The Effects of Recreational Lake Areas on Urban Home Prices: Case of Oklahoma City

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Abstract

In this paper, we analyze the effects of recreational lake areas on home prices. We examine single family homes in Oklahoma City close to Lake Hefner, while controlling for other structural and locational characteristics. We use manually collected data from 1678 homes sold from September 2012 till March 2015 in four zip codes adjacent to Lake Hefner in Suburbs of Oklahoma City. We analyze the data using the hedonic model. Hedonic Pricing Model is used to assess the influence of recreational lake area on home pricing. The zip code analysis reveals that people seem to avoid the homes in the area where the main entrance is located due to noise and traffic congestions particularly during holidays. For all other zip codes, without the entrance, people are willing to pay the premium for being closer to the lake. The topic has importance for residential developers, real estate investors and appraisers, and community planners. The results indicate that lake recreational areas add value to property even without the lake views.

Keywords**:** Real Estate, Property valuation, Hedonic Model, Home value, House price drivers, Residential property.

1. Introduction

There are quite a few lake recreation areas in urban regions surrounded by residential and commercial properties. In this paper, we examine the effects of such recreational area lakes on home prices. The topic is especially important for residential developers, real estate investors and appraisers, and community planners.

There are many reasons people may prefer to live near these areas. Lakes are used for recreational activities, such as boating and fishing. Living near a waterway reduces travel expenses and, in some cases, provides a great view. On the other hand, living in such an area can have drawbacks, such as traffic congestion and noise, especially during vacation season and on weekends.

Previous literature suggests a location closer to the ocean with a view of the water has a positive effect on a home's value (Seiler et al., (2001), Bond et al., (2002), (Cohen et. al., 2015) and Benson et al., (2000). Papers regarding lakes are focused on the positive impact of lake views (and/or multiple small bodies of water) on home prices (Cohen et. al., 2015). Conversely, there is a negative impact of traffic congestion on home prices in urban areas (Jin and Rafferty 2018).

In this current endeavor, we focus on the distance from one recreational lake area instead of multiple small bodies of water. In addition, we examine whether investing in homes close to lakes and recreational areas will still be attractive for investors and homeowners if views are taken out of the equation. We argue that views and their values depend on individual preferences. In our data, houses do not have a lake view. There is a wall around the lake preventing homes from having water views.

To examine this relationship, we chose Lake Hefner for our analysis. This lake is a popular recreational area near Oklahoma City. We believe that it is interesting to analyze lake areas in Oklahoma because the State of Oklahoma has more man-made lakes than any other state. We analyze data from four zip codes adjacent to the lake. These four zip codes surround the lake from all sides. There is only one entrance to the lake, and it is in zip code 1. We focus on a single city because prices in different cities can be affected by per capita income of that city (Qayyum & Yuyuengongwatana, 2016).

Hedonic pricing model is used to examine the relationship between the recreational lake area and home prices. Results indicate there is a premium associated with houses not located in the same zip code as the entrance to the lake. Our findings show that there is no significant relationship between distance from the lake and housing price in zip code 1. This indicates that in the zip code where the entrance to the lake is located, there is increased traffic congestion and noise, thus reducing the premium associated with these houses. On the other hand, for all other zip codes, the results show that home prices decrease as we move away from the lake. These results indicate that people prefer to live closer to the lake except for the zip code where the entrance is located. The rest of the paper is organized as follows: Section 2 presents the literature review, Section 3 explains data and methodology, Section 4 discusses the results, and section 5 presents our conclusion.

2. Literature Review

There is an extensive literature on the effects of water bodies on home prices but these studies are mostly focused on views. Plattner and Campbell (1978) analyze condominiums units in Eastern Massachusetts from 1973 to 1976. They report a price premium of 4% to 11% for properties with a lake view.

Benson et al., (1998) analyze almost 5,000 market transactions to find the effect of view on properties. They categorized these transactions by view type such as ocean, mountain and lake. They discover that for single family homes, there is a premium of 147% for properties with an ocean front, 35% for ocean view, and 10% for partial ocean view. Overall, they find an average premium of about 25% for properties with ocean, lake or mountain view.

Benson et al., (2000) focus on single-family homes as they examine data for 6,949 home sales from 1984 to 1993 in Bellingham, Washington. They discover that there are price premiums ranging from 8% to 127%, depending on the quality of an ocean/lake view and the distance from the water. They also report that an unobstructed ocean view can give a 59% price premium. Rush and Bruggink (2000) investigate homes in 21 towns of Long Island, New Jersey using a hedonic model. They find that there is a 0.3% premium per front foot for single family homes located on a bay and 0.4% price premium on single-family homes located on the ocean.

Bond et al., (2002) analyze the impact of a lakefront view on home value. They use a unique building code to divide homes in two groups, homes with lake view and homes without lake view. They find that there is a premium for properties with a lake view and a very desirable view can add almost 89.9% to home value**.** Further analysis reveals that square footage is positively related to home prices and desirable lakefront views add value to a home.

Nelson et al., (2005) examine the impact of artificial water canals on residential sales prices. They analyzed 793 sales transactions from May 1998 to November 2003 in Arlington, Texas. Their results show a price premium for canal-front properties on the magnitude of 11% on average.

Conroy and Milosch (2011) look at the premium associated with houses near coastal areas. They analyze premium for residential housing prices in San Diego County using 9755 home sales during 2006. They use the hedonic pricing model to analyze their data; they find that for every mile increase in distance from the coast, the price of the home falls approximately $8,680. Their results show there is a premium associated with homes near coastal regions, and this premium decreases as the distance from the coast increases. They use the home's age, number of bedrooms, number of bathrooms, and square footage as housing variables.

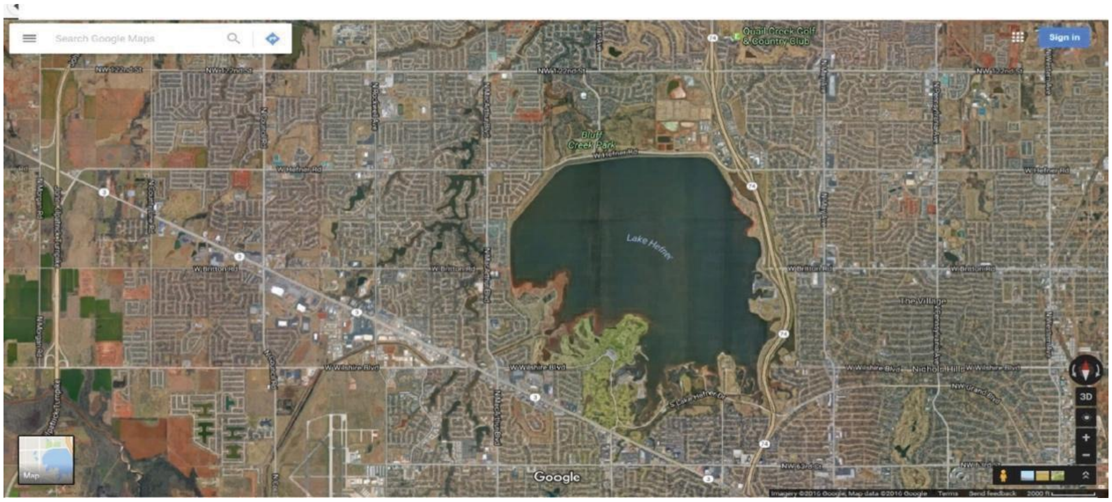
Cohen et al., (2015) investigate the effect of distance from the nearest lake on home prices. Examining home sales, in a Connecticut town with multiple bodies of water between 2000 and 2009, they find that homes closer to lakes have a premium. We argue that different bodies of water can have distinctive characteristics, such as size and/or view of the lake. To overcome that heterogeneity, we use one recreational lake area located in the center of the four zip codes.

The lake is located in an urban area so there is a possibility of traffic congestion inversely affecting the home prices. Jin and Rafferty (2018) examine effects of traffic congestion on home value. Their data is from the US Great Lakes Megaregion that includes metropolitan areas like Chicago, Detroit, Minnesota, Cleveland, St. Louis, and Pittsburgh and ten states, Wisconsin, Minnesota, Michigan, Iowa, Illinois, Ohio, Kansas, Indiana, Kentucky, and Missouri. They discover that although there is no significant relationship between traffic congestion and home value in rural and non-metropolitan areas, traffic congestion has a negative effect on home prices in urban areas.

Sirmans et al., (2005) review 125 empirical studies. They find that in most studies the number of bedrooms, square footage, number of bathrooms, garage, fireplace, and pool have a positive while age has a negative correlation with home value. These variables are used as structural variables in most hedonic models. In our study, we use the same control variables as Bond et al., (2002), Sirmans et al., (2005), Winson-Geideman et al., (2011), and Conroy and Milosch (2011). Age is another control variable we use in our study. Winson-Geideman et al., (2011) study the effects of age on the value of historic homes in designated historic districts. They find that, due to historic significance, age has a positive impact on houses that are more than 119 years old.

3. Data and Methodology

The area selected is an urban area located in the suburbs of Oklahoma City. We selected this area because of its homogeneous socioeconomic characteristics, physical boundaries (major roads), and of course, proximity to lake recreational areas. Housing sales data is manually entered from Zillow's website. Individual home distance from the lake and other landmarks is measured using google maps. The distance from Lake Hefner is the displacement of the house from the nearest part of the lake. The focus is on the zip codes adjacent to the lake but without a lake view. Figure 1 shows the lake and surrounding area. Our dataset contains 1678 observations of single-family homes sold from September 2012 through March 2015. The data provides information on the home's sales price, size, number of bedrooms, age, lot size, and address.



There are a few observations with missing information in one or more of these categories. We also remove any outliers from the dataset. We create dummy variables for distance, e.g., if the distance from the lake is a half mile or less, the value of the variable is 1 and 0 otherwise. Similar dummy variables are created for every half mile distance.

As discussed in the literature section, we use the hedonic pricing model for housing (Freeman 2003). This model is also used by Conroy and Milosch (2011), among others, to assess the effect of coastal distance on house pricing. Hedonic regressions statistically estimate the relation between certain characteristics of a property and its market value. The hedonic pricing model considers a house to be a composite good because it possesses many attributes. The home characteristics are divided into three categories: structural, neighborhood, and variables of interest. Therefore, it can be represented as

$$P = f(S, T, R)$$

Where P is the sale price of housing, S is a vector of structural characteristics, such as the number of bedrooms and bathrooms, square footage, and lot size. T is a vector of spatial and neighborhood characteristics, such as distance from downtown and highways, and R represents the variables of interest, distance from the lake.

Table 1 provides descriptive statistics for all variables within all zip codes. The value of single-family homes is given in US dollars. The age of the houses is given in years. Using google maps, distances from each house to Lake Hefner, highway 74 and downtown Oklahoma City are measured manually in miles. The mean distances from the lake and downtown Oklahoma City are nearly 1.63 miles and nearly 12.01 miles, respectively. Summary statistics indicate that, on average, the houses have a covered area of approximately 2200 square feet and average age of 57 years. The mean value of a single-family home in these zip codes is approximately $229,637.

Table 1: Descriptive Statistics for Full Sample Size

Variable	Description	Mean	Standard Dev	Min	Max
Log SellPrice	Log of sale price	12.05	0.69	9.62	14.81
SellPrice	Sale price of the house	229637.60	270924.50	15000.00	2700000.00
bed	Number of bedrooms	3.15	0.77	1.00	7.00
bath	Number of Bathrooms	2.39	0.92	0.00	8.00
age	Age of the house	39.51	18.38	0.00	85.00
age2	Age square	1898.34	1420.77	0.00	7225.00
Sqft	Square footage of the house	2128.50	985.06	363.00	9900.00
Lot Size	Size of the lot in Square feet	10603.48	7083.36	1224.00	91444.00
DowntownOK	Distance from downtown Oklahoma City	12.01	3.51	1.10	26.10
Log Downtown	Log of distance from downtown	2.44	0.32	0.10	3.26
distancefree74	Distance from highway 74	2.71	1.60	0.00	7.60
log Hwy Dist	Log of Distance from highway 74	0.79	0.69	-2.30	2.03
LakeHefners	Distance from Lake	1.63	0.98	0.03	6.00
Log Lake Dist	Log of distance from lake	0.25	0.76	-3.46	1.79
Lake 0 to 0.5[a]	Dummy: house within 0.5 miles of the lake	0.11	0.31	0.00	1.00
Lake 0.5 to 1.0	Dummy: house is between 0.5 to 1.0 miles of the lake	0.23	0.42	0.00	1.00
Lake 1.0 to 1.5	Dummy: house is between 1.0 to 1.5 miles of the lake	0.20	0.40	0.00	1.00
Lake 1.5 to 2.0	Dummy: house is between 1.5 to 2.0 miles of the lake	0.13	0.34	0.00	1.00

[a] None of these houses are adjacent to the lake or offer a clear view of the lake. The minimum distance is 0.03 miles.

4. Results

We present our regression results in Table 2. In the model, we include the log lake distance variable to provide the lake premium estimation. All coefficients are significant at the 1% level, except for the number of bedrooms, which is not significant in any of our models. Previous literature shows mixed results for the relation between home price and number of bedrooms. Simrans et al., (2006) finds having a higher number of bedrooms has a positive effect on home price. On the other hand, Boarnet and Chalermpong (2001), analyzing data from Orange County, suggest that this relationship is negative. Our results are more in line with Stevenson (2004), who finds that in Boston, a home’s number of bedrooms has no effect on the price. Perhaps this relation depends on the area and preferences of residents in that area.

Table 2: Regression results for Full Sample Including All Zip Codes

Variable	Model 1		Model 2	
	Coefficient	t-value	Coefficient	t-value
Const	12.30533	116.85	12.36886	121.18
Bed	-0.02723[c]	-1.79	-0.02543[c]	-1.70
Bath	0.16575[a]	10.19	0.15888[a]	9.97
Sqft	0.00033[a]	20.94	0.00033[a]	21.30
Lot size	0.00001[a]	7.83	0.00001[a]	7.99
Age	-0.02829[a]	-15.77	-0.02608[a]	-14.60
age2	0.00034[a]	13.71	0.00032[a]	13.09
Log Downtown	-0.37716[a]	-10.33	-0.38227[a]	-10.67
log Hwy Dist	0.05820[a]	5.44	0.08268[a]	7.51
Log Lake Dist	0.03619[a]	2.93		
Lake 0 to 0.5[d]			-0.03706	-1.16
Lake 0.5 to 1.0			-0.11917[a]	-5.04
Lake 1.0 to 1.5			-0.21806[a]	-8.52
Lake 1.5 to 2.0			-0.12313[a]	-4.37
Adj. R-squared	0.71		0.73	
F-Statistic	467.53		370.99	
No. of obs.	1678		1678	

Note: Dependent variable is sale price of the house. Bed is number of bedrooms, Bath is number of bathrooms, sqft is square feet covered area of the house minus garage. Lot size is size of the land where house is constructed, age is age of the house in years, Log Downtown is log of distance from downtown, Log Hwy Dist is log of distance from nearest highway i.e. highway 74 and then we have dummy variables for distance from lake.

[a] indicates significance at the 0.01 levels

[b] indicates significance at the 0.05 levels

[c] indicates significance at the 0.10 levels

[d] None of these houses are adjacent to the lake or offer a clear view of the lake. The minimum distance is 0.03 miles.

The variable of interest Log Lake Dist. has a coefficient of 0.0362, suggesting that a 10% increase in distance from the lake is associated with a 3.62% increase in price. The model 1 results also suggest that an additional bathroom is associated with a 16.6% higher sales price. The coefficient for square feet of structure is positive and significant, indicating that a 100-square-foot increase in structure is associated with a 3.30% higher price. Lot square footage is significant, and the effect is much smaller, with each 100 additional square feet of lot size associated with about a 0.01% higher price. The coefficient for age is negative, implying a decrease in price with age. The coefficient for age square is positive, suggesting the effect decreases as age increases; in other words, doubling the age would not double the age effect. Perhaps after a certain age the house acquires a certain historic charm or antiquity that helps stabilize the price.

The log distance from the freeway (LnFreeDist) variable is positive. We can argue that due to the noise and air pollution effects of busy highways, buyers may prefer to purchase homes farther from highways and freeways (Langley 1976), thus reducing home prices closer to highways. The log distance from downtown (LnDowntownDist) is negative, suggesting that home prices decrease as distance from downtown increases for a given home.

In Model 2, we have included lake distance dummies by mile up to 2 miles with a half-mile increment for each dummy variable. Our results for model 2 are similar to those in Model 1. As such, we estimate whether there is any premium on the houses based on distance from the lake. We find that the coefficient for houses located within a half mile of the lake is negative and not significant. For houses located between a half mile and one mile from the lake, the coefficient is negative and significant, and translates to a 11.9% decrease in price for houses located at that distance compared to houses that are beyond two miles. This effect increases for houses between one and 1.5 miles to 21.8%, and for those between 1.5 to two miles, the effect is 12.3%. That is, house prices are still lower at that distance compared to houses located beyond two miles. These results show that the negative relation between home prices and distance from the lake starts to decrease after 1.5 miles. Yet, the price of houses beyond 2 miles is higher than that of all houses closer than 2 miles. We suggest this negative effect can be attributed to traffic and noise, which is why the farther we move from the lake, the more the negative effect begins to diminish. To analyze further, we run our model on each zip code area separately. The results are shown in Table 3.

Table 3: Regression Results on Each Zip Code Separately

Variable	Zip Code 1		Zip Code 2		Zip Code3		Zip Code 4	
	Coeff	t-value	Coeff	t-value	Coeff	t-value	Coeff	t-value
Const	14.856230	21.52	12.04302	35.97	11.734660	102.7	11.439260	51.55
Bed	0.015324	0.45	-0.067325[b]	-1.96	0.028004	1.47	0.042504[c]	1.87
Bath	0.167454[a]	4.65	0.148836[a]	4.34	0.046463[b]	2.16	0.128691[a]	5.02
sqft	0.000261[a]	7.53	0.000479[a]	13.05	0.000252[a]	11.55	0.000137[a]	6.08
Lot size	0.000017[a]	5.17	0.000002	0.81	0.000012[a]	5.97	0.000005[a]	2.47
age	-0.030306[a]	-5.83	-0.0242958[a]	-5.42	-0.027764[a]	-7.95	-0.024933[a]	-7.48
age2	0.000297[a]	4.83	0.0002972[a]	4.65	0.000321[a]	4.30	0.000230[a]	3.45
Log Downtown	-1.483840[a]	-4.69	-0.2487422	-1.58	-0.054665	-1.53	0.075546	0.92
log Hwy Dist	-0.036171	-0.67	-0.0695718	0.513	0.041721[c]	1.86	0.041119[b]	2.00
Log Lake Dist	0.035781	0.47	-0.1080853[a]	-2.39	-0.024714[c]	-1.71	-0.080633[a]	-3.58
Adj. R-squared	0.78		0.73		0.66		0.54	
F-Statistic	173.48		119.31		87.67		58.09	
No. of obs.	437		399		410		432	

Note: Dependent variable is sale price of the house. Bed is number of bedrooms, Bath is number of bathrooms, sqft is square feet covered area of the house minus garage. Lot size is size of the land where house is constructed, age is age of the house in years, Log Downtown is log of distance from downtown, Log Hwy Dist is log of distance from nearest highway i.e. highway 74 and then we have dummy variables for distance from lake.

[a] indicates significance at the 0.01 levels

[b] indicates significance at the 0.05 levels

[c] indicates significance at the 0.10 levels

Table 3 results show that in zip code 1 the coefficient for log Lake Dist is positive and not significant, while for the other three zip codes the coefficient for this variable is negative and significant. The main entrance to Lake Hefner's recreational area and the marina is in the middle of zip code 1, and, due to traffic congestion and noise, buyers are not as likely to consider homes in this area. This is consistent with Jin and Rafferty (2018) that traffic congestion has a negative impact on home value thus reducing the premium associated with proximity to the lake, making the relationship statistically insignificant in this zip code. Consequently, if we take this zip code out then for the other areas it shows that buyers like to have properties close to the lake area without exposure to the gate entrance.

Table 4: Regression Results Without Zip Code 1

variable	Model 3		Model 4	
	Coeff	t-value	Coeff	t-value
Const	11.60550	103.46	11.60160	101.78
Bed	-0.02140	-1.37	-0.02221	-1.42
Bath	0.14512[a]	8.63	0.14731[a]	8.77
Sqft	0.00032[a]	19.26	0.00032[a]	19.45
Lot size	0.00001[a]	6.49	0.00001[a]	6.47
Age	-0.02725[a]	-14.97	-0.02698[a]	-14.7
age2	0.00034[a]	12.22	0.00034[a]	12.25
Log Downtown	-0.09537[a]	-2.44	-0.10577[a]	-2.66
log Hwy Dist	0.06869[a]	6.94	0.07587[a]	7.24
Log Lake Dist	-0.02570[b]	-2.11		
Lake 0 to 0.5[d]			0.07611[a]	2.37
Lake 0.5 to 1.0			-0.00068	-0.03
Lake 1.0 to 1.5			-0.04359	-1.5
Lake 1.5 to 2.0			-0.01956	-0.62
Adj. R-squared	0.64		0.64	
F-Statistic	248.27		187.88	
No. of obs.	1241		1241	

Note: Dependent variable is sale price of the house. Bed is number of bedrooms, Bath is number of bathrooms, sqft is square feet covered area of the house minus garage. Lot size is size of the land where house is constructed, age is age of the house in years, Log Downtown is log of distance from downtown, Log Hwy Dist is log of distance from nearest highway i.e. highway 74 and then we have dummy variables for distance from lake.

[a] indicate significance at the 0.01 levels

[b] indicate significance at the 0.05 levels

[c] indicate significance at the 0.10 levels

[d] None of these houses are adjacent to the lake or offer a clear view of the lake. The minimum distance is 0.03 miles.

In table 4, we run the same analysis used for table 2, but in table 4 we drop zip code 1. Our results for model 3 indicate that home prices in these three zip codes decrease as the distance to the lake increases. The coefficient for log Lake Dist is – 0.0257, suggesting a 10% increase in distance from the lake is associated with a 0.257% decrease in price. In model 4, the dummy variable for distance from 0 to a half a mile has a positive and significant coefficient indicating that the house prices closer to the lake are higher than those beyond two miles from the lake. This data indicates that once the congestion and traffic noise near the entrance is removed, those properties become more desirable to people wanting to live near the lake. Other dummy variables are not significant. Based on these results, we can argue that most houses having some premiums are located very close (between 0 to 0.5 miles) to the lake.

5. Conclusion

Given the advantages and disadvantages of owning homes close to recreational lake areas, the question of the value of such homes requires empirical investigation with the new data and time frame. To differentiate our study from prior literature we provide new data and time frame using a single lake recreational area to avoid heterogeneity caused by using multiple bodies of water. We focus on distance from the lake, not view. That's why Lake Hefner is selected because none of the houses is adjacent to the lake. We analyze 1678 homes in the zip codes adjacent to Lake Hefner in Oklahoma City and sold from September 2012 through March 2015. Our initial results indicate that people prefer to live away from the lake and are willing to pay higher prices. However, deeper zip code analysis demonstrates that homebuyers only avoid zip code 1, which is where the only entrance to the lake is located. On the other hand, homes in zip codes farther from the entrance and closer to the lake are more desirable, therefore command a premium. Overall, our results show that even without direct view, homes closer to the lake command a premium, while this relationship does not hold for the homes closer to the entrance. This study is useful for real estate appraisers who can include this additional variable while valuing properties. Also, real estate developers can assess the impact of lake recreational areas on their houses and plan their projects accordingly.

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