Senior Project

Department of Economics

"Economic Effect of Greenways in Summit County"

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Abstract

Recently bicycle infrastructure has been a focus for cities within Summit county and Akron in particular. However, this is not a new phenomenon in the Summit County area. One of the major bicycle, recreation, and environment project was the creation and maintenance of a "green way" that is known as the "Ohio Erie Canal Way Towpath." In this paper, I use a hedonic housing price model to estimate the effect that proximity to the Ohio Erie Canal Towpath has on willingness to pay for local households. Using Housing data from the Summit County Fiscal Office, I created an OLS regression of over 140,000 observations of house in Summit County sold within the years 1990 to 2019, and proximity data created through GIS. The regression used in this analysis takes into account housing characteristics, neighborhood quality, and proximity to the Towpath Amenity. The results of this analysis show that there is a positive and significant effect that proximity to the Towpath has on housing price.

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Introduction

One issue that many cities are facing in the United States is the stagnation of population growth. This issue can easily be seen by observing the cities in northeast Ohio. For example, the City of Akron has seen a population decrease of 0.6% from 2010 to 2017. Cleveland has seen an even greater population decrease of 2.6% within the same time (census.gov). Some of the population that left these cities moved into areas that are just outside of the city but within a distance that can still benefit from the Central business district of these cities. This growth of the suburban areas of Ohio is an example of sprawl.

The theory of urban location predicts that households will move to areas that offer the best amenities that match the household preferences (Straszhem, 1987). The households that have left the cities of Cleveland and Akron left to live in areas that they believe have greater benefit than original locations. Reasons why households might value an area more than another could include the quality of the school system, the quality of the environment of the area, and the overall quality of the neighborhood. If households hold an area in greater value because of one of its characteristics, then such characteristics would be considered an amenity. Areas with a greater amount of characteristics that would be considered amenities would be valued higher than an area that lacks such amenity. Because of the greater valuation, households would be willing to pay more to live in that area.

An infrastructure focus that many cities in the United States have taken up recently is the creation of bicycle and recreational areas. One example, in Summit County, that fits the focus of bicycle and recreation is the “Ohio Erie Canal Towpath.” This Towpath is a network of

trails and waterways constructed and maintained since the 1980s in Ohio. Summit County specifically sees the Towpath infrastructure pass through the county and many of its major cities as well. Since its creation it has become a central part of the culture and recreational time of the area. What effect does proximity to the "Ohio Erie Canal Way Towpath" have on housing Price? Using a hedonic housing price model, the effect of proximity to the Towpath on household willingness to pay for that area can be estimated to observe whether the presence of the Towpath is considered to be an amenity to the area or a disamenity.

Literature Review

The method for measuring the way that households value certain amenities and disamenities is based on the hedonic price analysis (Lancaster, 1966; Rosen, 1974).

Using this methodology several papers have analyzed the effect of bike lanes and trails on local housing prices. There is no consensus in the economic literature on whether bike lanes are actually considered an amenity by local populations. For example, Krizek, 2006 performed a hedonic analysis of bike lanes and trails in the cities of Minneapolis and St. Paul Minnesota. His analysis found that there is a negative effect of road side bike lanes on housing sales prices in proximity to the homes. There was an average effect of $-2,271 and $ -1,058 for houses, in cities and suburbs respectively, if the house was located within 400 meters from the bike lane. The only bile infrastructure with a positive effect on housing prices were non-roadside bike trails in cities. Houses located 400 meters closer would see a sales price increase of $509.85. The effect was $-240 in suburbs. This analysis concludes that different urban areas can value

goods differently, and that households may see the presence of bike lanes as a way to bring fears of crime in the local neighborhoods.

Other economic studies of bike lanes within metropolitan areas have found that the presence of bike infrastructure has a positive effect on housing sales prices. The areas analyzed in these studies include the state of Delaware (Racca Dhanju, 2006), San Antonio (Asabere Huffman, 2007), and Portland (Liu Shi, 2016). In the Delaware study, the presence of road side bike trails increased housing prices by an average of 8,886 dollars (Racca Dhanju 2006). The authors challenge the idea that bike lanes lead to an increase in crime. The San Antonio study found that the presence of bike trails lead to a 2 percent increase in housing prices. The Portland study found that housing prices would increase by 686 dollars every quarter mile closer a home is to Bicycle facilities. All of these studies conclude those bike infrastructures are amenities.

Following along the economic literature that analyzes the economic benefit of bicycle infrastructure, the economic analysis of greenways observes the economic effect that the presence of this type of infrastructure has on willingness to pay for households. A “greenway” is considered to be infrastructure such as bike paths and recreational trails that have an environmental component. In the study of bike lanes in San Antonio, the analysis found that the presence of a green way increased housing price by 5% (Asabere Huffman, 2007). The addition of the environmental factor leads to a further increase in the housing price. Other studies have also evaluated the effect of greenways on housing price. In an analysis of greenways in Austin Texas, the presence of greenways had the effect of increasing housing

price by 3.90%, 3.97%, and 1.13% in three different regressions (Nicholls Crompton, 2005). Another study of property values in Indianapolis finds that the presence of a greenway had the effect of increasing housing price by 4.16% (Lindsey 2004).

From this analysis of the literature, one can see a broad amount of findings that bicycle infrastructure and greenways have on housing price. The literature facilitates continued study in the area of bicycle lanes and green ways by allowing for studies for other areas. From the literature, each the different studies find that the presences of the amenity has a benefit that is different in each case. This allows for my analysis of the Ohio Erie Canal Way Towpath to be an addition to the economic observation in the study of economic effect of greenways.

Model

For this analysis, the economic model that I will create is an application of the hedonic pricing model. Through using this analysis, one is able to estimate the willingness to pay of the household. This analysis takes into account the characteristics of the good being purchased, in this case it is a household bought in a certain area, and measures the utility that the good brings to the household through a comparison is the price that is paid for the good. In my analysis of houses purchased in Summit County, the model that I will use is as follows.

Price=f(Housing Characteristics, Neighborhood Characteristics, Proximity to Amenity)

The housing characteristics refer to the variables that include the structure house. This includes the year built, bathrooms, bedroom, etc. The neighborhood characteristics refer to the

quality of the neighborhood or areas that the house is purchased. In this analysis, I will estimate this variable by creating a variable of the city area that the house is purchased. Finally the proximity to amenity refers to the proximity that the house is to an environmental good that is a certain distance from the home. In this analysis, I will be measuring the distance that a house is from the Towpath.

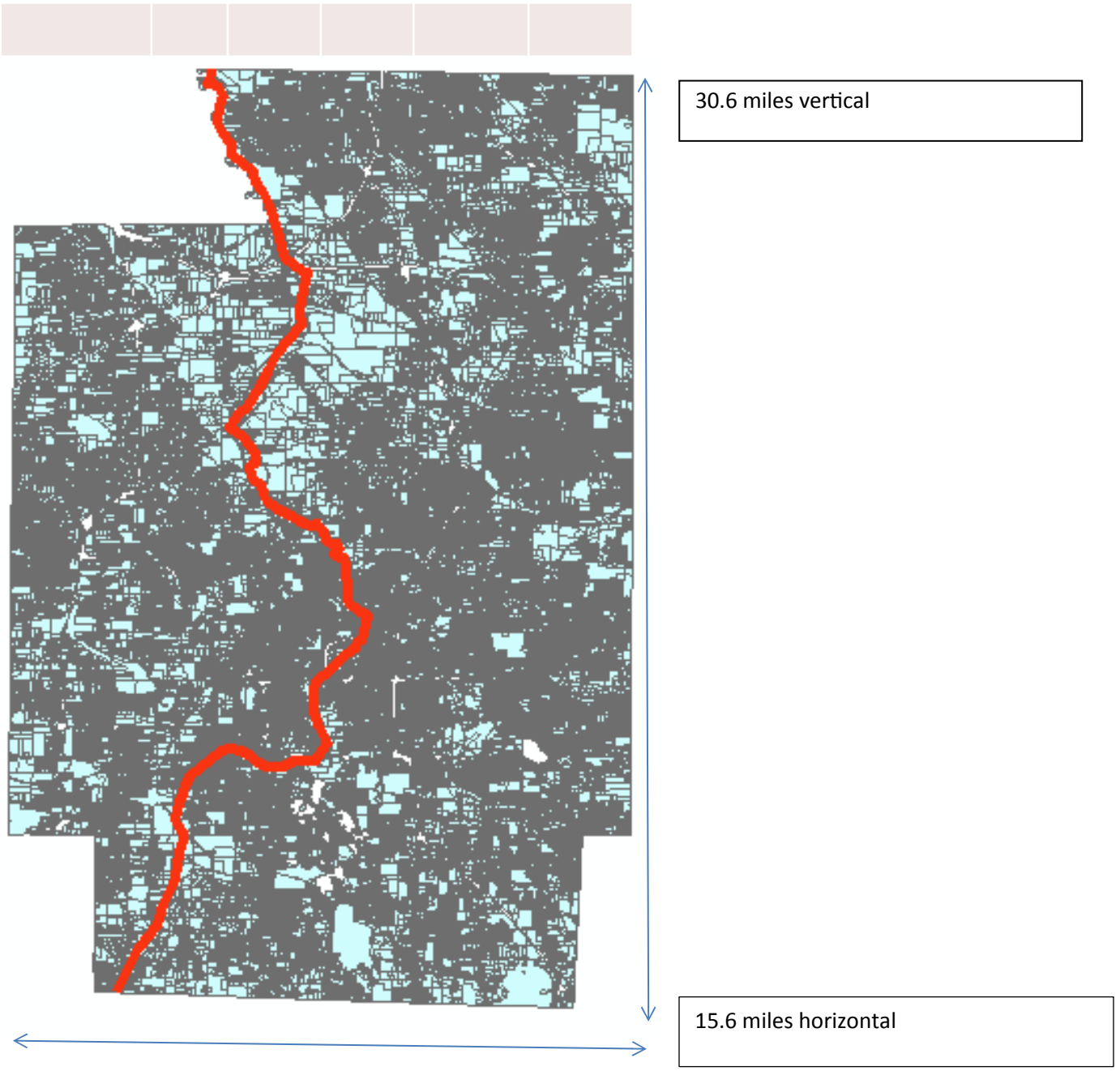
Data and Methodology

The data that I used in this analysis was provided through the Summit County Fiscal Office. From that data, there are over 170,000 household data observations that are provided for public use. In order to create a true analysis of proximity to the towpath, the data must be limited to the house sales that would be affected by proximity to the towpath. The Ohio- Erie Canal way towpath was an environmental project that began in the 1980s. The data in my analysis is limited to the 1990s to account for the completion of the Towpath construction. After the limitation of the data, the amount of household observations present in the regression is 141,547.

A basic OLS model is the method that is used to estimate the effect of the proximity to the towpath in this analysis. The econometric model is as followed, where $_i$ = individual sale of home:

Logprice =β_0 + β_{1i} yearbuilt + β_{2i} stories + β_{3i} rooms + β_{4i} bedrooms + β_{5i} fullbath + β_{6i} halfbath + β_{7i} familyrooms + β_{8i} sqft+ β_{9i} yearsold – β_{10i} proximity to the towpath + β_{11i} dummy variable for city + ε_i

Variable	N	Mean	Std Dev	Minimum	Maximum
MACENORTH	141547	0.000572	0.023915	0	1
SAGANORTH	141547	0.001088	0.032967	0	1
Twinsburg	141547	0.000191	0.01381	0	1
NORTONBAR	141547	0.177764	0.382316	0	1
BATH	141547	0.00385	0.061932	0	1
Clinton	141547	0.051425	0.220863	0	1
green	141547	0.000897	0.02994	0	1
HUDSON	141547	0.012279	0.110127	0	1
LAKEMORE	141547	0.000396	0.019887	0	1
MFALLS	141547	0.00178	0.042157	0	1
PENINSULA	141547	0.010943	0.104037	0	1
TALLMADGE	141547	0.003568	0.059624	0	1
RICHFEILD	141547	0.00231	0.048009	0	1
Akron	141547	0.112634	0.316146	0	1
year built	141547	1959.97	28.27239	1900	2018
rooms	141435	6.570707	1.669662	2	66
bedrooms	141547	3.116124	0.79023	2	43
full bath	141547	1.56151	0.709771	1	21
half bath	141547	0.465563	0.559937	0	11
family rooms	141547	0.304175	0.466555	0	7
story height	141547	1.445894	0.481475	1	3
SQFT	141547	1001.29	419.9526	120	9460
HOUSING PRICE	141547	152922.2	56260.9	52500	1345630
log price	141547	11.88277	0.32018	10.8685684	14.112373
YEAR SOLD	141547	2007.31	6.36116	1996	2019



Another type of data that is provided by the Summit County Fiscal Office is GIS data. For this analysis, GIS will be used to measure proximity from every household in Summit County to the closest point of the towpath. With this data and the process of ARCGIS, I was able to create a data table that is able to be merged with the household data and regressed in SAS. The figure above is a layer map created using ARCGIS. The red line represents the path that the

Towpath takes through Summit County. The grey areas are parcels of land that are considered residential property.

Results

Variable	Parameter Estimate	t Value	
Intercept	10.0124***	84.04	
year_built	0.00042781***	24.64	
rooms	0.02193***	62.41	
bedrooms	0.02263***	34.8	
fullbath	0.12441***	165.9	
halfbath	0.09697***	122.86	
familyrooms	0.066***	70.93	
story_height	0.22864***	205.52	
Sqft	0.00032875***	260.53	
year sold	-0.00004234	-0.74	
Proximity to the towpath	-0.00426***	-20.83	
MACENORTH	-0.00447	-0.29	
SAGANORTH	0.01349	1.22	
Twinsburg	0.04871	1.86	
NORTONBAR	-0.00873***	-7.85	
BATH	0.00000127	0	
Clinton	-0.02404***	-14.27	
Green	-0.02629**	-2.17	

HUDSON	-0.0197***	-5.94	
LAKEMORE	-0.02077	-1.14	
MFALLS	0.01293	1.5	
PENINSULA	0.00754	2.13	
TALLMADGE	0.01434***	2.36	
RICHFEILD	0.00375	0.5	
Akron	0.00047928	0.4	
R-Square	0.8185		
Significance	*,**,***	90%,95%,99%	

From the table of results of the OLS hedonic regression, the observation that is seen for the estimated coefficient for the proximity to the towpath comes to -0.00426***. This coefficient is interpreted, that every mile that the house is located one mile away from the Towpath housing price decreases by 0.426%. This also means that every mile that a house is located closer to the Towpath housing price increases by 0.426%. In dollar amounts, the effect of locating one mile closer to the Towpath increases the housing price by $626. The dollar amount is calculated through multiplying the coefficient value and the average sales value of houses within Summit County. This result follows the economic literature that proximity to a greenway has a positive effect on housing price. The magnitude of the effect is less than that found in the economic literature. One reason for this may be due to the amount of investment put into to the green way. This hedonic regression does not take into account the development of the green way and the amount of other amenities that are present within or are close to the green way.

The Housing variables follow closely to the signs predicted in the econometric model. All of the variables are positive and have a t value that is well within the level for significance at 99%. The only

value that is not significant is the value for year sold. This means that from the OLS estimation the amount time after the Towpath was completed does not have an observable effect on the willingness to pay for the household. When it comes to the location dummy variables, the results are mixed. Only some of the Dummy variables have a value that is statistically significant. These variables include the Norton and Barberton, Clinton, Green, Hudson and Tallmadge variables. Out of these, only the area of Tallmadge had a positive effect on housing prices. The rest of the areas with significant values had a negative effect on housing prices. One limitation of this method of location is the size of the area for the variable. By using the zip code for the location, the regression does not take into account the smaller neighborhood and school district areas. Further analysis in the effect of the Towpath should use variables that take into account a more local cluster of houses.

Conclusion

From my analysis of the effect of the Ohio Erie Canal Way Towpath, I find that the effect of proximity to the Towpath has a positive effect on housing prices. The hedonic regression that I perform within this paper finds that every mile a house is located closer to the towpath, willingness to pay increases by 0.426% or $626. The result follows the economic literature in that the effect of green ways has a positive effect on the sales price for housing.

A policy suggestion that would follow from this research would be to continue to invest in the Towpath infrastructure to increase the benefit that households find in this amenity. One form of investment that would bring more value to the Towpath would be the introduction of service oriented business that operates along or in close proximity to the Towpath. These businesses would be able to provide the individuals that utilize the towpath services that would

make each use of the towpath more valuable. Another suggestion would be to expand the towpath to more areas. This would increase the value of houses because more households would be in closer proximity to the towpath.

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https://www.census.gov/quickfacts/fact/table/akroncityohio/PST045217

https://www.census.gov/quickfacts/clevelandcityohio

Appendix 1

Table of Variables

Variable	Description	Source
MACENORTH	Dummy variable for Macedonia and Northfield zip code	Summit County Fiscal office
SAGANORTH	Dummy variable for Sagamore Hills and Northfield	Summit County Fiscal office
TWINSBURG	Dummy Variable for Twinsburg zip code	Summit County Fiscal office
NORTONBAR	Dummy Variable for Norton Barberton Zip code	Summit County Fiscal office
BATH	Dummy Variable for Bath zip code	Summit County Fiscal office
CLINTON	Dummy Variable for Clinton zip code	Summit County Fiscal office
GREEN	Dummy Variable for Green zip code	Summit County Fiscal office
HUDSON	Dummy Variable for Hudson zip code	Summit County Fiscal office
LAKEMORE	Dummy Variable for Lakemore zip code	Summit County Fiscal office
MFALLS	Dummy Variable for Munroe Falls zip code	Summit County Fiscal office
PENINSULA	Dummy Variable for Peninsula zip code	Summit County Fiscal office
TALLMADGE	Dummy Variable for Tallmadge zip code	Summit County Fiscal office
RICHFIELD	Dummy Variable for Richfield zip code	Summit County Fiscal office
AKRON	Dummy Variable for Akron zip code	Summit County Fiscal office
YEAR BUILT	Variable for year the house was built	Summit County Fiscal office
ROOMS	Variable for number of rooms	Summit County Fiscal office

BEDROOMS	Variable for Number of bedrooms	Summit County Fiscal office
FULL BATH	Variable for number of fullbathrooms	Summit County Fiscal office
HALF BATH	Variable for number of half bathrooms	Summit County Fiscal office
FAMILY ROOMS	Variable for number of family rooms	Summit County Fiscal office
STORY HEIGHT	Variable for number of stories	Summit County Fiscal office
SQFT	Variable for base sqft	Summit County Fiscal office
HOUSING PRICE	The housing sales price	Summit County Fiscal office
LOG PRICE	The log of the housing sales price	Summit County Fiscal office
YEAR SOLD	The year that the house was sold	Summit County Fiscal office
Proximity to the Towpath	Distance from the house to the towpath in miles	ARCGIS created with data from the summit county fiscal office.