-0.6166*** (0.0685)	0.1017** (0.0515)	-0.3252*** (0.0504)
CENSUS_TRACT_ID1500	-0.4743*** (0.0656)	0.1956*** (0.0505)	-0.2330*** (0.0495)
CENSUS_TRACT_ID1600	-0.2930*** (0.0684)	0.5894*** (0.0447)	0.0716 (0.0459)

CENSUS_TRACT_ID1700	1.1629*** (0.0490)	0.7207*** (0.0410)	0.6416*** (0.0444)
CENSUS_TRACT_ID1800	-0.6101*** (0.1251)	-0.6613*** (0.1237)	-0.4542*** (0.1225)
CENSUS_TRACT_ID1900	-0.2603*** (0.0590)	-0.2533*** (0.0584)	-0.0887* (0.0480)
CENSUS_TRACT_ID2001	-0.3778*** (0.0553)	-0.3017*** (0.0501)	-0.4639*** (0.0476)
CENSUS_TRACT_ID2002	-0.3155*** (0.0561)	-0.3080*** (0.0521)	-0.3231*** (0.0494)
CENSUS_TRACT_ID2200	-0.3580*** (0.0726)	-0.0774 (0.0545)	-0.2352*** (0.0504)
CENSUS_TRACT_ID2302	0.2977*** (0.0556)	-0.0431 (0.0508)	0.6940*** (0.0445)
CENSUS_TRACT_ID2303	0.3416*** (0.0522)	0.0992* (0.0513)	0.8294*** (0.0453)
CENSUS_TRACT_ID2304	0.4235*** (0.0525)	0.1773*** (0.0515)	0.9101*** (0.0454)
CENSUS_TRACT_ID2400	0.3335*** (0.0529)	0.0605 (0.0502)	0.7915*** (0.0435)
CENSUS_TRACT_ID2500	-0.1700*** (0.0567)	-0.2140*** (0.0505)	0.0065 (0.0444)
CENSUS_TRACT_ID2600	-0.1985*** (0.0557)	-0.2004*** (0.0531)	-0.0570 (0.0445)
CENSUS_TRACT_ID2700	0.1565*** (0.0546)	-0.1166** (0.0506)	0.6232*** (0.0442)
CENSUS_TRACT_ID2800	-0.1035* (0.0549)	-0.1328*** (0.0502)	-0.0140 (0.0445)
CENSUS_TRACT_ID2900	-0.0926* (0.0562)	-0.1008** (0.0512)	-0.0205 (0.0444)
CENSUS_TRACT_ID3000	-0.1167** (0.0562)	-0.1812*** (0.0523)	-0.0933** (0.0445)
CENSUS_TRACT_ID3101	-0.2618*** (0.0682)	-0.3079*** (0.0553)	0.0202 (0.0497)
CENSUS_TRACT_ID3102	-0.1920*** (0.0660)	-0.3249*** (0.0554)	0.0047 (0.0498)
CENSUS_TRACT_ID3201	-0.1729*** (0.0663)	0.4636*** (0.0516)	0.0356 (0.0505)
CENSUS_TRACT_ID3202	-0.1412**	0.4822***	0.0460

	(0.0644)	(0.0484)	(0.0475)
CENSUS_TRACT_ID3300	0.0599	0.7010***	0.1823***
	(0.0647)	(0.0448)	(0.0459)
CENSUS_TRACT_ID3402	-0.1806***	-0.4410***	0.3003***
	(0.0521)	(0.0510)	(0.0445)
CENSUS_TRACT_ID3404	-0.1721**	0.5498***	0.3396***
	(0.0684)	(0.0494)	(0.0478)
CENSUS_TRACT_ID3405	-0.1417**	0.5808***	0.3730***
	(0.0683)	(0.0492)	(0.0476)
CENSUS_TRACT_ID3406	-0.0054	0.5482***	0.3370***
	(0.0614)	(0.0473)	(0.0456)
CENSUS_TRACT_ID3407	-0.0430	0.6562***	0.4324***
	(0.0553)	(0.0463)	(0.0444)
CENSUS_TRACT_ID3501	-0.0896	-0.2826***	0.3694***
	(0.0702)	(0.0532)	(0.0480)
CENSUS_TRACT_ID3503	-0.0469	-0.2404***	0.4097***
	(0.0870)	(0.0744)	(0.0711)
CENSUS_TRACT_ID3504	-0.0635	-0.2692***	0.3748***
	(0.0711)	(0.0548)	(0.0498)
CENSUS_TRACT_ID3600	0.0590	-0.0281	0.0484
	(0.0579)	(0.0516)	(0.0450)
CENSUS_TRACT_ID3701	-0.1772**	0.0865	-0.0391
	(0.0758)	(0.0609)	(0.0567)
CENSUS_TRACT_ID3702	-0.4305***	-0.1186**	-0.2654***
	(0.0694)	(0.0509)	(0.0467)
CENSUS_TRACT_ID3703	0.2266***	-0.1272**	0.1233**
	(0.0703)	(0.0506)	(0.0484)
CENSUS_TRACT_ID3704	0.1973***	-0.1797***	0.0718
	(0.0696)	(0.0505)	(0.0483)
CENSUS_TRACT_ID3802	0.0154	-0.1206*	0.2053***
	(0.1301)	(0.0661)	(0.0615)
CENSUS_TRACT_ID3803	0.2079***	-0.2142***	0.1085**
	(0.0693)	(0.0544)	(0.0488)
CENSUS_TRACT_ID3804	-0.4162***	-0.5176***	-0.1892***
	(0.0653)	(0.0550)	(0.0496)
CENSUS_TRACT_ID3906	-0.0072	0.7295***	0.2680***
	(0.0618)	(0.0447)	(0.0449)
CENSUS_TRACT_ID3908	-0.0297	0.7942***	0.2711***
	(0.0621)	(0.0439)	(0.0449)

CENSUS_TRACT_ID3909	-0.1967*** (0.0628)	0.6337*** (0.0449)	0.1143** (0.0459)
CENSUS_TRACT_ID3910	1.0210*** (0.0587)	0.5277*** (0.0513)	0.2337*** (0.0511)
CENSUS_TRACT_ID3911	0.9499*** (0.0552)	0.4563*** (0.0471)	0.1647*** (0.0468)
CENSUS_TRACT_ID3912	-0.1276** (0.0593)	0.7392*** (0.0466)	0.3310*** (0.0457)
CENSUS_TRACT_ID3913	-0.2181*** (0.0576)	0.6440*** (0.0459)	0.2969*** (0.0443)
CENSUS_TRACT_ID3914	0.0131 (0.0624)	0.7292*** (0.0459)	0.1158** (0.0493)
CENSUS_TRACT_ID3915	-0.0090 (0.0615)	0.6987*** (0.0449)	0.0947** (0.0480)
CENSUS_TRACT_ID3916	0.1050 (0.0659)	0.8050*** (0.0509)	0.2686*** (0.0521)
CENSUS_TRACT_ID3917	-0.1013 (0.0669)	0.5122*** (0.0518)	0.0821 (0.0507)
CENSUS_TRACT_ID3918	0.1434** (0.0618)	0.7757*** (0.0470)	0.2489*** (0.0487)
CENSUS_TRACT_ID4001	-0.2891*** (0.0737)	0.4779*** (0.0493)	0.2621*** (0.0475)
CENSUS_TRACT_ID4003	-0.1118 (0.0754)	0.6433*** (0.0491)	0.4296*** (0.0475)
CENSUS_TRACT_ID4005	0.0436 (0.0763)	0.7849*** (0.0513)	0.5669*** (0.0498)
CENSUS_TRACT_ID4006	-0.0333 (0.0771)	0.7043*** (0.0521)	0.4870*** (0.0505)
CENSUS_TRACT_ID4103	-0.0033 (0.0734)	-0.2692*** (0.0573)	0.3819*** (0.0525)
CENSUS_TRACT_ID4104	-0.0289 (0.0703)	-0.2934*** (0.0529)	0.3580*** (0.0477)
CENSUS_TRACT_ID4105	0.0051 (0.0687)	-0.2220*** (0.0521)	0.4189*** (0.0470)
CENSUS_TRACT_ID4106	-0.0149 (0.0682)	-0.1802*** (0.0522)	0.4667*** (0.0471)
CENSUS_TRACT_ID4107	0.0043 (0.0679)	-0.1454*** (0.0522)	0.4993*** (0.0471)
CENSUS_TRACT_ID4204	-0.0813	-0.1268**	-0.0489

	(0.0588)	(0.0513)	(0.0446)
CENSUS_TRACT_ID4205	-0.0377	-0.1323**	-0.1158**
	(0.0564)	(0.0514)	(0.0467)
CENSUS_TRACT_ID4207	0.0452	-0.0565	-0.0315
	(0.0585)	(0.0525)	(0.0470)
CENSUS_TRACT_ID4208	0.0927	-0.0072	0.0176
	(0.0607)	(0.0521)	(0.0466)
CENSUS_TRACT_ID4209	-0.0725	-0.1213**	-0.0453
	(0.0567)	(0.0514)	(0.0447)
CENSUS_TRACT_ID4210	-0.1188**	-0.1729***	-0.1041**
	(0.0583)	(0.0513)	(0.0447)
SALE_TYPE_CODE0	Omitted (dummy)	Omitted (dummy)	Omitted (dummy)
SALE_TYPE_CODE6	-0.0325**	-0.0333**	-0.0329**
	(0.0157)	(0.0159)	(0.0160)
SALE_TYPE_CODE8	0.1016***	0.0956***	0.0997***
	(0.0044)	(0.0044)	(0.0045)
SALE_TYPE_CODE19	-0.3903***	-0.3923***	-0.3957***
	(0.0046)	(0.0047)	(0.0047)
ACRES	0.1185***	0.1126***	0.1096***
	(0.0077)	(0.0077)	(0.0077)
STORIES	0.0728***	0.0815***	0.0854***
	(0.0069)	(0.0070)	(0.0070)
YEAR_BUILT	0.0024***	0.0023***	0.0023***
	(0.0001)	(0.0001)	(0.0001)
NEW_WITHIN_LAST_5_YEARS	0.0130*	0.0132*	0.0094
	(0.0069)	(0.0070)	(0.0070)
FIXBATH	0.0039	0.0052	0.0103*
	(0.0056)	(0.0057)	(0.0057)
FIXHALF	0.00001	0.0015	0.0051
	(0.0046)	(0.0046)	(0.0047)
FIXTOT	0.0228***	0.0237***	0.0225***
	(0.0015)	(0.0015)	(0.0015)
FINISHED_BASEMENT_AREA	-0.0002***	-0.0002***	-0.0002***
	(0.00001)	(0.00001)	(0.00001)
SQ_FT	0.0003***	0.0003***	0.0003***
	(0.000005)	(0.000005)	(0.000005)
BSMTCAR	0.0039	0.0026	0.0026
	(0.0030)	(0.0030)	(0.0030)
`1ST_FLOOR_AREA`	0.0001***	0.0001***	0.0001***

	(0.00001)	(0.00001)	(0.00001)
GARAGE_SQ	0.0001***	0.0001***	0.0001***
	(0.00001)	(0.00001)	(0.00001)
ND1_OVERLAY	0.0413	0.0773***	0.0647**
	(0.0265)	(0.0257)	(0.0260)
H1_OVERLAY	0.2780***	0.2662***	0.1812***
	(0.0344)	(0.0348)	(0.0352)
FLOOD_ZONE	-0.0450***	-0.0568***	-0.0496***
	(0.0164)	(0.0166)	(0.0167)
PARK_500	-0.0097*	-0.0147***	-0.0172***
	(0.0056)	(0.0057)	(0.0057)
FIRE_STATION_300	0.0207	0.0096	0.0147
	(0.0211)	(0.0213)	(0.0215)
HOSPITAL_300	-0.0839	-0.0784	-0.0990
	(0.1590)	(0.1612)	(0.1625)
ELEMENTARY_SCHOOL1	Omitted (dummy)		
ELEMENTARY_SCHOOL2	-0.6370***		
	(0.0666)		
ELEMENTARY_SCHOOL3	0.1950***		
	(0.0585)		
ELEMENTARY_SCHOOL4	Omitted		
ELEMENTARY_SCHOOL5	-1.3092***		
	(0.0716)		
ELEMENTARY_SCHOOL6	0.0053		
	(0.0676)		
ELEMENTARY_SCHOOL7	0.0069		
	(0.0606)		
ELEMENTARY_SCHOOL8	0.0882		
	(0.0668)		
ELEMENTARY_SCHOOL9	-0.4366***		
	(0.0519)		
ELEMENTARY_SCHOOL10	-0.1090***		
	(0.0368)		
ELEMENTARY_SCHOOL11	-0.2501***		
	(0.0425)		
ELEMENTARY_SCHOOL12	0.0384		
	(0.0674)		
ELEMENTARY_SCHOOL13	-0.0285		
	(0.0539)		

ELEMENTARY_SCHOOL14	-0.0389 (0.0642)
ELEMENTARY_SCHOOL15	0.0580 (0.0594)
ELEMENTARY_SCHOOL16	0.1359** (0.0666)
ELEMENTARY_SCHOOL17	-0.0994* (0.0592)
ELEMENTARY_SCHOOL18	-0.0519*** (0.0156)
ELEMENTARY_SCHOOL19	0.0170 (0.0551)
ELEMENTARY_SCHOOL20	-0.0176 (0.0437)
ELEMENTARY_SCHOOL21	0.2792*** (0.0662)
ELEMENTARY_SCHOOL22	0.0414 (0.0320)
ELEMENTARY_SCHOOL23	-0.0640* (0.0345)
ELEMENTARY_SCHOOL24	0.1861*** (0.0667)
ELEMENTARY_SCHOOL25	0.0564 (0.0704)
ELEMENTARY_SCHOOL26	-0.1006 (0.1228)
ELEMENTARY_SCHOOL27	-0.3953*** (0.0528)
ELEMENTARY_SCHOOL28	-0.1266*** (0.0156)
ELEMENTARY_SCHOOL29	-0.1757*** (0.0662)
ELEMENTARY_SCHOOL30	0.0151 (0.0679)
ELEMENTARY_SCHOOL31	Omitted
ELEMENTARY_SCHOOL32	Omitted
ELEMENTARY_SCHOOL33	0.0548 (0.0692)

ELEMENTARY_SCHOOL34	0.1960*** (0.0492)	
ELEMENTARY_SCHOOL35	0.0692 (0.0443)	
MIDDLE_SCHOOL1		Omitted (dummy)
MIDDLE_SCHOOL2		-0.8597*** (0.0497)
MIDDLE_SCHOOL3		-0.9484*** (0.0440)
MIDDLE_SCHOOL4		-0.8665*** (0.0455)
MIDDLE_SCHOOL5		-0.0453** (0.0183)
MIDDLE_SCHOOL6		0.0414** (0.0186)
MIDDLE_SCHOOL7		-0.1798*** (0.0354)
MIDDLE_SCHOOL8		-0.4257*** (0.0383)
MIDDLE_SCHOOL9		0.0869*** (0.0257)
MIDDLE_SCHOOL10		-0.8993*** (0.0586)
MIDDLE_SCHOOL11		Omitted
MIDDLE_SCHOOL12		-0.8607*** (0.0487)
MIDDLE_SCHOOL13		-0.1059*** (0.0402)
HIGH_SCHOOL1		Omitted (dummy)
HIGH_SCHOOL2		0.0017 (0.0273)
HIGH_SCHOOL3		-0.2203*** (0.0306)
HIGH_SCHOOL4		0.3098*** (0.0426)
HIGH_SCHOOL5		0.4041*** (0.0432)
HIGH_SCHOOL6		-0.2156*** (0.0355)

PARK_100	-0.0031 (0.0091)	-0.0110 (0.0092)	-0.0133 (0.0093)
PARK_300	0.0137** (0.0064)	0.0109* (0.0065)	0.0076 (0.0065)
ND_1_100	0.0482** (0.0233)	0.0505** (0.0235)	0.0661*** (0.0238)
ND_1_300	0.0392* (0.0205)	0.0497** (0.0206)	0.0594*** (0.0209)
ND_1_500	0.0386* (0.0199)	0.0407** (0.0201)	0.0665*** (0.0203)
H_1_100	0.2105*** (0.0341)	0.2252*** (0.0345)	0.2100*** (0.0347)
H_1_300	0.1181*** (0.0265)	0.1350*** (0.0268)	0.1065*** (0.0270)
H_1_500	0.1530*** (0.0229)	0.1593*** (0.0231)	0.1371*** (0.0233)
SALE_DATE_YEAR2009	Omitted (dummy)	Omitted (dummy)	Omitted (dummy)
SALE_DATE_YEAR2009	0.0137** (0.0054)	0.0094* (0.0055)	0.0098* (0.0055)
SALE_DATE_YEAR2010	0.0292*** (0.0057)	0.0261*** (0.0057)	0.0295*** (0.0058)
SALE_DATE_YEAR2011	0.0127** (0.0060)	0.0088 (0.0061)	0.0117* (0.0061)
SALE_DATE_YEAR2012	-0.0036 (0.0058)	-0.0050 (0.0058)	-0.0030 (0.0059)
SALE_DATE_YEAR2013	0.0076 (0.0057)	0.0064 (0.0057)	0.0073 (0.0058)
SALE_DATE_YEAR2014	0.0224*** (0.0058)	0.0174*** (0.0059)	0.0170*** (0.0059)
SALE_DATE_YEAR2015	0.0521*** (0.0058)	0.0496*** (0.0059)	0.0505*** (0.0059)
SALE_DATE_YEAR2016	0.0841*** (0.0057)	0.0810*** (0.0058)	0.0789*** (0.0059)
SALE_DATE_YEAR2017	0.1508*** (0.0058)	0.1475*** (0.0059)	0.1470*** (0.0060)
SALE_DATE_YEAR2018	0.1844*** (0.0060)	0.1785*** (0.0061)	0.1790*** (0.0061)
SALE_DATE_YEAR2019	0.2251*** (0.0071)	0.2191*** (0.0072)	0.2202*** (0.0073)

SALE_DATE_MONTH1	Omitted (dummy)	Omitted (dummy)	Omitted (dummy)
SALE_DATE_MONTH2	0.0063 (0.0075)	0.0050 (0.0076)	0.0073 (0.0077)
SALE_DATE_MONTH3	0.0249*** (0.0070)	0.0240*** (0.0071)	0.0229*** (0.0072)
SALE_DATE_MONTH4	0.0237*** (0.0069)	0.0235*** (0.0070)	0.0246*** (0.0071)
SALE_DATE_MONTH5	0.0372*** (0.0066)	0.0375*** (0.0067)	0.0382*** (0.0068)
SALE_DATE_MONTH6	0.0379*** (0.0065)	0.0370*** (0.0066)	0.0391*** (0.0067)
SALE_DATE_MONTH7	0.0433*** (0.0067)	0.0413*** (0.0068)	0.0424*** (0.0068)
SALE_DATE_MONTH8	0.0356*** (0.0067)	0.0346*** (0.0068)	0.0345*** (0.0069)
SALE_DATE_MONTH9	0.0289*** (0.0071)	0.0269*** (0.0072)	0.0270*** (0.0072)
SALE_DATE_MONTH10	0.0254*** (0.0071)	0.0235*** (0.0072)	0.0238*** (0.0073)
SALE_DATE_MONTH11	0.0249*** (0.0073)	0.0229*** (0.0074)	0.0230*** (0.0075)
SALE_DATE_MONTH12	0.0263*** (0.0074)	0.0256*** (0.0074)	0.0252*** (0.0075)
Basement.r	0.0363*** (0.0017)	0.0376*** (0.0017)	0.0377*** (0.0018)
Zoning.r1	Omitted (dummy)	Omitted (dummy)	Omitted (dummy)
Zoning.r2	-0.0097 (0.0760)	-0.0116 (0.0770)	-0.0072 (0.0776)
Zoning.r3	0.0834** (0.0405)	0.0820** (0.0410)	0.0923** (0.0413)
Zoning.r4	0.0626 (0.0968)	0.2827*** (0.0967)	0.1150 (0.0985)
Zoning.r5	0.0477 (0.0763)	0.0580 (0.0772)	0.0693 (0.0778)
Zoning.r7	-0.1597 (0.1134)	-0.1644 (0.1150)	-0.1798 (0.1159)
Zoning.r8	0.0280 (0.0198)	0.1025*** (0.0188)	0.1330*** (0.0191)
Zoning.r9	-0.0166	0.0274	0.1397***

	(0.0186)	(0.0183)	(0.0198)
Zoning.r10	0.0072 (0.2255)	0.0697 (0.2283)	0.1641 (0.2301)
Zoning.r11	-0.1644 (0.1307)	-0.1619 (0.1325)	-0.1431 (0.1336)
Zoning.r12	-0.0856 (0.1129)	-0.0945 (0.1145)	-0.1008 (0.1154)
Zoning.r13	0.0356 (0.0259)	0.0206 (0.0259)	0.0359 (0.0258)
Zoning.r14	0.3463*** (0.0639)	0.3421*** (0.0648)	0.3661*** (0.0653)
Zoning.r15	-0.0259 (0.0321)	-0.0265 (0.0326)	-0.0307 (0.0329)
Zoning.r16	0.0312* (0.0161)	0.0246 (0.0163)	0.0230 (0.0164)
Zoning.r17	0.0289** (0.0136)	0.0228* (0.0138)	0.0268* (0.0139)
Zoning.r18	0.0399*** (0.0139)	0.0333** (0.0141)	0.0351** (0.0142)
Zoning.r19	0.0328** (0.0151)	0.0254* (0.0152)	0.0267* (0.0153)
Zoning.r20	0.0185 (0.0160)	0.0127 (0.0164)	0.0172 (0.0165)
Zoning.r21	-0.0235 (0.0153)	-0.0317** (0.0155)	-0.0274* (0.0156)
Zoning.r22	0.0515*** (0.0143)	0.0333** (0.0144)	0.0429*** (0.0146)
Zoning.r23	0.0842*** (0.0163)	0.0828*** (0.0163)	0.0916*** (0.0164)
Constant	6.2644*** (0.2557)	6.5649*** (0.2546)	6.0522*** (0.2473)
Observations	31,751	31,751	31,751
R ₂	0.8453	0.8410	0.8383
Adjusted R ₂	0.8444	0.8402	0.8375
Residual Std. Error	0.2239 (df = 31566)	0.2269 (df = 31586)	0.2288 (df = 31592)
F Statistic	937.4197*** (df = 184; 31566)	1,018.6620*** (df = 164; 31586)	1,036.3500*** (df = 158; 31592)

Note:

*p**p***p<0.01

Appendix 2

Lexington-Fayette Urban County, Kentucky Zoning Ordinance Description

Zone	Zone Title	R Zone Number
A-R	Agricultural Rural	1
A-U	Agricultural Urban	2
B-1	Neighborhood Business	3
B-2A	Downtown Frame Business	4
B-2B	Lexington Center Business	5
B-3	Highway Service Business	6
B-4	Wholesale and Warehouse Business	7
EAR-1	Expansion Area Residential 1	8
EAR-2	Expansion Area Residential 2	9
EAR-2/TA	Expansion Area Residential 2 / Transition Area	10
I-1	Light Industrial	11
P-1	Professional Office	12
PUD-1	Residential Planned Unit Development	13
PUD-2	Luigart Planned Unit Development	14
R-1A	Single Family Residential	15
R-1B	Single Family Residential	16
R-1C	Single Family Residential	17
R-1D	Single Family Residential	18
R-1E	Single Family Residential	19
R-1T	Townhouse Residential	20
R-2	Two-Family Residential	21
R-3	Planned Neighborhood Residential	22
R-4	High Density Apartment	23

Appendix 3

Census Tract Description

	White, percent	Black, percent	Asian, percent	Hispanic, percent	Poverty, percent
Fayette County, Kentucky (Census Data)	70.9%	15.3%	4.3%	7.4%	18.9%
CENSUS_TRACT_ID101	76.1%	24.4%	1.0%	3.1%	44.1%
CENSUS_TRACT_ID102	81.0%	18.5%	1.8%	1.6%	32.4%
CENSUS_TRACT_ID200	69.2%	34.5%	0.1%	3.9%	46.1%
CENSUS_TRACT_ID300	36.9%	56.6%	0.5%	8.6%	36.6%
CENSUS_TRACT_ID400	46.7%	50.7%	0.0%	6.4%	46.3%
CENSUS_TRACT_ID500	95.9%	6.7%	0.8%	0.6%	9.6%
CENSUS_TRACT_ID600	99.8%	0.2%	0.3%	0.5%	5.7%
CENSUS_TRACT_ID700	83.9%	5.0%	14.2%	1.9%	45.1%
CENSUS_TRACT_ID801	84.1%	11.5%	6.2%	3.1%	55.9%
CENSUS_TRACT_ID802	83.6%	15.4%	5.4%	3.8%	58.0%
CENSUS_TRACT_ID900	76.1%	15.2%	13.4%	4.2%	71.1%
CENSUS_TRACT_ID1000	72.3%	25.9%	2.6%	9.3%	38.7%
CENSUS_TRACT_ID1100	33.0%	48.2%	0.8%	33.8%	38.9%
CENSUS_TRACT_ID1300	76.6%	23.7%	0.0%	25.5%	38.9%
CENSUS_TRACT_ID1400	78.3%	22.3%	1.8%	17.9%	30.5%
CENSUS_TRACT_ID1500	83.2%	16.7%	0.5%	18.2%	20.5%
CENSUS_TRACT_ID1600	83.0%	13.7%	3.5%	8.2%	25.7%
CENSUS_TRACT_ID1700	88.4%	9.8%	1.8%	0.6%	16.7%
CENSUS_TRACT_ID1800	83.0%	8.0%	10.6%	2.3%	59.1%
CENSUS_TRACT_ID1900	66.0%	28.9%	4.4%	8.6%	61.8%
CENSUS_TRACT_ID2001	53.1%	23.9%	1.2%	45.0%	38.0%
CENSUS_TRACT_ID2002	63.6%	16.8%	0.4%	37.0%	18.3%
CENSUS_TRACT_ID2200	72.3%	14.9%	8.5%	5.0%	8.3%
CENSUS_TRACT_ID2302	94.7%	0.1%	7.9%	1.3%	17.5%
CENSUS_TRACT_ID2303	82.9%	5.3%	7.8%	2.9%	16.7%
CENSUS_TRACT_ID2304	98.9%	1.7%	0.5%	2.7%	1.4%
CENSUS_TRACT_ID2400	89.7%	2.3%	8.6%	2.7%	13.6%
CENSUS_TRACT_ID2500	97.8%	0.0%	2.8%	0.7%	33.7%
CENSUS_TRACT_ID2600	90.0%	5.6%	3.2%	7.8%	18.8%
CENSUS_TRACT_ID2700	86.7%	9.0%	2.1%	6.1%	14.8%
CENSUS_TRACT_ID2800	92.3%	3.0%	6.6%	6.6%	5.6%
CENSUS_TRACT_ID2900	90.7%	3.8%	1.9%	7.9%	5.7%
CENSUS_TRACT_ID3000	80.5%	5.2%	1.5%	9.1%	14.5%
CENSUS_TRACT_ID3101	82.7%	18.8%	2.0%	5.9%	21.0%
CENSUS_TRACT_ID3102	52.7%	50.2%	0.0%	0.0%	9.0%
CENSUS_TRACT_ID3201	88.3%	14.3%	0.8%	6.2%	15.9%

CENSUS_TRACT_ID3202	80.0%	22.2%	0.0%	3.2%	24.8%
CENSUS_TRACT_ID3300	69.4%	29.4%	0.0%	0.5%	13.2%
CENSUS_TRACT_ID3402	63.4%	33.6%	6.4%	2.9%	34.9%
CENSUS_TRACT_ID3404	62.8%	39.6%	1.1%	9.0%	32.5%
CENSUS_TRACT_ID3405	70.8%	26.8%	4.5%	1.6%	14.4%
CENSUS_TRACT_ID3406	82.1%	13.5%	2.4%	5.5%	9.4%
CENSUS_TRACT_ID3407	70.8%	20.0%	12.0%	3.7%	5.7%
CENSUS_TRACT_ID3501	85.4%	10.9%	4.0%	3.0%	21.0%
CENSUS_TRACT_ID3503	77.9%	14.1%	9.3%	4.6%	15.6%
CENSUS_TRACT_ID3504	63.6%	36.4%	1.8%	4.3%	26.5%
CENSUS_TRACT_ID3600	93.6%	3.0%	5.6%	2.3%	5.9%
CENSUS_TRACT_ID3701	67.7%	23.8%	0.2%	15.4%	25.9%
CENSUS_TRACT_ID3702	70.8%	25.1%	2.3%	11.2%	13.0%
CENSUS_TRACT_ID3703	83.5%	17.0%	1.7%	5.0%	4.3%
CENSUS_TRACT_ID3704	79.2%	24.7%	1.3%	5.6%	4.5%
CENSUS_TRACT_ID3802	85.9%	2.7%	0.9%	25.4%	18.6%
CENSUS_TRACT_ID3803	61.1%	36.8%	4.1%	9.9%	6.5%
CENSUS_TRACT_ID3804	16.4%	63.5%	0.0%	27.9%	31.6%
CENSUS_TRACT_ID3906	90.1%	4.2%	4.5%	7.1%	6.8%
CENSUS_TRACT_ID3908	83.1%	14.1%	5.9%	6.9%	6.6%
CENSUS_TRACT_ID3909	75.2%	22.3%	4.3%	6.0%	9.1%
CENSUS_TRACT_ID3910	53.2%	36.9%	2.1%	17.0%	29.1%
CENSUS_TRACT_ID3911	66.3%	32.1%	2.4%	4.6%	13.8%
CENSUS_TRACT_ID3912	73.7%	19.2%	8.0%	1.2%	14.4%
CENSUS_TRACT_ID3913	85.4%	7.1%	7.9%	2.9%	2.4%
CENSUS_TRACT_ID3914	62.7%	29.3%	10.6%	1.6%	24.8%
CENSUS_TRACT_ID3915	85.3%	11.1%	6.2%	2.7%	2.6%
CENSUS_TRACT_ID3916	96.4%	1.7%	4.0%	0.0%	4.0%
CENSUS_TRACT_ID3917	61.7%	31.1%	0.0%	16.6%	7.8%
CENSUS_TRACT_ID3918	91.1%	7.3%	2.0%	5.3%	5.9%
CENSUS_TRACT_ID4001	77.4%	22.0%	4.0%	6.1%	37.0%
CENSUS_TRACT_ID4003	89.1%	11.4%	2.1%	4.3%	13.1%
CENSUS_TRACT_ID4005	97.4%	0.3%	2.8%	1.8%	2.7%
CENSUS_TRACT_ID4006	91.7%	0.6%	7.2%	1.3%	2.8%
CENSUS_TRACT_ID4103	83.0%	5.7%	14.8%	1.2%	15.2%
CENSUS_TRACT_ID4104	81.7%	16.7%	0.3%	7.7%	21.0%
CENSUS_TRACT_ID4105	92.6%	7.3%	2.1%	6.3%	12.7%
CENSUS_TRACT_ID4106	90.7%	7.5%	6.0%	2.8%	5.9%
CENSUS_TRACT_ID4107	89.6%	4.5%	7.4%	4.3%	5.3%
CENSUS_TRACT_ID4204	91.5%	1.8%	6.4%	0.7%	6.5%
CENSUS_TRACT_ID4205	91.4%	5.4%	4.1%	2.2%	0.4%
CENSUS_TRACT_ID4207	92.0%	4.0%	5.5%	3.2%	3.2%

CENSUS_TRACT_ID4208	76.1%	4.3%	20.2%	4.1%	5.1%
CENSUS_TRACT_ID4209	93.3%	5.3%	2.8%	3.3%	3.6%
CENSUS_TRACT_ID4210	85.7%	3.9%	14.1%	2.0%	4.4%

Appendix 4**Elementary Schools**

Elementary School Number	KY State Reading Score	KY Average State Reading Score	Difference from Average	KY State Math Score	KY Average State Math Score	Difference from Average
1	28.5	54.6	-26.1	28.5	48.8	-20.3
2	74.9	54.6	20.3	69.8	48.8	21
3	79.4	54.6	24.8	78.6	48.8	29.8
4	20.1	54.6	-34.5	17.3	48.8	-31.5
5	38.3	54.6	-16.3	38	48.8	-10.8
6	25.2	54.6	-29.4	36.1	48.8	-12.7
7	68.3	54.6	13.7	69.4	48.8	20.6
8	74.2	54.6	19.6	68.1	48.8	19.3
9	37.9	54.6	-16.7	29.6	48.8	-19.2
10	36.1	54.6	-18.5	25.6	48.8	-23.2
11	53	54.6	-1.6	56.4	48.8	7.6
12	57.2	54.6	2.6	54.9	48.8	6.1
13	62.6	54.6	8	63.2	48.8	14.4
14	66.7	54.6	12.1	70.8	48.8	22
15	29.1	54.6	-22.6	28.3	48.8	-14.8
16	32	54.6	-3.9	34	48.8	-2.8
17	50.7	54.6	-17.2	46	48.8	-13.1
18	37.4	54.6	11.2	35.7	48.8	16.5
19	65.8	54.6	-16.7	65.3	48.8	-9.1
20	37.9	54.6	6.6	39.7	48.8	19.6
21	61.2	54.6	-22	68.4	48.8	-16.2
22	32.6	54.6	-20.8	32.6	48.8	-19.5
23	33.8	54.6	3.3	29.3	48.8	9.5
24	57.9	54.6	31.3	58.3	48.8	34.6
25	85.9	54.6	-25.4	83.4	48.8	-18.8
26	29.2	54.6	14.3	30	48.8	15.5
27	68.9	54.6	-10.3	64.3	48.8	-12.6
28	44.3	54.6	-5.7	36.2	48.8	-1.8
29	48.9	54.6	13.8	47	48.8	14.4
30	68.4	54.6	-11.7	63.2	48.8	-12
31	42.9	54.6	16.5	36.8	48.8	23.9
32	71.1	54.6	18.6	72.7	48.8	29.6
33	73.2	54.6	-34.2	78.4	48.8	-26
34	20.4	54.6	-21.7	22.8	48.8	-21.5
35	32.9	54.6	-54.6	27.3	48.8	-48.8

Appendix 5**Middle School**

Middle School Number	KY State Reading Score	KY Average State Reading Score	Difference from Average	KY State Math Score	KY Average State Math Score	Difference from Average
1	71.6	60	11.6	67.6	47	20.6
2	51	60	-9	39.2	47	-7.8
3	42.4	60	-17.6	20.7	47	-26.3
4	71.6	60	11.6	61.8	47	14.8
5	68.2	60	8.2	63.1	47	16.1
6	68.2	60	8.2	63.1	47	16.1
7	55.2	60	-4.8	49.8	47	2.8
8	47.9	60	-12.1	32.9	47	-14.1
9	75.9	60	15.9	66	47	19
10	57.2	60	-2.8	46	47	-1
11	57.2	60	-2.8	46	47	-1
12	55.1	60	-4.9	44.8	47	-2.2
13	41.4	60	-18.6	28.8	47	-18.2

Appendix 6**High School**

High School Number	KY State Reading Score	KY Average State Reading Score	Difference from Average	KY State Math Score	KY Average State Math Score	Difference from Average
1	34.5	45.4	-10.9	25.4	37.5	-12.1
2	31.2	45.4	-14.2	25.4	37.5	-12.1
3	52.9	45.4	7.5	51.9	37.5	14.4
4	63.6	45.4	18.2	55.1	37.5	17.6
5	53.1	45.4	7.7	51.3	37.5	13.8
6	44.1	45.4	-1.3	37.3	37.5	-0.2

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