**Estimating the impact of crime risks on property values**

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Abstract

In 2008, Leigh Linden and Jonah E. Rockoff estimated the value of homes on average dropped by 4 percent within 0.1 miles of an offender in Mecklenburg County, North Carolina. This paper follows the research of Linden and Rockoff and examines the impact of sex offenders’ proximity and density on property values in Warren County, Kentucky, using 16,814 housing records from 2012 to 2021. I have utilized fixed effects models for the cross-sectional data in this paper. I find a statistically significant coefficient at a 0.1 percent significance level in a drop of the sale price on average of 4% and 9% with the presence of sex offenders within 1 mile and 0.1-mile radius of a house, respectively, in Warren County, Kentucky.

*I would like to thank Dr. Stephen Locke for his generous support, guidance, and assistance throughout the project. Additionally, I would like to thank Dr. David Zimmer and Dr. Christopher Biolsi for taking the time to serve as readers.*

Introduction

The relationship between property values and crime risk can be likened to that of two sides of a seesaw, wherein an increase in one side is typically accompanied by a decrease in the other. The objective of this paper is to examine the impact of sex offenders on their neighborhood’s property values. A person who has committed a sex crime, which may include rape, sexual assault, child molestation, child pornography, or an attempted commission of any of these offenses, is commonly referred to as a sex offender. People always fear crime and are risk-averse to it which leads to their willingness to pay towards not being a victim or involvement being high[[1]](#footnote-1). In this paper, I investigate the crime risk of sex offenders within 1 mile and 0.1 miles from a house and its impact on house sale prices in Warren County, Kentucky. The information about sex offenders is easily accessible in every state to every individual online on the sex offender’s registry.

The Jacob Wetterling Crimes Against Children and Sexually Violent Offender Registration Program was established in 1994 after the abduction and disappearance of Jacob Wetterling in 1989. Megan's Law, named after seven-year-old Megan Kanka, who was raped and murdered by a prior sex offender in her neighborhood, requires public notification of convicted sex offenders' location and description. Adam Walsh's abduction and murder in 1981 led to the creation of the National Center for Missing and Exploited Children. These events spurred the development of laws and programs aimed at protecting children from sexual offenses and violent crimes.

In Linden and Rockoff (2008), they have utilized the registration date of the current address of a sex offender which allows them to use it as a close approximation of moving into the current address. Though all states have some of own regulations of sex offenders’ registry information, reporting a sex offender's current address is a mandatory requirement in all states according to Sex Offender Registration and Notification Act (SORNA)[[2]](#footnote-2). I have used these addresses and looked at the locations of the houses within a mile and a tenth-of-a-mile radius to find the density of offenders nearby and their impact on those neighborhoods.

As of February 2023, there are a total of 786,838 sex offenders in the United States. Though there was a decline in the number between 2021 and 2022, this year the total number has increased by about three percent[[3]](#footnote-3). According to available data, the states of Texas and California have the highest number of registered sex offenders in the United States, with 100,000 and nearly 62,000 individuals, respectively. In contrast, the District of Columbia maintains the lowest number of registered offenders in the country, with slightly over 1,000 individuals, while Vermont and Rhode Island each have roughly 1,000 offenders. Kentucky's registry shows a total of 9,362 registered sex offenders, resulting in a rate of 207 per 100,000 residents. This study focuses on Warren County, Kentucky, where a total of 142 registered sex offenders have been identified.

The results of this study indicate that the presence of a registered sex offender within a tenth of a mile can result in a property value decline of approximately 9 percent, or $18,977, on average. This effect, however, is observed to decrease to 4 percent or $8,434 when the radius is increased to one mile.

Literature Review

Numerous papers have documented the inverse correlation between crime rates and housing prices across different geographical locations and property types. Richard Thaler's (1978) early study identifies a negative relationship between property crime rates and property values. Thaler's estimates suggest that a one-standard-deviation increase in property crime per capita results in a reduction of approximately 3% in home values. The study uses data from Rochester, NY, in 1971 and operates a simple hedonic pricing model for its analysis. However, the use of data from a single year may result in omitted variable bias.

Steve Gibbons (2004) conducts a study to investigate the effect of domestic property crimes on housing prices. The study utilizes data from 10,464 properties in the inner London area between December 2000 and July 2001, with crime data from April 1999 to March 2001. Gibbons finds that for a one-standard-deviation increase in the local density of criminal damage, property values decreased by 10%. To address the spatial variation in the data, Gibbons employs a semiparametric model to estimate the linear parameters in the hedonic model.

These studies, along with other similar studies, may face potential omitted variable problems both in the cross-section and time series. It is probable that in a cross-sectional analysis, crime rates may exhibit a correlation with various other geographical features that researchers may not be able to sufficiently regulate or adjust for. Over time, changes in crime rates may correspond with changes in the composition and characteristics of neighborhoods, potentially impacting the value of properties located in a particular area[[4]](#footnote-4).

Limited research has been conducted to explore the link between the residential locations of sex offenders and property values. Larsen, Lowrey, and Coleman (2003) investigate the correlation between housing prices and proximity to the residence of a registered sex offender. The researchers analyze sales data in Montgomery County, Ohio for the year 2000. Their findings reveal that properties situated within a radius of 0.1 miles from a sex offender's home sold for 17.4% less, and this significant effect seems to extend up to 0.2 miles from the offender's residence, albeit with a lesser impact. Although my study shares similarities with Larsen et al. paper in terms of the empirical question and data type used (i.e., cross-sectional), their empirical approach faces the same potentially biased mentioned above.

Jaren C. Pope (2007) studies the effects of sex offenders on property values in Hillsborough County, Florida. He documented that the presence of an offender within a 0.1-mile radius of a property resulted in a 2.3 percent reduction in home sale prices, which translates to an average of $3,500 given the area's average home value by using a simple cross-sectional approach and spatial-temporal identification strategy to control for neighborhood and time-fixed effects. Pope's study differs from Linden and Rockoff's (2008) by incorporating the residential histories of offenders, allowing him to observe their arrivals and departures from neighborhoods. Pope’s results show that with an offender’s arrival, the negative impact on the sale price occurred and disappeared once the offender left the neighborhood, indicating a causal relationship between sex offenders and local property values.

In their study, Linden and Rockoff (2008) investigate the relationship between the presence of a sex offender in a neighborhood and the corresponding decline in home prices. To achieve this, they use hedonic estimation methodology and integrate data from the housing market with information from the North Carolina sex offender registry for Mecklenburg County. By utilizing both intertemporal and cross-sectional variance in the presence of a sex offender, they establish a four-year window surrounding the offender's arrival, including two years before and two years after, for their analysis. Their empirical approach employs a difference-in-difference strategy that controls for neighborhood and time-fixed effects before and after the arrival of an offender. Their study reveals a statistically significant decrease of 4% in housing prices within a tenth of a mile of the offender's residence when the offender moves into a neighborhood. No statistically significant impact was found on housing prices located further away from the offender's home. However, I employ a slightly different approach in that I utilize simple cross-sectional data using neighborhood, year, and housing characteristics fixed effects.

Caudill, Affuso, and Yang (2015) use a hedonic spatial error model to investigate the effect of proximity to sex offenders on property values in Shelby County, Tennessee. They estimate that the presence of an additional offender within a one-mile radius results in a decline of approximately 2% in property values. Moreover, their study indicates reduction in total housing value within 0.1 of a mile from a sex offender's residence is roughly equivalent to 14% of the house value, while within a one-mile radius, the loss is approximately 7%. However, they use the Zip code dummies to analyze the neighborhood effects, I use the census tract dummies. My study investigates the same radii as them but only those offenders who have lived in the proximity of the houses before the houses sold.

Peiyong Yu's (2016) study examines the influence of sex offender proximity on property values in Rochester, New York, utilizing a dataset comprising 19,702 screened single residential housing sales data spanning from 2000 to May 2013. Employing both fixed effects and semiparametric models, the author determines that homeowners situated within 0.1 miles, between 0.1 and 0.2 miles, and between 0.2 and 0.3-mile radii of a nearby sex offender experience property value declines of approximately 7%, 6%, and 3%, respectively.

In this study, I use fixed effects with extensive cross-sectional county-level data, integrating the sex offenders’ registry data with detailed housing sales and characteristics, the house sold year from 2012 to 2021, and census tract dummies for the neighborhood effect.

Data and Empirical Analysis

This paper is based upon two sets of data regarding the information on sex offenders and property data of Warren County, Kentucky. The dataset of the sex offender registry contains basic demographics, conviction date, current address, the status of supervised release, victims' age, and type of offense. For Warren County which includes the city of Bowling Green, there are 142 offenders registered till December 2022. As of February 2023, Kentucky has 9,362 offenders, and the rate per hundred thousand residents is 207. In Warren County, the ratio of residents to sex offenders is 985[[5]](#footnote-5) to 1. The data end up with 110 offenders after removing homeless, offenders with county jail addresses, and missing addresses which could not be included in geocoding to locate the offenders.

Figure 1 shows the distance of the nearest sex offender from a house located within a 1-mile radius in the x-axis and the property sale price in the y-axis. Without including any additional controls, the red regression line illustrates the upward trend of the sale price by the increase in distance of an offender from a property. On average, an increase in the distance from the offender's location is associated with a rise in property value.

The second source of data is the 16814 property records of Warren County that provide details on housing characteristics, sale information, latitude, and longitude, census tracts, and other information regarding each house. **Figure 1**

Chart, scatter chart

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I have generated the variables for the houses within a 1-mile and 0.1-mile radius to find the density of offenders near a house using the coordinates of houses and offenders. I have looped through each house to each offender to find the offenders who have lived within 1 mile and 0.1-mile radius of the houses before the house was sold using the off-market date of a house and conviction date of offenders. In the analysis, this study includes only the houses that have been sold, after merging the variables of interest, filtering the data for missing values, and ending up with 14450 observations. Moreover, I have generated the nearest offender distance variable within 1 mile of each house. In the dataset of the housing characteristics, I have dummy variables for age 5 or less to age 81, new or under construction, appearance, bedrooms, full bath, half bath, square feet of 1000 to 6000, lot size, air conditioning with electricity, and attached garage.

**Figure 2**

Map

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I use the 0.1 miles radius to see the offender’s presence within the radius from a house in general on google map.

As a dependent variable, I use the natural logarithm of the sale price. On the other side as an independent variable, I include a set of housing characteristics, dummies for sold months and years, and dummies of each census tract for fixed effects. I have used four models to measure the impacts of sex offenders’ presence within a mile radius on a house sale price. Model 1 is without any control variables, the second one incorporates controls for housing characteristics, the third one includes housing characteristics and sold year and month, and the fourth model controls housing characteristics, month, year, and census tract variables.

Sex offenders generally relocate to regions with lower property values. However, due to the correlation between the location of sex offenders and both observable and unobservable neighborhood traits, it becomes challenging to determine the impact of sex offenders on property values by simply comparing areas with and without them. From Figure 2, it could be assumed that registered offenders tend to reside in less favorable areas; in this scenario, they live in the same neighborhood. The property listing prices of the shown area are less than the mean value of Warren County[[6]](#footnote-6). It is unlikely that registered offenders could get a high paying job opportunities or have enough financial stability to maintain the living expenses of an expensive neighborhood. It is because employers are risk-averse to crime risks in their environment.

Linden and Rockoff (2008) use a difference-in-difference to investigate the before and after effects of an offender's arrival in a neighborhood. They use the date of registration of the current address as an offender's approximate arrival time in a neighborhood. However, there are no registration dates for the current address available in the Kentucky sex offender registry data. I have utilized fixed effects models for the analysis.

In the equations, sold price is the price of the house that was sold at that time, offendersLived1 is the density of offenders who have lived before the house was sold within a 1-mile radius, 13 age dummies of the house starting from age 5 years or less to age 81, beds are the number of bedrooms, fb, and hb are the number of a full bath and half bath, 14 square feet dummies, including the size of a house from under 1,000 to 6,000 and above square feet, lot size used, a dummy if the house has electricity running air-conditioned, a dummy for an attached garage, the number of units, the dummy for fair appearance, 11 sold month dummies, 9 dummies for sold years, and 18 dummies for census tracts. Moreover, I use the same models for a 0.1-mile radius in place of 1 mile. In that, the variable is offenders\_lived\_0.1 without changing any other factor.

Results

Table 1 represents the estimation results for the variable of interest offenders’ density within 1-mile radius from a house who lived in that neighborhood before the house was sold. To save space, I do not report all the dummy estimates for the age, square feet, year, and tract dummy variables here. However, the summary has attached in the appendix. The standard errors are shown as robust. Without any control in Model 1, it seems that on average, one additional offender's presence within 1 mile of a house tends to reduce the sale price by 11% which is statistically significant at the 0.1% level. Model 2 controls for housing characteristics, though the coefficients of explanatory variables are statistically significant except for bedrooms and lot size and both of these variables have very small coefficients. One additional full bath increases the sale price on average by 22%, and an additional half bath increases the sale price on average by 14%. Houses with electricity-powered air conditioning have 14% higher prices than those without electricity-powered ones. Houses value increase in the same 14% magnitude for the houses with attached garages compared to those without attached garages. Housing characteristics disappear the offenders’ negative impact here. Going forward including the year and month fixed effect in Model 3 estimates a statistical coefficient, which means that on average, holding constant housing characteristics, sold months, and sold years, one additional offender's presence within 1 mile reduces the sale price by 4%. Housing characteristics impacts drop 5%-1% among those variables. However, when the neighborhood fixed effect, tract dummies are included in Model 4, most of the variables are statistically significant. The negative impact of offenders is not different from zero when I control for the census tract and is statistically insignificant. Surprisingly, it could be that sex offenders tend to live in a neighborhood where the property value is low in which their presence is not impacting the property value of that neighborhood.

**Table****1 – Regression result with offenders who lived within 1 mile.**

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Table 2 demonstrates the impacts of sex offenders when they are within a tenth-of-mile radius of a house. In this table Model 1 shows that on average, an additional offender’s presence decreases the property value by 32%. Model 2 includes the housing characteristics which have around the same impacts as Table 1 except negative offender’s insignificant density coefficient. Model 3 indicates the higher negative impacts of an offender within a tenth of a mile drops the house value by 9% controlling housing characteristics, months, and years which is statistically significant. However, interestingly Model 4 of Table 2 has a statistically significant coefficient of the offender’s density variable when controlling for the census tract dummies. Model 4 estimates unstable and unreliable coefficients due to the high Variance Inflation Factor (VIF).

**Table 2 – Regression result with offenders who lived within 0.1 miles.**

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These high VIFs suggest that there is multicollinearity among these variables. Some census tract dummies are highly correlated which indicates multicollinearity in the model. Omitting tract dummies with VIF would help to address multicollinearity. I omit a few tracts dummies and find the coefficient of the offender density variable is negative and insignificant in this Model 4.

The adjusted R^2 for Model 3 is 0.78 which says 78% of the variation in the dependent variable is explained in this model, though Model 4 has adjusted R^2 of 0.81 but it is not include a big difference of variation in the analysis. I prefer Model 3 in both Table 1 and Table 2. The estimates of Model 3 are indicating that residential properties near offender locations are on average priced lower compared to other regions and offenders tend to live in low-property value areas within the county.

Linden and Rockoff (2008) find a similar result when they include neighborhood-year fixed effects and housing characteristics in the regression: the findings suggest that the control variables included in the regression analysis effectively account for most of the divergences between the areas in which offenders move and the rest sections of the county. After controlling for these variables, there are no significant differences in the cost of residential properties in proximity to sex offenders' locations as compared to other parts of their neighborhoods in their study before the offenders' arrival.

However, I have analyzed the offender presence dummy within 1 mile on the log sold price and incorporated the controls for housing characteristics, sold months and years, and census tract dummies in Table 3. The offender presence dummy is generated from the offendersLived1 variable. I have omitted the five tract dummies with high VIFs in this regression those are tract 212270115, 212270116, 212270117,212270118, and 212270119. The findings of this suggest that on average house value drop by 4.30101%4.3% with an offender’s presence nearby than no offender nearby in a 1-mile radius and the results are highly statistically significant. The adjusted R^2 of this regression is 0.81 which is the same as Model 4 in both Table 1 and Table 2 that indicate no change in variation from the earlier regression models. I have reported the robust standard errors in the regression analysis to account for the possibility of heteroscedasticity in the data.

**Table 3: offender presence within 1 mileTable

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Multiple R-squared: 0.8051, Adjusted R-squared: 0.8041

The key results from the analysis are that on average house prices drop by 4% with the presence of sex offenders within 1 mile, and when the radius is 0.1 miles, the sale prices reduce by 9% which is significant at a 99.9% confidence level. The reduction in the sale price within a 1-mile radius in dollar amount is $8,434; for a 0.1-mile radius, the amount is $18,977. However, offenders tend to reside in low-property-value areas.

Limitations

In a perfect world randomly assigned variables can provide a perfect causal relation between sex offenders and property values. Sex offenders would be residing in regions both higher and lower property values. Their presence and density would impact the property of that neighborhood. There would be detailed data on registered sex offenders' move-in and move-out dates, and their neighbors are aware of their presence and detailed information about them. However, in the real world, sex offenders are not distributed randomly as they are inclined to live in places where the property value is lower, and they are unlikely to spend high living expenses due to limited employment opportunities. Moreover, the data has limitations, and the sample size is small. 872 houses have an offender within a 0.1-mile radius, and among them, only 126 houses have offenders who lived nearby before the houses were sold. Even after controlling for a large number of explanatory variables, there may be other factors that are not included in the analysis that could affect the local property values. For example, there may be unmeasured environmental or social factors that could influence the relationship between property values and offenders’ density and proximity. Also, the quality and quantity of the data play a big role in employing an empirical methodology.

To better understand the relationship between offender density and proximity on housing prices, it may be helpful to conduct further analyses, such as checking offenders living in rented apartments or owned houses, examining spatial autocorrelation, endogeneity, measurement errors in data, unobservable variables or controlling for additional variables that may be affecting the relationship.

Conclusion

The findings of this study provide evidence that sex offenders not only result in direct expenses for their victims but also generate indirect costs for property owners and the wider society. In examining the study of Linden and Rockoff (2008), I have found that on average, property values drop by 4% and 9% within 1 mile and 0.1 miles of a house in Warren County, Kentucky. I used fixed effects regression models on the cross-sectional data for this study. Although the empirical findings are consistent with previous research, making direct comparisons is tough due to the use of different measures to assess sex offender concentration in each area. Specifically, this study uses the density of offenders within a 1 and 0.1-mile radius, along with housing characteristics, sold months and years, and neighborhood fixed effects, whereas Caudill et al. (2015) employ two measures of sex offender presence: distance to the nearest sex offender and the density of sex offenders within a 1-mile radius. This study shows that the proximity of a registered sex offender within a 0.1-mile radius leads to a 9% decrease in house value. In comparison, Caudill et al. (2015) found a 14% decline in housing prices for the same radius. This magnitude of estimate is also comparable to the value of 17% reported by Larsen et al. (2003) and the drop in house value of 7% within a 0.1-mile radius by Yu (2016).

Although Linden and Rockoff (2008) report a smaller estimate compared to my findings for 1-mile and 0.1-mile radii, a 4% and 9% drop in property value, respectively, the difference with existing studies on crime risk and property values may also be because the studies are undertaken for different locations and datasets.

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**APPENDIX**

Table

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**Homes.com listings price near the house shown in figure 2**

A picture containing diagram

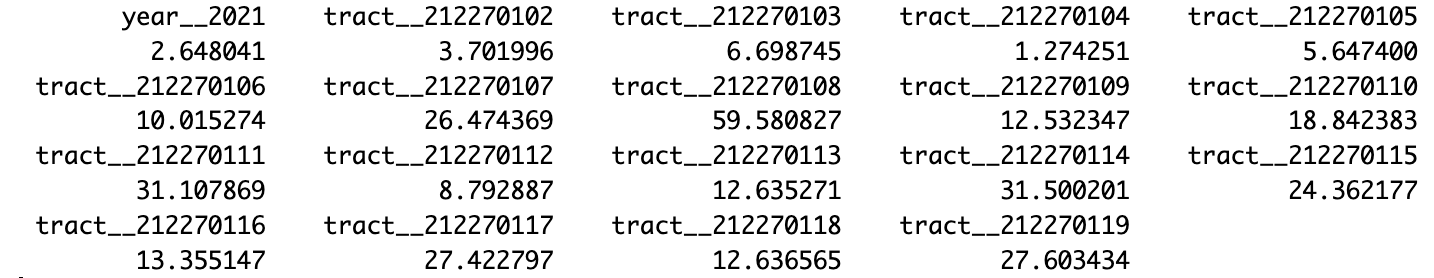
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**Variance Inflation Factor for the Model 4 tract dummies in Table 1**

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**Variance Inflation Factor for the Model 4 tract dummies in Table 1**

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**The regression summary of Table 1**

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**The regression summary of Table 2**

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1. Linden and Rockoff, “Estimates of the Impact of Crime Risk on Property Values from Megan’s Laws.” [↑](#footnote-ref-1)
2. “Sex Offender Registration and Notification Act (SORNA): Department of Justice.” [↑](#footnote-ref-2)
3. “How Many Registered Sex Offenders Are in Your State? - This article shows the registered sex offender number in all states, presents concentration of sex offender per 100,000 and information regarding sex offenders- published April 10,2023” [↑](#footnote-ref-3)
4. Linden and Rockoff (2008) mentioned about these assumptions.” [↑](#footnote-ref-4)
5. “U.S. Census Bureau QuickFacts. - the population of Warren County in latest census of July 2022” [↑](#footnote-ref-5)
6. “Bowling Green, KY Real Estate & Homes for Sale | RE/MAX and Homes” [↑](#footnote-ref-6)