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Relationship between Crime and Housing Values

Senior Project

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Abstract

Crime is problem in many neighbor around the world. Not only does it present problems for public safety, it can have negative effects on property sales. Past studies and myself have examined this relationship between crime and housing values using the hedonic housing price model. The data was gathered from the City of Akron Geographic Information Systems (GIS) which updates this information on a regular basis and is extracted from parcel information available through the Summit County Fiscal Office. The crime data was gathered through the Akron Police Department and Fairlawn Police Department. With this information, I was able to get housing data from Fairlawn and Akron Ohio from the year 2018 and apply it to my research. Using an OLS model, I have proven that crime does effect house values. Based on the results, crime does have an effect on housing prices and housing characteristics. Housing values drop when crime increase in their community. House values in Akron are worth a lot less near Seiberling and David Hill compared to the house values in Fairlawn near Copley.

I.   **Introduction**

If you were to ask a home buyer what they think is most important in a home or neighborhood, I expect to hear things like better schools or a nice area. When people say "nice area" do they mean a place with nice houses or a place where there are low crime rates? I always ask myself why people would spend more money in areas that have low crime rates. Is it because individuals would rather move to a place with higher property and willing to spend for the security knowing they would be safer. That's why I wanted study "Do Crime Rates Affect Housing Prices"

When it comes to crime, there have been an increase in the number of sources to help find where crime has taken place in your neighborhood. Ashley Chorpenning a personal finance writer and content creator, states, "Sites such as Crime Reports and Spot Crime collect police and crime report information. You can simply type in your address or potential address and review all of the crimes that have been committed in your area. These sites break down the type of crimes committed as well as the dates they occurred" (Chorpenning). Even though crime is very unpredictable, there are websites to help find crime or statistics in your area.

Residents tend to avoid dangerous criminals by going outside less or move elsewhere, but criminal activity can shift between neighborhoods in ways that can be hard to track because it is unpredictable. That's why I wanted to focus on two cities in Fairlawn and Akron Ohio. By using the one zip code in each city, this will help filter the crime rates and housing values into a specific location. For this research, I located data from the Akron Police Department, Fairlawn Police Departments, and Summit County Fiscal Office. Using these sources, I was able to get data of these two variables to know what price the house was being sold in Fairlawn and Akron and where the crimes were taken place in each community.

According to Area Vibes, a website that tracks crime in a specific area, "Akron, OH crime rate is 82% higher than the Ohio average and is 79% higher than the national average. Looking at violent crime specifically, Akron, OH has a violent crime rate that is 134% higher than the Ohio average and 77% higher than the national average. For property crime, Akron, OH is 75% higher than the Ohio average and 79% higher than the national average (Area Vibes 2019). Knowing that Akron has a high crime rate, would that affect housing prices in Akron.

II.   Literature Review

Past studies have examined the relationship between crime and housing values using the hedonic housing price model and spatial analysis. Lynch & Rasmussen (2001) wanted to test the impact on crime on housing prices, housing characteristics, and neighborhood characteristics in Jacksonville FL 2001. In order to test their hypothesis, they used the hedonic price model and data drawn from Multiple Listing Service (MLS) to measure housing characteristics and housing values. For their crime data, they went on the Jacksonville police department. In order to get data on neighbor chacteristics, they used Equifax Data. They could find latitude and longitude of each house in the sample using a geographic coding program and one-mile radial distance is swept around each observation to generate the neighborhood characteristics. Their model focused on the selling price of the home, neighborhood characteristics which includes park, and housing characteristics. Their results suggest that both violent and property crime has a trivial effect on the price of the average home sold in the Jacksonville, FL. A 1% increase in property crime increase housing values by 21%, and a 1% increase in violent crime increase housing values by 18%. When compared with Pope and Pope (2012), they wanted to find the relationship between crime and property values from 1990 to 2000 at the zip code-level in nearly three thousand urban zip codes throughout the United States. This is very similar to what I am conducted, but mine is

on a much smaller scale. The crime data comes from the FBI's Uniform Crime Reports. The housing data comes from a commercial vendor who provides home price indexes following the Case-Shiller (1987) methodology. Just like the other papers on housing, they used the hedonic price model to come up with their analysis of the impacts of crime values. For their model, they used the Case Shiller Index to find their results which is based on repeat sales for homes where physical housing characteristics are differenced away. Using the Case Shiller Index, they found that zip codes in the top decile in terms of overall crime reduction saw property value increases by 19%. In Bayram and Prentice (2018), they analyzed, crimes committed against persons and crimes committed against property in metropolitan Melbourne and regional Victoria in Australia in 2019. For their analysis, the crime data were obtained from the Victorian Crime Statistics Agency (CSA) and they used a hedonic regression model to estimate the effect of crime on property values. Housing characteristics and income were also included in their model to see if that would influence housing values. They found that income plays a significant rule in house values and increase house values by 24% in Victoria and increase house values by 19% in Melbourne. Crimes against the person increase house values by 29% in Victoria and Melbourne by 22%. Senick (2018), analyzed the spatial impact between 10 different types of crimes and their effects on nearby housing values. By using the OLS estimation strategy and hedonic price model, he incorporates a high school area controlling variable to focus on a particular crime within a mile and half mile of the school and connects that to the house property value. His results were that violent crimes tend to be more damaging than property crimes. A 1% percent increase in violent crimes decrease the house value by 47% and a 1% increase in property crime decrease the house value by 43%.

It is the goal of this paper to further the research done in this previous literatures, but also to improve upon it in a new way. This study will examine crimes at an individual level, but with a focus on only two cities. Studies that have examined data at county or nationwide levels need to account for variation amongst at all the cities, but a singular city makes it easier to track crime and house values. That's why I am going to focus on a one area in Akron and Fairlawn and pick schools from each zip code. By using the zips codes in those cities, this will help filter the crime rates and housing values into a specific location. This will help track of how many houses were sold, the price of the house, and where the crime was taken place. Even though there models were different in comparing crime, housing values, and housing characteristics, they all had similar results saying that an increase in property crime and violent crime can make housing values drop. Also how housing characteristics play a huge role regarding the price of the house.

III.   Theoretical Model

The hedonic price model helps identify price factors according by the price of a building and used to estimate the extent to how each factor affects the price of the home. Houses have a variety of traits such as the number of rooms, overall size the number of bathrooms, proximity to schools. A hedonic regression equation treats these characteristics separately, and estimates the impact of each housing characteristics. This model will help me with my research on how housing characteristics will affect crime rates and house value. The basic Hedonic Model looks as follows:

$$P_i = \beta 0 + \beta_1 X_1 i + \cdots + \beta_7 X_7 + \varepsilon_I$$

In this model, Pi represents the price of the house and β represents the explanatory variable that adds or subtracts to the sales price. Even though this model is mostly used to

quantify how variables such as pollution or to understand people's preferences in the housing

market when it comes to number of bathrooms or bedroom, It can also be the best way to

determine the effect crime has on housing values. "While quantitative information regarding

crime exists (crime rate, density, etc.) how people value crime, or more specifically for this

paper, how much individuals would pay to not be near crime is inherently qualitative" Senick

(2018). The use of the model in this area of study is not only understandable, but is commonly

used when studying house prices and crime.

Even though the model is very popular in this area of study, there are problems regarding

an inherent risk of omitted variable bias. There sometimes can be numerous unobservable factors

that can correlate with variables in the model. "If they are omitted from the regression, they

could influence the variables in the regression, thus distorting and biasing the results" Senick

(pg10-11, 2018). There are numerous examples of how this problem could be complicated in

research on crime like school districts, parks, or the average income in the neighborhoods could

affect the amount of crime in a given area. The problem of omitted variable bias is quite serious

because if your estimates are biased and inconsistent. It can have an effect on the signs of the

coefficients which can become unreliable. Hence your model fails. This is why endogeneity and

unobserved heterogeneity are such major problems when studying this subject.

IV.   Data

The majority of data included in this study was made available through databases kept by

the City of Akron Geographic Information Systems (GIS). The city updates this information on a

regular basis and is extracted from parcel information available through the Summit County

Fiscal Office. The crime data was extracted from the Akron Police Department and Fairlawn

Police Department. Since crime is a big category that can mean a number of things, I am going to

break down crime into two parts property crime and violent crimes. Property crimes can include theft, burglary, larceny, motor vehicle theft, shoplifting, arson, and vandalism. Violent crimes is classified by murder or rape, as well as crimes in which violence is the means to an end. By separating crime into two categories, it is to study what type of crime was happening in the two cities. I predict that violent and property crimes are going to have negative results because I expect house values to drop when crime increase

Depending on what school you go to in your zip code, can affect housing prices as well. I included four schools Seiberling, Firestone, David Hill, and Copley in my research but had to drop Firestone because of omitted variable bias. I predict that Seiberling and David Hill are going to have negatives results and Copley going to have positive results. For example, Fairlawn is known to be a good community with a low crime rate. Would someone pay more for their house so their child can go to a good school? If you were to move in a neighborhood where the house prices are very low, would that affect if crime by those are schools are high as well?

Another variable that I am going to include in my regression is the age of the house. It's interesting that some buyers would absolutely love an older home because of its unique characteristics, while another buyer will not love the same home for the same characteristics. I predict that it is going to have negatives results. I want to know when a house gets older would that make the value of the house depreciate in value. The material of the house is also an important factor that can influence house pricing and I predict that is going to have positive results. If a house is made of brick would that incentivize people to spend more money since its better quality? Houses with chimneys can also add value to the house. Buyers that want a big house expect a fireplace and may be willing to pay more for a home with one.

The number of bedrooms and bathrooms can also influence the price of the house and I predict that both will have positives results. If you have a great three bedroom house and a two bathrooms, would that affect the price of the house? Understanding what causes the price of the house is very important. These factors can help decide if staying in the neighborhood of someone`s choosing worth it or not.

Price $= \beta0 + \beta1$bedroom $+\beta2$ bathroom$-\beta3$ property crime$-\beta4$violent crime$- \beta5$house age $+\beta6$ brick $+\beta7$ chimney

Price $= \beta0 + \beta1$bedroom $+\beta2$ bathroom$-\beta3$ property crime$-\beta4$violent crime$- \beta5$house age $+\beta6$ brick $+\beta7$ chimney $– \beta8$Seiberling$+ \beta9$Copley $-\beta10$ David Hill

Property crime $= \beta0 +\beta1$ house age

V. Results

		Results on Housing Values	
		Coefficient (t-stat)	
variables	model 1	model 2	model 3
bedroom	16,788 (4.22) **	16,788 (4.22) **	~
bath room	12,745 (2.54)**	12,745 (2.54)**	~
p_crime	(-14,193) (-2.76) **	(-14,193) (-2.76) **	~
v_crime	(-15,470) (-3.62) **	(-15,470) (-3.62) **	~
houseage	(-8923) (-1.38)	(-8923) (-1.38)	(.1275) (1.52)
brick	9,826 (2.29) **	9,826 (2.29) **	~
chimney	(10071) (2.93) **	(10071) (2.93) **	~
seiberling	~	(-9,251) (-2.63) **	~
copley	~	11630 (2.17) **	~
david hill	~	(-7,351) (1.04)	~
R-squared	0.3801	0.419	0.315
adjust R-squared	0.3743	0.402	0.296
f-value	56.36	58.36	49.19
observations	574	574	574

Note: All T-Values given in absolute value. **, respectively, denote statistical significance at the 90% confidence interval.

The table above shows the variables that are affected by house price in Akron and

Fairlawn. Whenever a bedroom is added to the house, the housing price increase by 16,788

dollars. If you own property in an area populated mainly by families. Adding an extra room to a

two bedroom home will certainly add value. Whenever a bathroom is added to the house, the

housing price increase by 12,745 dollars. I expected this to happen since homes with more

bathrooms tend to be larger and more square footage usually means a more expensive homes.

Homes with more bathrooms might also have other more expensive features. An increase in

property crime in both areas, decrease the housing price by 14,193 dollars. A person would

suspect that as crime increase in a neighborhood, house values will drop since no one would

want to buy or rent a house for a high price if crime is so common in that neighbor. An increase

in violent crime in both areas, decrease housing price by 15,470. When property crime increase,

housing price will decrease 13,728. As I said before, houses would not sell for a lot of money if

crime is common in that neighborhood. House age is insignificant since the independent variable

house values has no effect on the dependent variable. If a house is made of brick, the housing

price will increase by 9,826 dollars. Brick homes are very sturdy and protects your home from

damage during particularly harsh storms. It's fireproof, termite proof, and durable over a long

period of time. A house with a chimney, increase the housing price by 10,071. If you live in a

high-end home, buyers expect a fireplace and may be willing to pay more for homes with one.

Fireplaces are more desirable, and therefore more valuable, in cold climates. Based on the

results, crime does have an effect on housing prices and housing characteristics. Housing values

drop when crime increase in their community. The second model difference from the first model

because the schools from each city were added in as a way to measure the relationship between

house values and schools. Seiberling and David Hill are schools in Akron and Copley is a school

in Fairlawn. Living by Seiberling Elementary, the house value will decrease by -9,251 dollars.

Living by Copley High, the house value will increase by 11,630 dollars. The David Hill variable

is insignificant since the independent variable which is house values has no effect on the

dependent variable. Based on the results, housing characteristics and crime play a role in house

values. Also the house values in Akron are worth a lot less near the schools compared to the

house values in Fairlawn near Copley. You can assume that the crime rate is much higher in

Akron compared to Fairlawn. The third model on if property crime has an effect on house

values? Since the house age was insignificant, I wanted to test it against another variable to see if

it would be significant. The results were insignificant because its numerical value may not be

zero or the predictor do not have significant information about response variable. In the others research, they didn't use house age as a dependent variable. They instead use vacant as a dependent variable and found that vacant homes are significant. I was almost right in my hypothesis when it came to which variables were to have a positive or negative relationship. The only variables that I hypothesis wrong were house age and David Hill.

VI.   Conclusion

This paper examines the link between crime and property values. This paper focuses on two cities in Ohio Fairlawn and Akron. By using the zips codes in those cities, this will help filter the crime rates and housing values into a specific location. Previous studies have discussed the relationship between crime and house values in different areas around the world. When comparing crime, housing values, and housing characteristics, they all had similar results saying that an increase in property crime and violent crime can make housing values drop. Based on the results, crime and housing characteristics besides house age play a role in the value of the house. Schools in the communities in Akron and Fairlawn also have an effect on crime. If you live by a school and in Fairlawn, house values increase and if you live by a school in Akron, house values drop. With that being said, this study recognized that housing values have a significant impact on schools. I did not include the proximity to other amenities or disamenities of the surrounding area, such as parks, churches, or entertainment venues. This would require advanced knowledge of GIS and would also add another step to the already lengthy data collection process. Crime serves as one of the most important influences for change in structure of a particular community. City officials in Akron and Fairlawn have to recognize that crime is a problem and will continue to be a problem and focus on the reasons why crimes happens.

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Descriptive Statistics							
Variables	Description	N	mean	standard deviation	min	max	source

house value	Price of the house on sale	574	15615	13861	7391	716375	Summit County Fiscal Office
house age	The age of the house	574	2.43	0.354	2	4	Summit County Fiscal Office
chimney	Houses with chimneys	574	1.62	0.41	1	3	Summit County Fiscal Office
brick	Houses made of brick material	574	2.77	1.35	0.51	4	Summit County Fiscal Office
property crime	number of property crime in Akron and Fairlawn	574	4.69	2.51	2.43	7	City of Akron and Fairlawn Police Department
violent crime	Number of violent crimes in Akron and Fairlawn	574	0.56	1.28	0.89	3	City of Akron and Fairlawn Police Department
bedroom	number of bedrooms in the house	574	0.29	1.19	0.61	2	Summit County Fiscal Office
bathroom	number of bathrooms in the house	574	1.7	3.17	1.37	5	Summit County Fiscal Office
Seiberling	School in Akron	574	1.49	2.9	1.16	4	Akron Office of Information Technology
Copley	School in Fairlawn	574	1.27	2.49	1.05	4	Akron Office of Information Technology
David Hill	School in Akron	574	1.08	2.21	0.89	3	Akron Office of Information Technology