# The Effect of Homicide on Local Rents

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An extended abstract...a work in progress!

The collateral effects of homicide—that is, tolls on individuals and communities experiencing homicides in addition to loss of life—are numerous. While previous work has documented impacts on children and intergenerational mobility, we explore the effects of violent crime on a different economic outcome. Specifically, we use a unique geocoded and timestamped data set of advertisements for rental housing to examine the effect of neighborhood homicides on local rent prices. Using a difference-in-difference approach, we find that homicide decreases the listed price of nearby rental housing. Homicide reverberates throughout communities, affecting various aspects of individual and collective experience. Additionally, since homicides, and crime more generally, are geographically concentrated, understanding their wide-ranging effects helps explain broader, systemic differences across neighborhoods and how individual residents' lives—including their economic conditions—are shaped by their geographic contexts.

While homicide rates across the U.S. have substantially declined over past decades, the decline has been unevenly experienced. Cities overall have less violent crime than they did 30 years ago but homicide rates remain stubbornly high in some locales compared to others. Moreover, the collateral effects of homicide—that is, tolls on individuals and communities experiencing homicides in addition to loss of life—are numerous. Nearby homicides affect children's cognitive performance as well as standardized test scores (Sharkey 2010; Sharkey et al. 2014) while homicides, and violent crime more generally, limit economic mobility across generations (Sharkey and Torrats-Espinosa 2017). Notably, these effects exist whether or not individuals witness homicides directly. Broadly, exposure to neighborhood violent crime is likely a central mechanism by which individuals are disadvantaged in their life-chances (Burdick-Will et al. 2011; Harding 2009; Harding et al. 2011). In this paper we explore the effects of violent crime on a different economic outcome. Specifically, we use a unique geocoded and timestamped data set of advertisements for rental housing to examine what effect neighborhood homicides have on local rent prices.

Our findings reveal a consistent effect of homicide on the prices for rental housing. Across 27 U.S. cities, a homicide depresses the prices for rent in advertisements for nearby housing posted multiple days afterwards. As violence is not evenly distributed across neighborhoods (Peterson and Krivo 2010; Sampson 2012) we also examine the possibility that the geographic concentration of homicides is what drives our main effect. We find that the prices for rental housing in advertisements posted preceding homicides are generally unaffected meaning that homicides themselves likely have the effect of lowering the price of rental housing nearby.

On a theoretical level, our findings add to a small but burgeoning literature on how violence affects economic outcomes. Indeed, there is a great deal of research that examines how various economic variables affect crime. We know, for example, that concentrated economic disadvantage remains one of the strongest predictors of crime rates (Bursik 1986; 1988; Peterson and Krivo 2010) although the mechanisms by which the relationship operates are often ill-defined (Sharkey, Besbris, and Friedson 2016; Sharkey and Faber 2014). Other internal and external neighborhood economic factors also affect rates of violent crime including levels of economic discrimination, foreclosure, and mortgage lending net of other controls for violence and economic conditions (Immergluck and Smith 2006; Messner 1989; Peterson and Krivo 2009a, 2009b, 2010; Saporu et al. 2011; Squires and Kubrin 2006; Veléz and Richardson 2012; Veléz, Lyons, and Boursaw 2012). However, less work has examined the relationship between violent crime and economic outcomes in the other direction. In other words, while it is well established that economic conditions drive crime rates, even violent crime, the ways in which crime may affect economic conditions remains relatively understudied.

# CRIME AND THE HOUSING MARKET

The economic cost of housing has many causes. Prior work has looked extensively at the various factors that produce house prices at local and national levels and point to broad economic indicators like inflation, the availability and cost of credit, and demand curves to help explain the prices of housing. Empirical work on the relationship between crime and housing prices tends to point to a correlation between the two. Previous work has looked at various aspects of the relationship and found, for example, that crime rates are positively associated with mortgage

defaults (Feinberg and Nickerson 2002) and that property crime reduces housing values (Thaler 1978) and that these effects may be extralocal—affecting nearby neighborhoods as well (Burnell 1988). The studies that examine the relationship most directly have found varying effects—some showing that the crime rate overall and home appreciation rates are fairly independent (Lynch and Rasmussen 2001; Manning 1986) while others showing that crime, particularly violent crime, does in fact negatively impact housing prices (Tita, Petras, and Greenbaum 2006; see also Schwartz et al. 2003). There is, however, a robust line of research examining the relationship between crime and the demographic composition of neighborhoods (Alba et al. 1994; Cullen and Levitt 1999; Liska and Bellair 1995; Krivo and Peterson 1996; Morenoff and Sampson 1997). Since housing prices are tied to the socio-economic and racial/ethnic make up of neighborhoods (Anacker 2010; Flippen 2004), crime may have an indirect effect on housing prices if it drives neighborhood demographics by inducing moves among residents (Duggan 1999; Rosen 2017).

Almost no work examines the effect of crime on rent prices. Overall, the study of rents is far less robust than the study of housing prices. Economists are often interested in the price-rent ratio as a predictive measure of prices in the short- and long-term, but these models generally fail to consider how rent may be produced in different ways than price and assume rent to simply be some function of price. However, the rental market and the market for property differ in various ways—demographic, geographic, and cost—and may therefore be driven by different factors. One study (Rizzo 1979) compared the costs of all reported crime to Chicago's 71 community areas and found that crime does reduce both rents and property values but at different rates and at different total costs to local communities. However, the study is limited by both its geographical scope and non-geocoded crime data.

In this paper we are able to build on and improve upon this previous work using both rent and crime data disaggregated to much smaller geographic levels. While previous work has used finer data to explore the impact of crime on housing prices at the tract level (see Tita et al. 2006), no work has done the same for rent prices. This may be, in part, due to the fact that as geocoded crime data has become more readily available, rent data has not followed suit. In general, available administrative data on rents and the rental market more broadly are quite limited (Boeing and Waddell 2016; Durst and Wegmann 2017; Schachter and Besbris 2017), failing to account for rapid churn in tenancy and price. Rents are neighborhood specific—as is crime—so data disaggregated at higher geographic levels may not be able to account for important variation across neighborhoods. Indeed, "[t]he advantage of using a much smaller geographic unit of analysis is that the homogeneity within each [tract] is increased while simultaneously the variation across [tracts] is also increased" (Tita et al. 2006:303). As such, we set out to compile a more refined data set on rental prices.

# DATA

Our rental market data come from Craigslist. Social scientists are increasingly recognizing the value of online data (Lazer and Radford 2017; Salganik 2017); since Craigslist is widely recognized as the dominant platform for today's metropolitan rental housing market and the primary source of information for the vast majority of rental housing searches (Boeing and Waddell 2016; Rae 2015), we view it as a promising alternative data source (Schachter and Besbris 2017). While Craigslist cannot provide a census of all rental housing in the U.S., it is more comprehensive and timely than any other existing sources including the American Community Survey and the American Housing Survey (Boeing and Waddell 2016).

To collect this data we designed a set of Python scripts to crawl the web and collect information from rental ads, including listing date, rent (price), square footage and other rental unit characteristics, neighborhood name, geo-location, and the full text of the advertisement. We include all Craigslist sites that correspond to the 50 largest MSAs in the United States. For most metros, the corresponding Craigslist site closely matches Census definitions, but some are more distinct. For example, the 'SFBay' Craigslist site covers both the San Francisco-Oakland-Hayward, CA MSA and the San Jose-Sunnyvale-Santa Clara, CA MSA. We refer to this site as the San Francisco Bay Area. Similarly, while the Census treats Miami, Fort Lauderdale, and West Palm Beach, FL as one MSA, in May of 2017 when we began data collection, each of these areas had its own Craigslist site. During data collection, Craigslist switched to using just one site, with the Fort Lauderdale and West Palm Beach sites now redirecting to the main Miami site. We combine all unique listings from these three sites and refer to them as the Miami metro area. Third, the Los Angeles Craigslist covers Los Angeles County area rather than Los Angeles-Long Beach-Anaheim MSA, which includes Orange County. Meanwhile, Craigslist has a separate site for Orange County, which we do not include as part of our Los Angeles metro area. While these examples demonstrate that Craigslist and Census data do not follow identical definitions of metro areas, in our paper we only use Census data at the tract level (details below), and follow Craigslist market definitions to determine metro area boundaries for our MSA fixed effects, so these discrepancies do not impact our results.

In all metros, posters creating ads for rental housing are asked to supply a "specific location." Posters are asked to provide at least one of the following location information: neighborhood name, exact address, closest cross streets, or geographic location on a Google maps image. Thus, for a subset of listings, we capture exact addresses; for another (overlapping) subset, we capture approximate longitude and latitude from the cross-street plot on Google maps. Across our metro areas, 12% of all listings are missing a geocode and are thus excluded from all analyses presented here.<sup>1</sup> We use the geocodes to assign each advertisement to a Census tract using the ArcGIS geographic join tool. ArcGIS returns 15 character FIPS census tract code to indicate in which Census tract each geocode belongs. We use Census tracts to approximate neighborhoods.

The Python scripts, which have been running continuously since late May, 2017, capture each unique listing posted in each MSA. The scripts revisit each MSA Craigslist site once per week, and check to see whether each currently posted listing is new, in which case all information will be scraped, or if the listing is a repeat from the previous week, which is also noted in the database. We are therefore able to track how long listings remain on the market, as well as collect data on new listings each week. By visiting each site weekly, we miss listings that are posted and removed within one week; however, since landlords are free to post listings at any time, this missing data should not bias any of our analyses. As described below, from late May of 2017 through the middle of February, 2018, we collected 3,950,558 listings across all 50 MSAs.

<sup>&</sup>lt;sup>1</sup> For the remaining posts, we collect any specific neighborhood/location information provided in the listing. Depending on the level of geographic information included in the advertisement, some listings are not included in some analyses. However, by collecting all listings, regardless of the amount of geographic information provided, we are able to test whether and how these sample restrictions based on data limitations influence our findings. This will allow us to consider whether and how providing specific geographic information is systematically related to other unit, neighborhood, or city characteristics.

We eliminate listings missing geocodes (about 12% of the 3.9 million), as well as listings that are exact duplicates of one another (about 50% of all listings, due to a combination of poster practices and how Craigslist manages listings), for a final dataset of 1,781,746 unique, geocoded listings. <sup>2</sup> We then merge our data with 2016 ACS 5-year pooled data on neighborhood (e.g., tract) racial/ethnic and immigrant composition, several indicators of socioeconomic status, and other neighborhood characteristics relevant to rental market dynamics.

### Crime Data

We leverage data provided by the Washington Post<sup>3</sup> to measure homicides. The news outlet collected and published the date and location (address) of homicides in 50 of the largest cities in the United States between 2012 and 2017. Of the cities in the Washington Post dataset, 39 overlapped with our data on rental listings—though homicide data was unavailable<sup>4</sup> for the period of study for 12 of that subset of cities. Therefore, we estimate the relationship between homicides and rental market activity for 27 cities. We geocoded the addresses of homicides in the Washington Post dataset and joined them to census tracts using ArcGIS 10. We then used census tracts to match homicide activity to rental listings.

#### METHOD

We leverage variation over time within census tracts to identify the relationship between homicides on subsequent listed rental prices in the same neighborhood. Specifically, we identify the treatment effect with difference-in-differences models with tract fixed effects as well as week of the year fixed effects to control for time-invariant characteristics of neighborhoods that may drive rent prices (e.g. geography) and period effects from week to week. We lag the effect of homicide to ensure that the homicide precedes the listing of the rental price, a key dimension for establishing causality. As detailed below, we test multiple lags, ranging from one to ten days. We also control for unit (listing) characteristics, including the number of bedrooms, to account for baseline unit differences which may also be associated with listing price. Finally, we cluster our standard errors at the Census tract level. Altogether, we consider this a conservative modeling strategy, especially given that homicides are relatively rare events.

We also conduct robustness checks to further assess causality. In our preliminary analysis, reported below, we estimate additional models with lead effects of homicides. Here we are looking for evidence that there is no effect of homicides which occur *after* a listing is posted. If future homicides are associated with rental prices, this suggests that the relationship between homicide and rent price is spurious and there is an unspecified confounder.

We also plan to conduct additional analyses before the PAA conference in April. First, we are working to increase our homicide data coverage to additional cities, which will increase our sample size and the generalizability of our findings. Second, we plan to estimate the effect of

<sup>&</sup>lt;sup>2</sup> Including duplicates increases our statistical power but does not substantively change any of our findings. We use the reduced, non-duplicate dataset to produce more conservative estimates. <sup>3</sup> The data are publicly available here: https://github.com/washingtonpost/data-homicides

<sup>&</sup>lt;sup>4</sup> The Washington Post reports that this is because some police departments did not provide complete data for all years. Our independent investigation of the data identified several cities for which homicide data was incomplete for the period of study—those cities were excluded from our analyses.

homicide using regression discontinuity models. The regression discontinuity approach will identify the effect by comparing prices of immediately before and after homicide incidents. Third, we will run difference-in-differences models with different time lags. The length of the lags represents the length of the impact of homicide. For example, if we use a one-day lag, we are estimating the effect of homicide for rental prices of the following day. With different lags, we can test how long the impact of homicides last.

## PRELIMINARY FINDINGS

Table 1 (below) reports descriptive statistics. It is important to note that experiencing a homicide within a Census tract is extremely rare; only .1% of tracts in our dataset experienced at least 1 homicide in the previous 1 day. As we extend the lag time, more tracts can be classified as experiencing a homicide (up to a max of 1.3% of tracts having at least 1 homicide in the previous 10 days). This is both because homicides are relatively rare events and because they are geographically clustered; 74.9% of tracts in our sample experienced no homicides in the entire study period.

### [Table 1 about here]

Table 2 presents a series of models testing varying lagged effects of homicide on logged listed rental price. Each model includes census tract fixed effects and week fixed effects, along with controls for listing characteristics. Standard errors are clustered by tract. As shown in Table 2, we find evidence that there is a small, negative effect of homicides on rental unit listing prices two to five days later.

#### [Table 2 about here]

While our data do not allow us to directly test the mechanism(s) whereby homicide impacts rent prices, we suspect that the period immediately after news spreads about a homicide is when we would see the largest impact on rental prices. This is in line with our finding of an effect two to five days after a homicide. In the immediate aftermath (just one day prior) it is unclear whether many Craigslist posters will be aware of the event, and posters may avoid putting listings on Craigslist the day after an event. As a few more days pass and the immediate shock of the event wears off, we posit that the impact of homicide declines, which is also in line with our preliminary findings. This declining impact over time is especially likely given that most homicides occur in a small number of tracts.

Importantly, as shown in Table 3, we find little evidence of any lead effects of homicide on listed rental price. As shown in Model 3, even when we control for homicides in the next two days, the significant, negative impact of at least one homicide in the previous two days remains. This suggests that the effect of homicide on listed rental price is not spurious.

### [Table 3 about here]

Of course, much work remains. In the next several months we will conduct additional robustness checks, estimate difference-in-differences models with different time lags, identify treatment effects from regression discontinuity design, and add homicide data for additional cities. Nevertheless, we think these initial findings offer strong preliminary evidence of a causal effect of homicide on listed rental price. This finding adds to recent work examining the collateral effects of homicide beyond loss of life. Homicide reverberates throughout communities, affecting various aspects of individual and collective experience. Additionally, since homicides, and crime more generally, are geographically concentrated, understanding their wide-ranging effects helps explain broader, systemic differences across neighborhoods and how

individual residents' lives—including their economic conditions—are shaped by their geographic contexts.

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| Table 1. Descri | otive Statistics of the | e Analytical Sample |
|-----------------|-------------------------|---------------------|
|                 |                         |                     |

|   | Mean     | S.D.    | Min.    | Max.     |
|---|----------|---------|---------|----------|
| Price                                   | 1516.106 | 911.821 | 390.000 | 5754.000 |
|   |          |         |         |          |
| Timing of homicide                      |          |         |         |          |
| At least 1 homicide in previous 1 days  | 0.001    | 0.036   | 0.000   | 1.000    |
| At least 1 homicide in previous 2 days  | 0.003    | 0.051   | 0.000   | 1.000    |
| At least 1 homicide in previous 5 days  | 0.006    | 0.080   | 0.000   | 1.000    |
| At least 1 homicide in previous 7 days  | 0.009    | 0.095   | 0.000   | 1.000    |
| At least 1 homicide in previous 10 days | 0.013    | 0.114   | 0.000   | 1.000    |
| Listing characteristics                 |          |         |         |          |
| Number of bedrooms                      | 1.792    | 0.970   | 0.000   | 8.000    |
| Listing includes square feet            | 0.660    | 0.474   | 0.000   | 1.000    |
| Listing ever updated                    | 0.162    | 0.368   | 0.000   | 1.000    |
| Observations                            | 322794   |         |         |          |

|  | Model 1        | Model 2     | Model 3      | Model 4 |
|--|----------------|-------------|--------------|---------|
| Timing of homicide                                     |                |             |              |         |
| At least 1 homicide in previous 1 days                 | -0.01          |             |              |         |
|  | (0.01)         |             |              |         |
| At least 1 homicide in previous 2 days                 |                | -0.02*      |              |         |
|  |                | (0.01)      |              |         |
| At least 1 homicide in previous 5 days                 |                |             | -0.01+       |         |
|  |                |             | (0.01)       |         |
| At least 1 homicide in previous 7 days                 |                |             |              | -0.01   |
|  |                |             |              | (0.01)  |
| At least 1 homicide in previous 10 days                |                |             |              |         |
|  |                |             |              |         |
| Listing characteristics                                |                |             |              |         |
| Number of bedrooms                                     | 0.19***        | 0.19***     | 0.19***      | 0.19*** |
|  | (0.00)         | (0.00)      | (0.00)       | (0.00)  |
| Listing includes square feet                           | 0.09***        | 0.09***     | 0.09***      | 0.09*** |
|  | (0.01)         | (0.01)      | (0.01)       | (0.01)  |
| Listing ever updated                                   | -0.00          | -0.00       | -0.00        | -0.00   |
|  | (0.00)         | (0.00)      | (0.00)       | (0.00)  |
|  | - *            | . ,         | . ,          |         |
| Observations   | 322794         | 322794      | 322794       | 322794  |
| All models include fixed effects for census tract and  | l week of the  | year. Stand | lard errors  | are     |
| clustered at the census tract and are presented in par | rentheses. + r |             | 05. ** p<.01 | . ***   |

| Table 2. Estimates of the Effects of Homicides on the Listed Price of Rental Units (L | logged) |
|---|---------|
|   |         |

p<.001

|   | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 | Model 9 | Model 10 |
|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| At least 1 homicide in previous 1 days  | -0.01   |         |         |         |         |         |         |         |         |          |
|   | (0.01)  |         |         |         |         |         |         |         |         |          |
| At least 1 homicide in next 1 days  | 0.01    | 0.01    |         |         |         |         |         |         |         |          |
|   | (0.01)  | (0.01)  |         |         |         |         |         |         |         |          |
| At least 1 homicide in previous 2 days  |         |         | -0.02*  |         |         |         |         |         |         |          |
|   |         |         | (0.01)  |         |         |         |         |         |         |          |
| At least 1 homicide in next 2 days  |         |         | 0.00    | 0.00    |         |         |         |         |         |          |
| , s   |         |         | (0.01)  | (0.01)  |         |         |         |         |         |          |
| At least 1 homicide in previous 5 days  |         |         |         |         | -0.01+  |         |         |         |         |          |
| ······································  |         |         |         |         | (0.01)  |         |         |         |         |          |
| At least 1 homicide in next 5 days  |         |         |         |         | -0.00   | -0.00   |         |         |         |          |
| The least T holmerde in next 5 days   |         |         |         |         | (0,00)  | (0,00)  |         |         |         |          |
| At least 1 homicide in previous 7 days  |         |         |         |         | (0.00)  | (0.00)  | -0.01+  |         |         |          |
| At least 1 holineide in previous 7 days   |         |         |         |         |         |         | (0.01)  |         |         |          |
| At least 1 homicide in part 7 days  |         |         |         |         |         |         | 0.01*   | 0.01*   |         |          |
| At least 1 holmende in next / days  |         |         |         |         |         |         | -0.01   | -0.01   |         |          |
| At least 1 handisida in anasisus 10 days  |         |         |         |         |         |         | (0.00)  | (0.00)  | 0.01    |          |
| At least 1 homicide in previous 10 days   |         |         |         |         |         |         |         |         | -0.01   |          |
|   |         |         |         |         |         |         |         |         | (0.01)  | 0.00     |
| At least 1 homicide in next 10 days   |         |         |         |         |         |         |         |         | -0.01   | -0.00    |
|   |         |         |         |         |         |         |         |         | (0.00)  | (0.00)   |
| Number of bedrooms  | 0.19*** | 0.19*** | 0.19*** | 0.19*** | 0.19*** | 0.19*** | 0.19*** | 0.19*** | 0.19*** | 0.19***  |
|   | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)   |
| Listing includes square feet  | 0.09*** | 0.09*** | 0.09*** | 0.09*** | 0.09*** | 0.09*** | 0.09*** | 0.09*** | 0.09*** | 0.09***  |
|   | (0.01)  | (0.01)  | (0.01)  | (0.01)  | (0.01)  | (0.01)  | (0.01)  | (0.01)  | (0.01)  | (0.01)   |
| Listing ever updated  | -0.00   | -0.00   | -0.00   | -0.00   | -0.00   | -0.00   | -0.00   | -0.00   | -0.00   | -0.00    |
|   | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)  | (0.00)   |
| Observations  | 322794  | 322794  | 322794  | 322794  | 322794  | 322794  | 322794  | 322794  | 322794  | 322794   |
| All models include fixed effects for census tract and week of the year. Standard errors are clustered at the census tract and are presented in parentheses. + |         |         |         |         |         |         |         |         |         |          |
| _p<.1, * p<.05, ** p<.01, *** p<.001  |         |         |         |         |         |         |         |         |         |          |

Table 3. Estimates of the Effects of Homicides on the Listed Price of Rental Units (Logged), Including Lead Measures of Homicide