

The Relationship of Airbnb to Neighborhood Calls for Service in Three Cities

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Abstract

Short-term rentals have grown rapidly in cities since the founding of Airbnb in 2008. As a result, many homeowners have voiced concerns about the impact of Airbnbs on the character of their neighborhoods and city councils have begun constraining their growth. Though there is a substantial literature exploring the connection between tourism and criminal activity, there is scant work on the relationship between Airbnbs, disorder, and crime. This paper takes up the issue using data on the growth of Airbnbs and calls for service to the police in Portland, Oregon, Nashville, Tennessee, and New Orleans, Louisiana. We find that Airbnbs tend to locate in areas with high calls for service and that an increase in Airbnbs in the previous month is correlated with a small increase in calls related to revelry and property crimes, and a decrease with respect to suspicious individuals.

Introduction

Airbnb and other short-term rentals (STRs) are one of the largest outgrowths of the “sharing economy”. Short-term rentals were first introduced in 1995 when Vacation Rentals by Owners (VRBO) opened and have grown rapidly since the founding of Airbnb in 2008. Short term rental companies allow property owners or lease holders to earn increased rents by offering their properties for days or weeks to tourists. Reserving a room with an Airbnb is typically less expensive than booking a hotel (D. Guttentag, 2015; Wang & Nicolau, 2017), and travelers also choose Airbnb because it is perceived to provide a more authentic form of travel and a way to engage in the lived experience of locals (Brochado et al., 2017; D. A. Guttentag & Smith, 2017; Maitland, 2010). Short-term rentals have allowed for the expansion of tourism where no traditional

accommodations previously were available (DiNatale et al., 2018) and can act to add visitors to areas that were previously overlooked (Ioannides et al., 2019). Growing from a single conference in San Francisco where airbeds were rented to attendees, Airbnb was present in over 30,000 cities across 191 countries by 2017 (Gallagher, 2018).

As STRs grow, however, residents and cities have voiced concerns about their effects on neighborhoods. For renters and potential home buyers, STRs have contributed to the continued increase in housing prices since the end of the Great Recession. Because homeowners and landlords can earn new profits by renting their properties short term to tourists, there has been an increase in the cost of renting on a longer lease or purchasing a property for your own use. For instance, Sheppard and Udell (2016) found an increase in prices between 6 and 11 percent in New York City as a result of Airbnbs growth. That finding was supported (though with a smaller magnitude) by Darren, Kung, and Proserpio's (2017) study of Boston's housing market. These changes are felt more heavily in low income areas of a city as Airbnb introduces new uses to areas that surround the urban core but were formerly not considered 'desirable' (Wachsmuth & Weisler, 2018). All of these concerns relate to changes in a neighborhoods character as gentrification increases, though in this case the process is driven by tourists rather than permanent higher-income residents (Füller & Michel, 2014; Gant, 2016; Gravari-Barbas & Guinand, 2017).

Beyond concerns about the "character" of neighborhoods and worries associated with gentrification, Airbnb may change patterns of criminal and misdemeanor activity in neighborhoods and across cities. Tourism has long been found to increase crime in cities, particularly in the areas that tourists frequent (Biagi & Detotto, 2014; Fujii & Mak, 1980). The relationship between Airbnb and crime briefly became a national concern in the Fall of 2019, following a shooting on Halloween at a property that was rented as an Airbnb. That event led the platform to ban "house party" locations, although future enforcement may be difficult (Hawkins et al., 2019). Earlier, in 2016, Airbnb had created an online portal (<https://www.airbnb.com.au/neighbors>) for neighbors to report bad behavior by guests, particularly noise violations or issues related to vice, which would

be forwarded to hosts, but with no direct legal repercussions implied. These kinds of problems are a real cost to residents as the decision to live in a particular kind of neighborhood is a genuine preference even if it happens to be idiosyncratic or contingent.

In light of these concerns, city councils have begun to respond. Regulation passed in the city of New Orleans require that STRs do not “adversely affect the residential character of the neighborhood.” including generating “noise, vibration, glare, odors, or other effects that unreasonably interfere with any person’s enjoyment of his or her residence” and all listings must “appear outwardly to be a residential dwelling” (City Planning Commission, 2018).

A complete picture of the effects of STRs on neighborhoods requires understanding whether Airbnb has altered neighborhoods in ways that are visible through criminal activity related to behavior by tourists. To date, however, there has been scant research on the relationship of Airbnbs to crime, or how the changing character of neighborhoods is potentially reflected in changing patterns of crime. In this paper, we use data on the number of Airbnbs at the census block group level from 2015 to the present to study their impact on calls for service for three cities in the United States. In particular, we test for the colocation and impact on changes in calls for service for four categories of calls related to tourism: revelry, property crimes, sex crimes, and suspicious individuals. We find that Airbnbs are prevalent in areas with higher rates of calls for service, though some of that relationship is explained by locating near tourist amenities. In addition, we find that as the number of Airbnbs increase in a neighborhood, there is a corresponding increase in the number of calls for service related to revelry and property crimes, but a decrease for suspicious individuals.

Literature Review and Hypotheses

Tourism has long been studied for its impact on crime. Yet Airbnbs’ relationship to crime has not been well documented, owing in part to a lack of data on the platform and its recent rise as a feature of travel. In a 2017 study of the locations of Airbnb listings, Wegmann and Jiao (2017) found that Airbnb density was

lower in areas with higher rates of violent crime, which likely relates to surrounding amenities as well as the structure of neighborhoods. In a 2019 study of Florida counties, Yu-Hua, Pennington-Gray, and Kim (2019) show that shared-room listings of Airbnb positively correlate with both property and violent crime at the county level; however, there was not a significant result for other types of Airbnb accommodations.

Tourism has been directly associated with increases in crime, particularly property crimes and theft (Biagi & Detotto, 2014; Montolio & Planells-Struse, 2016). Scholars have found that areas with more tourists are likely to see higher rates of crime (Biagi & Detotto, 2014), that increases in tourist activity raise crime rates (Montolio & Planells-Struse, 2016), and that seasonal flows of tourists predict increases and decreases in crime (McPheters & Stronge, 1974). When a brief increase in tourism occurs, such as with an international sporting event, there has been found to be an increase in theft, which may impact locals and tourists equally within a small boundary (Barker et al., 2002). Typically, though, locals and tourists are affected differently by crime. The routine activity theory of crime predicts that tourists are in exactly the right setting to be victimized: away from home, family, and other “guardians” who might deter crime, and often “sticking out” in a way that presents an easy opportunity for crime (Cohen & Felson, 1979). As such, visitors are more likely to be the victims of property crime and crimes of opportunity, rather than violent offenses (de Albuquerque & McElroy, 1999).

Despite the robust relationship between crime and tourism, the picture is not clear in the case of Airbnb guests, as not all tourists have an equal effect on crime. National park visitors, for example, appear not to contribute to crime (Grinols et al., 2011) while on the other hand, as casinos open and draw tourists in, there is a small to medium bump in property related offenses nearby (Grinols, 2006; Ochrym, 1990). The typically positive relationship between tourism and property crime that has been established throughout the literature suggests our first hypothesis:

H1a: Neighborhoods with more Airbnbs will have higher levels of property crimes.

H1b: As Airbnbs increase in a neighborhood, there will be an increase in property crime.

Tourists are not only the victims of crime but can be perpetrators themselves. Tourism-perpetuated crimes can be driven by deviance and the freedom of breaking ones routines (Stone & Sharpley, 2013; Uriely et al., 2011). In recent years a significant amount of international concern has been raised about tourists breaking taboos and local laws to do rare things, such as hunting in protected areas (Muboko et al., 2016; Naidoo et al., 2016). Tourists have also been found to travel to commit sex crimes, particularly to places where prostitution operates within a legal gray areas allowing travelers to avoid guilt or detection (Ryan & Kinder, 1996; Troshynski & Blank, 2008; Wonders & Michalowski, 2001). Travel has also been demonstrated to be associated with an increase in substance abuse and risky behavior, which is often embraced within tourists spaces of a city (Calafat et al., 2013; Hughes et al., 2008). As Airbnb changes the shape and locations of tourist's accommodations, there is the potential such tourism-related behaviors would spread into residential sections of a city. Tourists choose to stay at Airbnb for a multitude of reasons (D. Guttentag et al., 2018), so it is not clear whether in totality they travel more as "ugly Americans" or quasi-residents. These findings on tourism, deviance, and sex crimes suggest additional hypotheses:

H2a: Neighborhoods with more Airbnbs will have higher levels of revelry related disturbances.

H2b: As Airbnbs increase in a neighborhood, there will be an increase in revelry related disturbances.

H3a: Neighborhoods with more Airbnbs will have higher levels of sex crime.

H3b: As Airbnbs increase in a neighborhood, there will be an increase in sex crime.

Potential for such disturbances and disorder may raise the concern of residents and lead them to be more aware of rising danger. In addition, the use of Airbnbs may lead individuals to be perceived as suspicious individuals. Many Airbnbs involve remote access in unfamiliar settings, which may cause a tourist to be misidentified as a robber or a prowler. As such, we test a fourth hypothesis to see whether growth in Airbnbs attracts the attention of neighbors and increases calls for service related to suspicious individuals.

H4a: Neighborhoods with more Airbnbs will have higher levels of suspicious individual calls.

H4b: As Airbnbs increase in a neighborhood, there will be an increase in suspicious individual calls.

Study Design

Data. In order to study the impact of short-term rentals on crime in cities, we use data on Airbnbs and calls for service to 911 for three cities. A review of cities with publicly available data on Airbnb listings and calls for service was conducted, and three such cities were identified with both: Nashville, Tennessee, New Orleans, Louisiana, and Portland, Oregon. While primarily selected due to data availability, those three cities present different tourist backgrounds, distinct populations, and varying levels of call for service.

Despite its ubiquity as a concept, the operationalization of crime or crime rates has always been plagued by issues of reliability and validity. Statistics published by governments often reflect gamesmanship by officials, and more broadly do not capture events that are not reported to police (MacDonald, 2002; Skogan, 1974). These issues have led scholars to conduct surveys in order to measure the rate of victimization within a population. While surveys of victimization have made important contributions, they are also plagued by inaccuracy, recall bias, and other sources of error (Cantor & Lynch, 2000; Gottfredson, 1986; Skogan, 1975).

Rather than official crime statistics or victimization, we use calls for service to measure crime. Calls for service capture a wide variety of behaviors and appeals, including requests for information, assistance, the regulation of interpersonal disputes, and nuisance complaints (Antunes & Scott, 1981; Klinger & Bridges, 1997). Such an operationalization is not without errors of its own, reflecting the unwillingness of certain populations to call the police and the fact that many calls do not reflect crimes, only the perception of their potential (Klinger & Bridges, 1997). However, in this analysis we are primarily interested in the perceptions of residents of what is occurring as a result of the introduction of Airbnbs. In particular, issues related to public drunkenness, noise violations, or suspicious individuals are less likely to be legally adjudicated and reflected in official crime statistics, but when they rise to a level of transgression for neighborhoods should be captured by a call to 911.

Data on calls for service were collected from online repositories hosted by the cities studied. Data was downloaded from 2015 to the present, which was the first year that data for Airbnbs was available. Calls for service generally reported the date, reason, and the geocoordinates (longitude and latitude) for the call. Over 200 individual reasons for calls were originally listed in the data, which we manually coded to reflect the hypotheses from the introduction and exclude any call that was not related to revelry, property crime, sex crime, or suspicious individuals. Table 1 displays the original listed reason for calls that we included as well as their count.

Insert Table 1. Calls for Service Coding

Information on Airbnb comes from an open source website (insideairbnb.org) that posts web scrapped data about individual listings in select cities; this data is collected and disseminated in order to provide an analytical tool for studying the growth and impacts of Airbnbs by the public, researchers, and reporters. The web scrapping is generally run once per month but can be irregularly collected, creating gaps in the data. Data on Airbnb listings contains information on the location in latitude and longitude, price, reviews, and other information. Similar data has been used to study Airbnb and its relationship to housing price changes and policies regulating the short-term rental market (Gurran & Phibbs, 2017; Kakar et al., 2018; van Holm, 2020). Data on Airbnbs was available from March 2015 to September 2019 when the research began (58 total months). As shown in Figure 1, there were gaps present for all three cities, and Nashville had the fewest observations.

Insert Figure 1. Airbnb Observations by Month

In all three cities studied there has been a general growth in Airbnbs month over month, as shown in Figure 2 below. In addition, the three cities have a similar number of Airbnbs, particularly since the beginning of 2019. The sharp drop in Airbnbs in New Orleans in May of 2017 reflects the adoption of new regulations in that city, and the removal of listings from the website that had failed to receive a permit (van Holm, 2020).

Insert Figure 2. Growth of Airbnb

The latitude and longitude for both Airbnbs and calls for service were aggregated to the census block group level in order to bound them within an identifiable geography. Block groups nest below census tracts, and thus provide a micro level of analysis that encompasses a few city blocks. The expectation is that the use of census blocks as the unit of analysis will create a close tie between the presence of Airbnbs and the local conditions in the surrounding area.

In addition to those two principle sources, data was collected from the 2015 census at the block group level for the demographics and housing condition of neighborhoods.

Method. The analysis proceeds in two stages. First, we test the cross-sectional locations of Airbnbs relative to calls for service. As there has been scant research about the relationship of Airbnbs to crime, it is useful to first assess the patterns of colocation between the two. We do so by studying the earliest observation for each of the three cities, in order to minimize capturing any effects Airbnb may have had on changing neighborhoods. The first observation was March 2015 for Portland and June 2015 for New Orleans and Nashville.

We test the impact of Airbnbs on the four types of calls for service driven by our hypotheses developed from the literature: Revelry or partying, property crime, sex crime, or suspicious individuals. In the initial regressions these four separate types of calls for service is the dependent variable, with the number of Airbnbs as the primary predictor. We test both the total number of Airbnbs in a neighborhood as well as the three types: entire place, shared rooms, and private rooms. As both calls for service and Airbnbs are count variables, we use a log transformed version.

In addition, we include information for each census block group collected from the 2015 5-Year ACS. Specifically, we account for aspects of both the demographics and housing in the community, as has been done elsewhere in the literature (Cohn, 1993; Kurtz et al., 1998). With regard to demographics, we control for the racial makeup of the neighborhood using the percentage of residents who are white. In addition, we include measures for the share of residents with a college education to control for the human

capital of the neighborhood. Finally, we include the total population. The character and quality of the housing is controlled for with the median rent in the census block group, the housing density, and the share of housing that is vacant. Finally, the city for each census block group is included to capture differences across the three locations studied.

The relationship of Airbnbs to levels of call for service is further tested using just the city of New Orleans. The City of New Orleans publishes data on the locations of hotels and traditional accommodations, which is included to study the presence of non-Airbnb tourists. Hotel listings were only available for 2019, which means there is a temporal mismatch between the calls for service and measure of traditional accommodations; however, it is not anticipated that their locations have shifted significantly in the four-year gap. Airbnbs have the ability to alter the geography of tourist lodging in a city, so disaggregating these two effects may further clarify the pattern of location.

Summary statistics for all variables used to study the relationship between Airbnb locations and calls for service are presented in Table 2 below. As shown, an average census block group had .59 for service for revelry per month, 11.8 calls related to property crime, .02 Sex Crimes, and 5 calls about suspicious individuals. The average census block group had 4.4 Airbnbs.

Insert Figure 3.

Modeling neighborhood-level phenomena with ordinary least squares or other methods can often prove challenging given the interconnectedness of nearby units. As displayed in Figure 3, spatial autocorrelation was present in all three cities studied. The LISA analysis show that Airbnbs are generally clustered near the city's downtowns or central business district and near to each other (Anselin, 1995).

In order to correct for this potential bias, we account for spatial endogeneity by identifying spatial relationships in a weight matrix, which is used to address omitted variables and spatial error (Anselin, 2013; Anselin et al., 1996) Both spatial lag and spatial error models were tested and compared using a LaGrange multiplier test along with the overall model fit; a spatial lag model was shown to perform better across the

models, although the results did not differ significantly (Anselin, 1988). Thus, the first set of models report the results from the spatial lag model.

Insert Table 2.

The second set of analyses studies the impact of changes in the number of Airbnbs during the preceding month (t_1-t_2) on the change in the number of calls for service during the current month ($t-t_1$) for the four categories of calls defined above. In order to correct for spatial autoregression, we use a spatial fixed effects model provided by the `splm` package in R (Millo & Piras, 2012). However, spatial fixed effects models are sensitive to unbalanced panel models. As such, the sample is limited to the observations from between August 2018 through June 2019, as the longest period where all three cities have consecutive monthly observations. All four of these models use fixed effects for the census block group and time.

Summary statistics for changes in calls for service and Airbnb listings are displayed in Table 3 below. As shown, calls for service related to revelry and suspicious individuals declined in the average month across the study period, but increased for the other two categories of crime. In addition, the average census block group added .21 Airbnb listings per month.

Insert Table 3

Results

Insert Table 4. Cross Sectional Models for Full Sample

We first analyze the locations of Airbnb's relative to calls for service in each census block group. As shown in Table 4, there is a positive correlation of Airbnbs for all four types of call for service tested, although calls related to suspicious individuals does not reach statistical significance. Airbnbs has the strongest association with property crimes, with 1% more total listings being associated with 1.4% more calls. Looking at the three types of rooms listed for Airbnb's, it is entire homes and apartments that are driving the association in the case of revelry, property crimes, and sex crimes. Conversely, private rooms are most

strongly associated with calls for suspicious individuals, while entire home listings are insignificant with a negative sign.

The other results for demographics and urban form largely align with what has been found elsewhere in the literature but deserve brief review. Census block groups further from the central business district of a city, which are typically more residential, are associated with fewer calls related to revelry, property crime, and sex crimes. Areas with a higher socioeconomic status, as measured by the share of college graduates and median rents, typically have fewer calls, though the significance is mixed across the four types. Greater housing density, when holding the population and all else constant, is associated with fewer calls for service across all four models. Higher rates of vacancy, which can be taken as a sign of disorder in a neighborhood, is significantly correlated with a higher number of calls for revelry, property crime, and sex crimes.

Finally, there are some significant differences across the three cities. New Orleans has more calls for service related to sex crimes than Nashville, and fewer related to suspicious individuals. There are substantially more calls for service related to revelry in New Orleans than in Portland, but the differences with Nashville are insignificant. Thus, the three cities have distinct patterns of calls for service across the data tested.

Insert Table 5. Regression for Airbnb Locations in New Orleans.

Table 5 looks at the patterns of calls for service and New Orleans, in order to include a measure for the number of hotels in each census block group. It is possible that the cross-sectional relationship between calls for service and Airbnbs is driven by their colocation near tourists' sites, which have historically been associated with higher levels of crime and calls for service.

However, the results in Table 5 weaken the interpretation of the earlier findings in Table 4. As shown, the number of hotels in a neighborhood is significantly associated with an increase in calls for service for revelry, property crime, and sex crimes. In addition, the significance of the measure for the number of Airbnb's is reduced as well by the inclusion of hotels. In the case of revelry, none of the measures for Airbnb's

reaches significance. There is still a strong positive association between Airbnbs, and entire place listings in particular, and calls related to property crime. In addition, there is a significant positive correlation between sex crimes and shared room listings

Thus, while it is not entirely the colocation in tourist areas that drives the relationship with calls for service in New Orleans, the presence of tourism in the same areas does explain a substantial part of the relationship. In addition, the relationships remain consistent for other control variables with the earlier regression, although the significance in several cases decreases.

Insert Table 6. Regression for Changes in Airbnb

Finally, we test the relationship of changes in Airbnbs from the previous month with the changes in calls for service. In contrast to the earlier models, here Airbnb has a different relationship to calls for service depending on the dependent variable tested. The relationship between changes in Airbnbs for census block groups and changes in calls for service related to revelry is positive and significant, as predicted. A one-unit increase in Airbnb listings in the previous month is associated with .009 more calls for service related to revelry. The relationship is significant for both entire home listings as well as shared rooms, but not private rooms

The change in property crimes is also significant, with a one-unit increase in Airbnbs being associated with .072 more calls for service; the relationship is largely driven by entire home listings, which is the only room type that reaches significance. Calls related to suspicious individuals decreases with an increase in all Airbnbs, although the room types have different directions. While an increase in entire homes and private rooms are both associated with decreases in calls for suspicious individuals, shared room listings are associated with an increase. Finally, calls related to sex crimes is insignificant across both models.

Discussion

Concerns about Airbnbs tend to focus on some aspect of the character of neighborhoods. There are concerns about the aesthetics of the neighborhood shared by NIMBYs and New Urbanists. There are concerns about gentrification, equality, and who gets to remain a resident. There are also concerns about the individuals that Airbnbs will bring to the neighborhood. As we described it above, are Airbnb guests ugly Americans or are they quasi-residents? Do Airbnbs increase crime and disorder in an area? Our focus in this paper has been on this third concern.

Despite the conventional wisdom that Airbnb changes the character of neighborhoods by bringing in disorderly tourists, we see mixed evidence that that is the case. Airbnbs do appear to co-locate in areas with higher levels of all four types of crime, but a large portion of that relationship appears to relate to the collocation of Airbnbs with tourist activities, which themselves are associated with higher rates of certain crimes. The issue may relate to the economics of Airbnb as well. Airbnb hosts may be selecting properties that are near tourist activities and low in cost, which will often mean neighborhoods on the fringe of downtown. Tourists may not know the city well enough to recognize whether they're in a desirable neighborhood or not, so hosts are able to generate increased stays and profits in these neighborhoods.

We find that Airbnbs are related to increases in calls for service, though the magnitudes of the changes are small. This means that the kinds of "party house" cases, like the one mentioned in the introduction, are not typical of the effect Airbnbs have on an area. Adding 100 Airbnbs to an area is likely to produce only 1 additional revelry call per month. In the average month there were roughly 600 Airbnbs added across all three cities. Thus, there are changes to calls for services in neighborhoods that is associated with the growth of Airbnbs, but those changes are likely imperceptible in most neighborhoods.

It is possible that informal social control mechanisms partly account for the small increase in calls in two ways. First, visitors may act more like residents (quasi-residents) than those staying in hotels. This might be a result of the neighborhood setting influencing visitor behavior. In other words, staying in a residential area makes perspicuous in the minds of visitors that they are in a place much like their own neighborhood

where there are strong informal constraints on disorderly behavior. Just as one would not normally engage in behavior that is disrespectful of one's neighbors, visitors accord similar respect to their "quasi-neighbors." This explanation is consistent with social norm theories that factor into Jane Jacobs-style urbanism and broken windows hypotheses of disorder (Jacobs, 1961; Kelling & Wilson, 1982). Alternatively, it might be the neighborhood setting selecting for certain kinds of visitors. If a visitor wants to engage in especially disorderly behavior, they might seek out hotels rather than homes in a neighborhood.

Second, calls for service might increase because residents are more willing to make a call for service when Airbnb visitors are acting disorderly than when a neighbor is acting disorderly. This could be because neighbors who know one another are more likely to ignore little disagreements, or because they want to avoid long term escalations of conflict. Individuals who know one another might also be more likely to work out their disagreements without needing to invoke police authority. It could also be because residents find "outsiders" bothersome and are more inclined to punish them. Of course, both of these explanations can be true at the same time. The takeaway is that the already small magnitude of increase in revelry calls may be overstating the level of change in behavior for a given neighborhood.

There is also an increase in property crime calls associated with an increase in Airbnbs. The effect is larger than for revelry calls, though still small as adding roughly 14 Airbnbs to an area is likely to produce 1 additional property crime call for service. That finding is somewhat perplexing given that we also observe a decrease in calls for suspicious individuals. Calls for suspicious individuals and property crime are generally positively associated in the data, with levels of calls for property crime and suspicious individuals being strongly correlated ($r=.60$), and the change in the two move in tandem ($r=.23$).

Why then the differing results? They may be explained in part by a loss of collective efficacy in neighborhoods as a result of Airbnbs growth. Citizens are less able to recognize their neighbors after tourists begin to enter residential areas, and they are unwilling to wrongly call the cops for a suspicious individual. In addition, a loss of knowledge about who lives nearby makes property crime easier, as it adds to the anonymity

of potential criminals. While it should be again emphasized that the size of the impacts are small, that is one potential explanation that goes to further show the way that Airbnb changes the character and lived experiences of neighborhoods.

These conclusions make for a complicated policy evaluation. Airbnbs do appear to have some effect on the neighborhoods they enter, not just with regard to their character or cost, but in their crime profiles. While the magnitude of changes are small, they may explain some portion of the “anti-social guest behavior” that causes an anti-tourist sentiment (Richards et al., 2019; Suess et al., 2020). However, given the magnitude of change to calls for service we have found, it is unlikely crime is the core reason behind these feelings within neighborhoods. While it does not appear that crime resulting from Airbnb’s will lead to the demise of quiet residential neighborhoods or that it is imperative that cities take action, it likely adds to communities concerns and provides another reason for cities to consider further regulations.

However, cities have had a difficult time finding the appropriate tools to limit Airbnb’s growth (Nieuwland & Melik, 2020). While the results here suggest limited impacts, cities can consider restrictions which constrain growth or types of Airbnbs based on land-uses or the type of housing within a neighborhood. Such activities will not significantly prevent the growth of Airbnb’s overall, but will help to reduce negative spillovers on to residential sections of a city. Such restrictions may be unfair, causing growth in Airbnbs in other sections of a city, and reduce the ability of residents to use their properties as they see fit. Alternatively, cities could consider significant additional penalties onto owners for noise violations or vice that occurs in Airbnbs by guests; however, such regulations would be unlikely to significantly reduce bad behavior or be considered equitable.

The analysis is not without limitations. Looking at monthly changes made it impossible when using fixed effects to account for other features in a neighborhood that may change since no other pertinent statistics are published on a monthly basis. Future work may be able to expand the time horizon of study in order to see how changes in demographics may interact with changes in Airbnb, and therefor influence crime. In

addition, the three cities studied were selected in part based on the availability of data on both Airbnbs and calls for service. Their differing demographics, sizes, and regions helps to make the results more generalizable, but without a larger sample it is difficult to know how similar other cities are.

Finally, the use of census block groups has ensured a small geographic footprint for the neighborhoods studied, but we cannot ensure that changes in Airbnbs are the actual cause of changes in calls. For instance, while there is a positive association between Airbnbs and calls for revelry, we cannot assert it is short term rentals producing those calls. This is a significant limitation of any neighborhood based study, but may be able to be improved upon in future studies tracking actual addresses from calls for service or crime reports.

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Table 1. Calls for Service Coding

Revelry		Property Crime	
Code	Count	Code	Count
Noise Complaint	22778	Theft	268882
Intoxicated Person	15601	Burglar Alarm, Silent	215690
Person Indecently Exposed	4440	Burglary - Residence	151067
Obscenity, Exposing	3659	Burglary - Non-Residence	128577
Fireworks	3445	Stolen Vehicle	50584
Personal Relief	2430	Simple Burglary Vehicle	27670
Underage Drinking	1212	Burglary	25283
Drunk	550	Shoplifting	22849
Indecent Behavior	416	Auto Theft	21818
		Holdup / Robbery	18986
		Hold Up Alarm	16016
		Residence Burglary	11835
		Robbery	5282
		Simple Burglary	5154
		Bicycle Theft	3777
		Armed Robbery With Gun	3777
		Theft From Exterior	3686
		Pickpocket	3435
		Burglar Alarm, Local	2952
		Simple Robbery	2678
		Business Burglary	2499
		Burglar Alarm, Silent, Far No Response	1139
		Theft From Exterior Of Vehicle	986
		Simple Robbery, Property Snatching	763
		Carjacking	656
		Aggravated Burglary	518
		Armed Robbery	407
		Armed Robbery With Knife	350
		Business Burglary	341
		Carjacking- No Weapon	166
		Simple Burglary Domestic	134
		Aggravated Burglary Domestic	56
		Safe Burglary	5
Total	54531	Total	998018
Sex Crimes		Suspicious Individuals	
Code	Count	Code	Count
Sex Offender Registration Check	5272	Suspicious Person	318107
Aggravated Rape	1698	Suspicious	93713
Sexual Battery	1467	Prowler	13067
Simple Rape	758		
Prostitution	626		
Video Voyeurism	210		
Aggravated Rape Unfounded By Special Victims Or Child Abuse	187		
Aggravated Rape Male Victim	63		
Sexting	47		
Simple Rape Male Victim	34		
Simple Rape Unfounded By Special Victims Or Child Abuse	34		
Soliciting For Prostitution	29		
Oral Sexual Battery	24		
Total	10449	Total	424887

Table 2. Summary Statistics for Cross Sectional Models

	N	Mean	SD	Min	Max	Description
Revelry	1,246	0.59	2.95	0	60	Calls for service related to revelry or partying in each city's first observation.
Property Crime	1,246	11.8	14.33	0	184	Calls for service related to property crimes in each city's first observation.
Sex Crime	1,246	0.02	0.22	0	6	Calls for service related to sex crimes in each city's first observation.
Suspicious Individuals	1,246	4.72	12.45	0	333	Calls for service related to suspicious individuals in each city's first observation.
Airbnb - all	1,246	4.44	7.19	0	65	Total count of Airbnbs in each city's first observation (log transformed in model).
Airbnb- entire home	1,246	2.85	5.44	0	58	Total count of Airbnbs listing entire home in each city's first observation (log transformed in model).
Airbnb- private room	1,246	1.5	2.38	0	22	Total count of Airbnbs listing private rooms in each city's first observation (log transformed in model).
Airbnb- shared room	1,246	0.08	0.44	0	10	Total count of Airbnbs listing shared rooms in each cities first observation (log transformed in model).
Distance from CBD	1,246	4.7	2.86	0.12	17.96	Distance of census block group from that city's central business district observation (log transformed in model).
Total Population	1,246	1229	819.48	0	12093	Total population observation (log transformed in model).
White	1,246	.59	.32	0	1	Share of non-Hispanic whites.
College Graduate	1,246	.40	.24	0	1	Share of those with college degree or higher.
Median Rent	1,246	1089	328.93	99	3501	Median rent (log transformed in model).
Housing Density	1,246	3267	3295	0	53869	Total number of housing units per square mile (log transformed in model)
Vacant Housing	1,246	.11	.11	0	1	Share of housing units that are vacant.

Table 3. Summary Statistics for Panel Models

	N	Mean	SD	Min	Max
Revelry (t-t1)	15,510	-0.02	1.09	-42	28
Property Crime (t-t1)	15,510	0.02	5.85	-105	103
Sex Crime (t-t1)	15,510	0.01	0.51	-6	7
Suspicious Individuals (t-t1)	15,510	-0.04	3.92	-185	124
Airbnb - all (t1-t2)	15,510	0.21	3.22	-195	192
Airbnb- entire home (t1-t2)	15,510	0.19	3.13	-199	189
Airbnb- private room (t1-t2)	15,510	0.01	0.69	-13	14
Airbnb- shared room (t1-t2)	15,510	0	0.21	-12	6

Table 4. Cross Sectional Models for Full Sample

	Revelry		Property Crimes		Sex Crimes		Suspicious	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Airbnb - all (log)	0.055*** (0.017)		0.140*** (0.025)		0.115*** (0.026)		0.008* (0.004)	
Airbnb- entire home (log)		0.067*** (0.022)		0.166*** (0.032)		0.137*** (0.034)		-0.002 (0.005)
Airbnb- private room (log)		-0.006 (0.023)		-0.0003 (0.034)		-0.006 (0.036)		0.016*** (0.006)
Airbnb- shared room (log)		0.076 (0.061)		0.068 (0.091)		0.101 (0.096)		-0.006 (0.015)
Distance from CBD (log)	-0.130*** (0.028)	-0.123*** (0.028)	-0.153*** (0.040)	-0.139*** (0.041)	-0.330*** (0.044)	-0.318*** (0.045)	-0.010 (0.007)	-0.012* (0.007)
Total Population (log)	0.180*** (0.026)	0.178*** (0.026)	0.529*** (0.039)	0.526*** (0.039)	0.426*** (0.041)	0.423*** (0.041)	0.006 (0.007)	0.007 (0.007)
% White	0.066 (0.069)	0.050 (0.070)	0.172* (0.103)	0.142 (0.104)	0.133 (0.108)	0.105 (0.109)	0.010 (0.017)	0.014 (0.018)
% College Graduate	-0.267*** (0.090)	-0.262*** (0.089)	-0.352*** (0.133)	-0.344*** (0.133)	-0.921*** (0.142)	-0.914*** (0.142)	-0.066*** (0.023)	-0.067*** (0.022)
Median Rent (log)	0.022 (0.049)	0.020 (0.049)	-0.177** (0.073)	-0.180** (0.073)	-0.188** (0.077)	-0.191** (0.077)	0.014 (0.012)	0.014 (0.012)
Housing Density (log)	-0.049*** (0.017)	-0.051*** (0.017)	-0.163*** (0.025)	-0.166*** (0.025)	-0.123*** (0.027)	-0.126*** (0.027)	-0.00003 (0.004)	0.0001 (0.004)
% Vacant Housing	0.911*** (0.152)	0.895*** (0.153)	0.583*** (0.226)	0.565** (0.227)	1.028*** (0.238)	1.007*** (0.239)	-0.007 (0.038)	-0.005 (0.038)
Portland	-0.227*** (0.046)	-0.216*** (0.047)	-0.784*** (0.073)	-0.758*** (0.073)	-0.010 (0.070)	0.017 (0.071)	-0.035*** (0.011)	-0.038*** (0.011)
Nashville	-0.027 (0.042)	-0.026 (0.042)	-0.229*** (0.063)	-0.227*** (0.063)	0.280*** (0.070)	0.285*** (0.070)	-0.033*** (0.011)	-0.033*** (0.011)
Constant	-0.702* (0.389)	-0.656* (0.389)	0.360 (0.582)	0.446 (0.582)	0.581 (0.611)	0.663 (0.611)	-0.080 (0.098)	-0.084 (0.098)
Observations	1,246	1,246	1,246	1,246	1,246	1,246	1,246	1,246
AIC	1522	1522	2540	2539	2641	2641	-1920	-1922
Log Likelihood	-748	-746	-1257	-1254	-1307	-1305	973	976

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5. Cross Sectional Model for New Orleans

	Revelry (1)	Property Crimes (2)	Property Crimes (3)	Sex Crimes (4)	Sex Crimes (5)	Sex Crimes (6)	Suspicious (7)	Suspicious (8)
Airbnb - all (log)	0.046 (0.034)		0.118*** (0.039)		0.064 (0.043)		0.015 (0.012)	
Airbnb- entire home (log)		0.077* (0.045)		0.138*** (0.052)		-0.005 (0.056)		-0.007 (0.016)
Airbnb- private room (log)		-0.027 (0.046)		-0.009 (0.053)		0.019 (0.057)		0.037** (0.016)
Airbnb- shared room (log)		-0.119 (0.120)		0.003 (0.138)		0.324** (0.149)		-0.025 (0.042)
Count of Hotels (log)	0.245*** (0.057)	0.244*** (0.058)	0.253*** (0.066)	0.237*** (0.067)	0.305*** (0.071)	0.300*** (0.073)	0.005 (0.020)	0.007 (0.020)
Distance from CBD (log)	-0.043 (0.065)	-0.049 (0.064)	-0.034 (0.075)	-0.046 (0.074)	-0.281*** (0.082)	-0.313*** (0.081)	-0.024 (0.023)	-0.022 (0.023)
Total Population (log)	0.226*** (0.054)	0.228*** (0.054)	0.536*** (0.064)	0.543*** (0.064)	0.463*** (0.068)	0.475*** (0.068)	0.016 (0.019)	0.014 (0.019)
% White	0.083 (0.169)	0.066 (0.171)	0.260 (0.194)	0.235 (0.197)	0.421** (0.210)	0.460** (0.212)	0.040 (0.060)	0.057 (0.060)
% College Graduate	-0.317 (0.221)	-0.324 (0.221)	-0.080 (0.254)	-0.067 (0.254)	-1.265*** (0.277)	-1.212*** (0.276)	-0.173** (0.079)	-0.177** (0.078)
Median Rent (log)	-0.139 (0.103)	-0.140 (0.102)	-0.240** (0.118)	-0.241** (0.118)	-0.176 (0.127)	-0.179 (0.127)	0.033 (0.036)	0.033 (0.036)
Housing Density (log)	-0.047 (0.039)	-0.045 (0.039)	-0.308*** (0.045)	-0.308*** (0.046)	-0.170*** (0.049)	-0.166*** (0.049)	0.00000 (0.014)	0.001 (0.014)
% Vacant Housing	0.879*** (0.252)	0.905*** (0.252)	0.445 (0.290)	0.470 (0.290)	1.210*** (0.313)	1.200*** (0.313)	-0.034 (0.089)	-0.028 (0.089)
Constant	0.045 (0.825)	0.040 (0.824)	2.067** (0.953)	2.074** (0.953)	0.917 (1.030)	0.896 (1.027)	-0.240 (0.293)	-0.238 (0.292)
Observations	443	443	443	443	443	443	443	443
AIC	698	700	827	831	889	890	-217	-217
Log Likelihood	-337	-336	-401	-401	-432	-431	120	122

Note: *p<0.1; **p<0.05; ***p<0.01

Table 6. Spatial Fixed Effects

	Revelry		Property Crimes		Sex Crimes		Suspicious	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Change in Airbnb - all	0.009***		0.072***		0.0003		-0.022**	
	(0.003)		(0.014)		(0.001)		(0.009)	
Change in Airbnb- entire home		0.008***		0.078***		0.0005		-0.019**
		(0.003)		(0.015)		(0.001)		(0.009)
Change in Airbnb- private room		0.003		-0.039		-0.003		-0.142***
		(0.013)		(0.067)		(0.006)		(0.043)
Change in Airbnb- shared room		0.224***		0.004		-0.005		0.723***
		(0.041)		(0.217)		(0.019)		(0.141)
Constant								
Observations	15,510	15,510	15,510	15,510	15,510	15,510	15,510	15,510
R2	0.091	0.09	0.072	0.049	0.081	0.082	0.073	0.073

Note: *p<0.1; **p<0.05; ***p<0.01

Figure 2. Growth of Airbnb

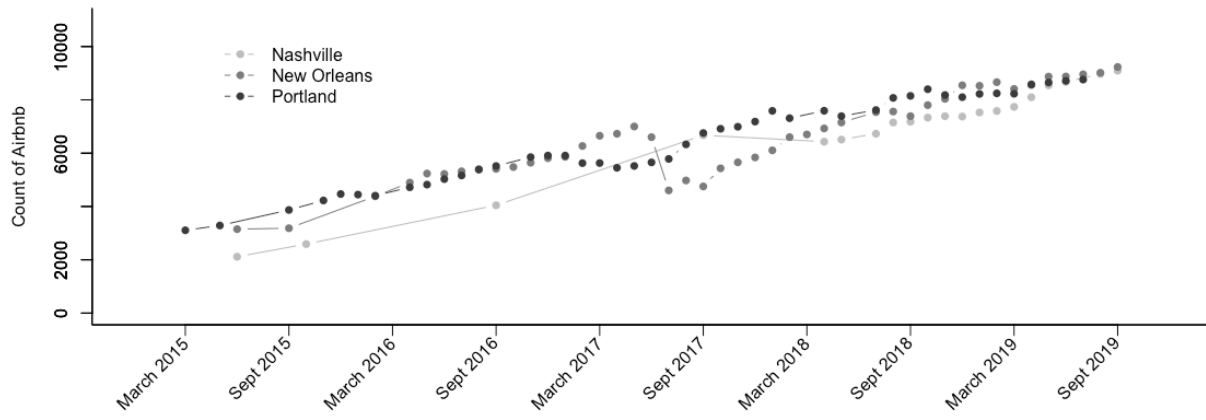


Figure 3. Local Indicator of Spatial Autocorrelation
Nashville



New Orleans



Portland

