Gun Violence and Business Activity*

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Abstract

We study the relationship between gun violence and economic activity using data that contains the precise location and timing of 312 thousand shooting incidents, 759 thousand shots fired, 50 thousand gun violence casualties, and over 3 billion visits to over 465 thousand businesses. Our first finding is that rates of gun violence are highly predictive of economic activity. Our second finding is that common proxies for gun violence massively understate it's prevalence. For every injured or killed victim of gun violence, there are six times as many shooting incidents, and fifteen times as many shots fired. Meanwhile, the types of neighborhoods predicted to be sites of high levels of gun violence based on relatively sparse injury data often do not align with places that experience the most gunfire. Moreover, a typical shooting contains 88 stores within a 0.5 mile vicinity, and each year fifty-nine percent of all stores are exposed to a shooting within their block. Finally, we find little evidence that gun violence causes declines in economic activity. A regression discontinuity design that aims to recover the impact of unexpected gun violence events yields null results. These findings suggest that policies which address gun violence alone are unlikely to improve economic conditions for businesses and individuals who are located in high-gun violence neighborhoods.

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1 Introduction

There is an epidemic of gun violence in the United States. Over the last 10 years, there have been at least 100,000 gun related homicides (Gramlich, 2023), much of them occurring in large urban areas. At the extreme, cities like St. Louis, MO, and Birmingham, AL, have per capita rates of gun death that exceed those of other common lethal diseases like lung cancer.[1] The high-cost of gun violence is also born inequitably. For example, gun violence is now the leading cause of death among young Black men (CDC, 2024) as well as among all children ages 1-17 (Johns Hopkins Center for Gun Violence Solutions, 2024).

Nationally, there is a strong association between gun victimization and poverty. This suggests that economic conditions could play an important role. Yet, despite this connection, a deeper exploration of the link between gun violence and economic activity has proved elusive. The first challenge is that *actual* rates of gun violence are notoriously difficult to measure, with most individual gun shots going unreported (Carr & Doleac, 2016). For that reason, researchers have often been forced to rely on imperfect proxies. However, victimization data, for example, likely represents the tip of the iceberg, with even trained police officers, arguably the group with the most precise shooting skills, fire accurately (hit the individual they target) some 17-40% of the time (Donner & Popovich, 2019; Baker, 2007). The second challenge stems from the fact that simple cross sectional comparisons have the potential to be confounded. Does gun violence harm economic activity and cause underdevelopment? Or is it poverty itself and the associated lack of economic opportunity that creates conditions where gun violence thrives? The answer to these questions are key to understanding the connection between the ongoing epidemic of violence and sustained economic prosperity.

We study the relationship between gun violence and economic activity using novel data that contains the precise location and timing of 312 thousand shooting incidents, 759 thousand shots fired, 50 thousand gun violence casualties, and over 3 billion store visits. Our data on shooting incidents and gunshots come from acoustic gunshot detection technology: a system of fixed array microphones that have been installed in cities across the United States in order to aid law enforcement agencies (Ang *et al.*, 2025). This data allows us to view, at an *extremely* fine level of temporal and spatial resolution, both the timing and extent of gun fire events for neighborhoods contained in 20 major US cities.[2] To measure economic activity, we unite the acoustically detected gunshot data with counts of consumer foot traffic measured via cell phone tower pings. The combined data allows us to make an unprecedented exploration of the connection between gun violence and business activity.

We begin by descriptively characterizing the landscape of gun violence, and it's connection to economic activity, across the United States. Our first finding is that there is substantial heterogeneity in rates of shooting incidents across cities that not sufficiently predicted with common proxies such as gun shot victimization and homicides. For example, the data reveal that for every victim of gun violence, there are at least 6 shoot-

[1] Recent estimates suggest that the per-capita lung cancer morality rate in St. Louis is 64-69 per 100 thousand residents per year. For gun deaths, that number is 76.4. See https://www.stlouis-mo.gov/government/departments/mayor/initiatives/resilience/equity/opportunity/health-safety/mortality-rate.cfm and https://www.axios.com/2023/10/16/america-gun-deaths-crime-south for more detail.

[2] For the complete list of cities, see table A1

ing incidents and over 15 individual shots fired. In fact, we find that the correlation between rates of gun violence incidents and gun violence victimization is only 0.049. These findings suggest that most existing work on the topic of gun violence in the United States drastically understates the prevalence of gun violence exposure.

Cities with high rates of gun violence also have significantly lower levels of business activity. While larger cities with large acoustic gunshot detection system coverage areas tend to have both more shootings and more businesses on average, comparisons of rates at the block level yield a stark, negative relationship. In fact, the correlation between the number of businesses per block and rates of gun violence is 1.1. Regression analysis suggests that cities with an additional shooting per block per year have, on average, -0.1 fewer business contained in them. However, it is important to note that retail businesses in our data are not evenly distributed across census blocks. For that reason, in order to measure how often individual business are actually exposed, it is important to zoom in to finer levels of within-city resolution.

We find that most businesses are exposed to gun violence. Our data contain information on consumer activity for 465,538 businesses, which are visited by an average of 52-160 consumers in a typical month. A typical gun violence incident in our data has 88 businesses located within a 0.5 miles radius of the incident. Fifty-nine percent of all businesses in areas with acoustic gunshot detection experience a shooting on their individual census block. Zooming out to the broader, community-wide level, we find that 95% of all businesses are exposed to at least one shooting incident over the study period. Thus, depending on the definition of exposure, we find that either a majority of businesses or *virtually all* businesses in our sample are exposed to gun violence.

Next, we explore the impact of gun-violence on short-run consumer behavior. To do so, we exploit the fine temporal variation of the timing of gun shots in our data in a regression discontinuity design. Intuitively, we compare foot traffic patterns in affected blocks from just before a gun shot event to just after. If the precise timing of a shooting incident is orthogonal to other observed an unobserved determinants of consumer and business behavior, than this comparison will isolate the causal effect of gun-violence on economic activity.

We find substantively precise evidence that gun violence does not impact economic activity. The point estimates from our regression enable us to rule out changes in foot traffic beyond declines of 5.8 visits or increases of 1.8 visits after a shot is fired—these represent a very small, and insignificant change relative to mean visitations in our sample (≈ 100). We find similar patterns when exploring more violent incidents involving multiple shots; incidents that result in victimization or homicide; and among incidents that occur in more or less violent neighborhoods. We also do not find evidence of heterogeneity by business type or by distance from the gunshot. Overall, we conclude that these findings suggest that policies which address gun violence alone are unlikely to improve economic conditions for individuals who live in high-gun violence neighborhoods.

We advance the existing literature in multiple ways, first regarding the determinants of business activity in low income neighborhoods. This literature has predominantly focused on the effectiveness of place-based

economic incentives, finding broadly mixed results in effectiveness (Neumark & Savych, 2022; Shybalkina, 2022). As for the role of public safety and the criminal justice system specifically in economic activity, limited evidence to date suggests that mass shootings have potential adverse impacts in local employment rates (Cuellar & Jung, 2025), and that gunfire reduced residential property values in one small- to mid-sized city (Locke *et al.*, 2024). We show that shootings do not lead to significant changes in economic activity across sectors in a range of cities across the country, suggesting that curbing gun violence cannot on its own advance urban economic conditions.

Second, when aiming to understand the impact gun violence has on entrepreneurship and economic activity, much of existing research focused on gun victimization. One strand of this literature examines the opportunities and policies focused on averting violent victimization, finding that on the enforcement side, policies like increased number of police officers reduce violence, while on the public's side, job training programs show substantial promise in reducing gun involvement (Mello, 2019; Bhatt *et al.*, 2024). Meanwhile, another strand of this literature focuses on the costs of gun violence—predominantly examining mass shootings specifically—, finding that the exposure to these events decreases a range of health outcomes (Currie *et al.*, 2023; Soni & Tekin, 2023). We advance this literature by examining the impacts of a more complete measure of gunfire.

2 Data

We rely on five data sources, described in detail below.

SafeGraph Visit Data 2018-22. To measure the number of visits to businesses, we use data from SafeGraph, which provides information on the number of visits to each business on each date across the country. The data identifies each business using the North American Industry Classification System (NAICS), and includes NAICS codes at the most detailed level of specificity, providing 6-digit NAICS codes.[3] This data is collected via cellphone apps, with the sample covering approximately 7.5% of the US population (Li *et al.*, 2024). Therefore, the total number of visits to a business are approximately 13 times the observed visits in the SafeGraph sample. In terms of representativeness, we are reassured by a recent, comprehensive study—examining SafeGraph data precisely for our study years—finding that the number of devices residing in an area are highly correlated with the number of residents based on the American Community Survey, and biases for specific demographic groups are minimal with sampling bias ranging on average across the years within -0.03 and +0.01 for every demographic category (Li *et al.*, 2024).[4]

Acoustic Gunshot Detection Data 2018-22. To estimate the amount of violence occurring in urban neighborhoods, we use data from acoustic gunshot detection technology. Such technology involves a series of permanently mounted sensors in some urban neighborhoods, which pick up the specific acoustic sound a gunshot makes, and using multiple devices picking up the same sound, locate its location and time using

[3]For example, there are separate 6-digit NAICS codes for full-service and limited service restaurants, and for physicians versus psychiatrists.

[4]Specifically, the device-population residence correlation is 0.99 in urban settings at the county, and 0.68 at the census tract level. Demographic groups are split into 23 categories across age, gender, race and ethnicity, education, and income groups.

the process, and does so with a generally high level of accuracy (Maher, 2006; Loeffler & Flaxman, 2018; Mazerolle *et al.*, 2000; Watkins *et al.*, 2002; Goode, 2012; Irvin-Erickson *et al.*, 2017).[5] Such technology is currently deployed in approximately 100 cities nationwide (Electronic Frontier Foundation, n.d.). From the acoustic gunshot technology data, we have information on the exact time and location of every incident of shooting that took place in the technology-covered areas in the study cities. In addition, for ten of the twenty study cities, we have information on the precise number of shots fired as well, where one shooting incident might involve multiple shots fired.[6] Generally, specific parts of a given city are covered due at least in part to the cost associated associated with the technology (Blackburn & Mares, 2019), with the coverage areas ranging from a few neighborhoods to around half of a city.[7] The deployment neighborhoods are determined based on a given city's preferences, primarily deploying the technology in more violent neighborhoods. While this technology is not without controversy (Ang *et al.*, 2025; Gwidt, 2024; Guariglia, 2021; Stanley, 2021), it enables using a measure of gunfire that does not rely on, and therefore is not potentially influenced by, human reporting.

Gun Violence Archive Data 2018-22. We use this dataset to estimate the level of victimization as compared to gunfire in our study cities. The Gun Violence Archive collects the largest national collection of recorded instances of fatal and non-fatal violent gun victimization across the US, with exact information on the location and time of the incident, "from over 7,500 law enforcement, media, government and commercial sources" (Gun Violence Archive, n.d.). Using this, we can assess to what extent patterns of victimization might under-report the volume of gunfire in urban neighborhoods.[8]

911 Calls for Service data 2018-22. We use 911 calls for service datasets from sample cities to estimate to estimate the extent of shootings- and shot fired-related calls local residents make to police. Using this, we can assess to what extent patterns of shootings related calls might under-report the volume of gunfire in urban neighborhoods.

American Community Survey 2010. To address the potential differences in the impact of heightened violence in urban neighborhoods with different demographic compositions, we use American Community Survey 10-year population estimates at the census block level.

Our data from these data sources covers 20 US cities: Baltimore, MD; Boston, MA; Chicago, IL; Cincinnati, OH; Denver, CO; Fresno, CA; Glendale, AZ; Hartford, CT; Jacksonville, FL; Las Vegas, NV; Louisville, KY; Milwaukee, WI; Minneapolis, MN; New York, NY; Oakland, CA; Pittsburgh, PA; Richmond, CA; San Diego, CA; San Francisco, CA; Washington, DC. (Of these, 911 data is limited to a subset of cities.) These cities include a wide city types, from some very large cities to small- to mid-sized cities, cities that are near

[5] To limit the potential for false positive classification, which are mainly due to car backfires, helicopters, and fireworks (Carr & Doleac, 2016), we exclude New Year's Eve, New Year's Day, and Fourth of July from our study.

[6] See Table A1 for the list of cities with detected shots fired, and the city-specific temporal coverage of this data source.

[7] In our sample, coverage area is lowest in San Diego, covering 3% of the city, while on the other end of the spectrum, Chicago, Hartford, Oakland, Pittsburgh, Richmond, and Washington, DC have at least half the city covered.

[8] We define incidents of gun violence victimization as events of reported gun homicide and non-fatal gun injuries, collected in the Gun Violence Archive. A single gun violence incident can have multiple victims, including with fatal and non-fatal injuries. The Gun Violence Archive dataset has been validated by a recent review and found to be reliable, and closely matching police agency reports, where such reports are available (Koper *et al.*, 2025).

the higher versus the lower end of violent crime in urban settings, and cities from the East Coast, the West Coast, the Midwest, the West, and the South. See a map of study cities in Figure A1.

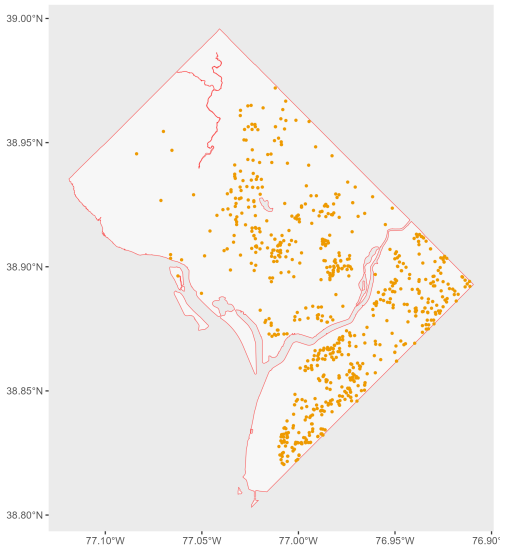
3 Descriptive evidence

First, we compare the exposure to gun violence as measured by gun homicides versus as measured by acoustic gunshot detection technology. To visualize one example city, in Figure 1 we compare Panel A, which captures homicides, to Panel B, which captures shootings. The figure shows that shootings take place substantially more frequently than gun homicides do.

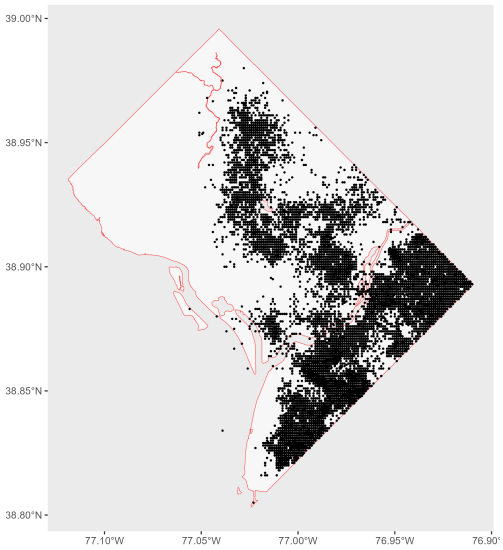
Across all cities, in total, we observe 40,854 gun victimization incidents (involving 50,942 individual victims)[9] and 759,698 shots fired. We find that across all cities, for every gun violence victimization incident, there are at least 6.1 acoustically detected shootings, and at least 15 shots fired in sensor-active census blocks. An incident can involve one or multiple fatal and non-fatal victimizations. Using the ratio of shooting incidents to shots fired for the cities where we do have this detail, we find that that ratio is 4.09. Then, a likely total shot estimate across all sample cities—assuming that the shooting–shot ratio on average is the same in cities with and without this detail—is 1,275,569.

[9]For comparison, annual total victims (fatal and non-fatal) in these 20 cities equals the number of pedestrians who die in traffic crashes each year *nationwide* (National Safety Council, 2024).

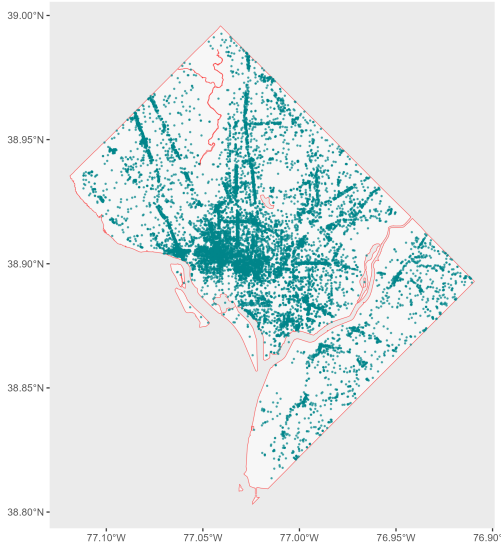
Figure 1: The spatial distribution of gun violence and businesses in Washington, DC



(a) Panel A: Gun Homicides



(b) Panel B: Shootings



(c) Panel C: Businesses

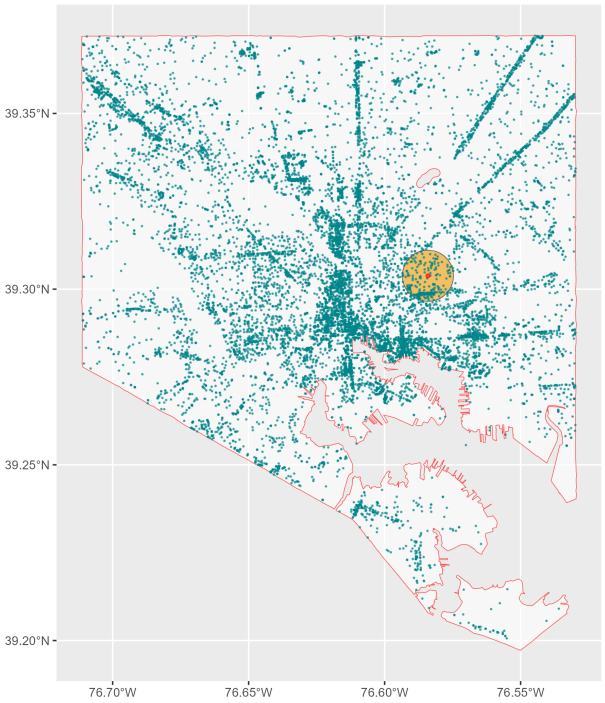
To understand the extent to which businesses are exposed to shootings in their vicinity, we link each business to shooting incidents that occur in its 0.5 mile vicinity (see a visual example of this linkage in Figure 2).[10]

[10]For this descriptive section, we use 0.5 mile radius based on the scant evidence on how far the sound of gunshots might travel in built-up urban environments, and specifications in the previous literature, which suggests this can be somewhere between 0.25 to

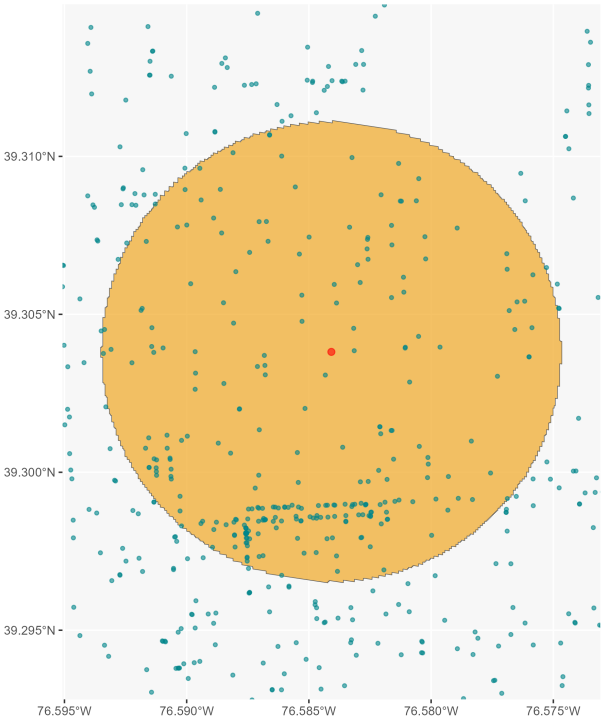
In total, there are 465,538 businesses in the sample cities, observing a total of over 3 *billion* visits over the 5 years (specifically, 3,206,625,849). We observe that businesses are located across the entirety of cities, and even with census blocks being small areas, 28-62% of blocks have at least one business citywide.

Businesses in censor-covered areas are regularly exposed to gunfire. On average, we observe that there are 88.09 businesses within a 0.5 mile radius of a shooting. Meanwhile, focusing in on the census block level (which is largely equivalent to the city block), 59% of businesses experience a shooting within the same census block that the business is located in sometime during 2018-2022.[11] These average also include substantial variation.

Figure 2: Example: Shooting and the businesses within its 0.5 mile radius



(a) Panel A: The map of Baltimore, with an example shooting (in red), and the businesses (in green) within a 0.5 mile vicinity (in yellow) that we estimate how the shooting might impact



(b) Panel B: A zoomed in section of the map of Baltimore, with an example shooting (in red), and the businesses (in green) within a 0.5 mile vicinity (in yellow) that we estimate how the shooting might impact

1 mile (Robbins *et al.*, 2024; Decibel Pro, 2021).

[11] At the census tract—approximately, neighborhood—level this rate is substantially higher with 95% of businesses experiencing a shooting within the same census tract they are located in sometime during 2018-2022.

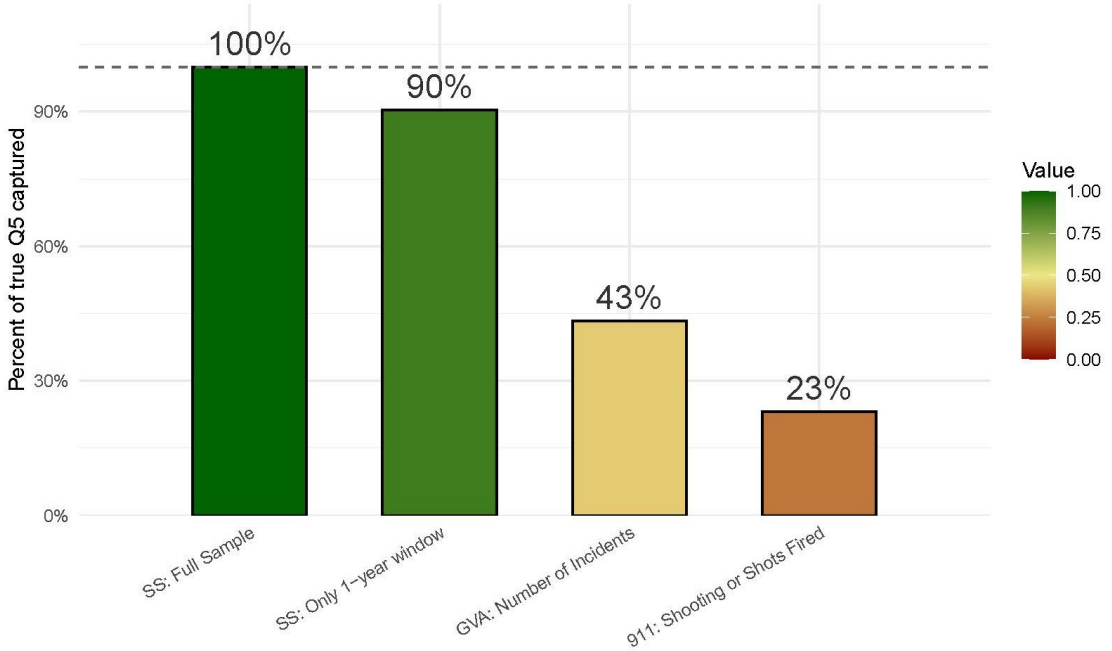
3.1 Identification of the most gunfire-heavy neighborhoods

As we have seen in the previous section, the level of gun violence, relying on victimization data, is under-reported by a factor of 15 in urban America. However, an equally important and police-relevant question is whether this under-reporting simply misses the volume of the true level of violence or if it *misplaces* violent-perceived neighborhoods as well, potentially incorrectly classifying the neighborhoods experiencing the highest levels of violence. We observe this to be indeed the case.

Comparing our rich, automatically generated acoustic gunshot data to other, frequently utilized sources, we observe that even one year of acoustic gunshot data decisively outperforms other sources. Specifically, comparing gun-shot detection data for all five years as the baseline, one year of gunshot detection data correctly classified 90% of the most violent neighborhoods (i.e., the top quintile of neighborhoods based on shots fired in all data years). On the other hand, five years of fatal and non-fatal gun violence injury still incorrectly identify the majority of violent neighborhoods, with only 43% of the most violent neighborhoods being correctly identified through injury data. Lastly, using shootings-related calls for service for all five years, only 23% of the most violent neighborhoods are correctly identified as such.

These findings can have far-reaching consequences, as they suggest that for example policies trying to target violent urban areas might miss as much as nearly 60-80% of their intended targets if locations for policy support are identified via where incidents take place and where calls arrive to the police from. A miss-classification like this would yield both that neighborhoods in need of support do not receive it, and that gun violence reduction policies might have limited scope in achieving an effectiveness if the starting levels are not as high in the targeted neighborhoods as elsewhere in the city.

Figure 3: Correctly classified most violent quintile neighborhoods



4 The causal impact of incidents of shots fired on business activity

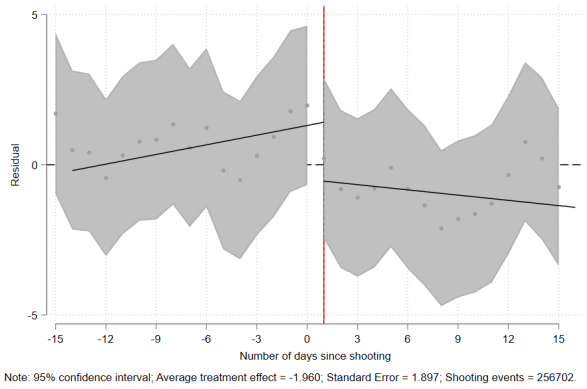
In this section we estimate the impact of single incidents of gun violence. Specifically, we use a regression discontinuity in time design to estimate the short-run impact of gun violence on business activity, considering neighborhoods that have just experienced a gunfire as treated, while neighborhoods without recent gunfire as untreated. In our main specification, we focus on the 15 days preceding and following a shooting, comparing business activity in the 15 days prior and the 15 days following an incident. The identifying assumption is that in the absence of the specific gun violence, consumer behaviors would have progressed similarly in gunfire (treatment) and non-gunfire (control) neighborhoods. The regression specification is as follows:

$$Y_v = \beta_0 + \beta_1 After_v + \beta_2 Date_v + \beta_3 After_v * Date_v + X_v + \varepsilon_v$$

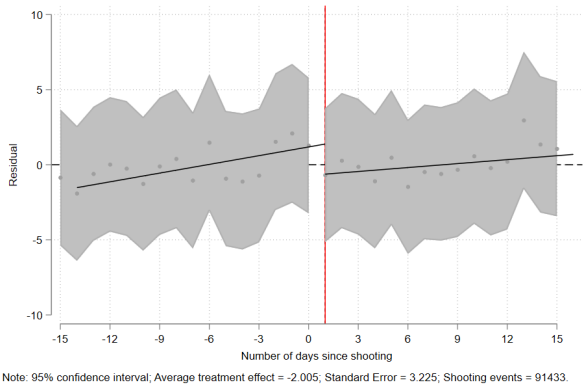
where Y_v is the business visit count outcome for businesses within the given vicinity of a gun violence event, $After_v$ is an indicator for the date being after the gun violence event, $Date_v$ is the date running variable, while $After_v * Date_v$ is the interaction of the two. X_v includes a day of the week variable to de-trend the data, while ε_v captures errors.

Looking at Figure 4, we observe that the number of visits to businesses in the 15 days following a shooting are not significantly different from the number of visits in the 15 days prior to a shootings, and this zero change is tightly estimated. We conclude that the number of visits to local stores is not significantly impacted by a single incident of shots fired in relatively violent urban neighborhoods.

Figure 4: The impact of shootings on visits to businesses



(a) Panel A: Number of visits within 0.5 mile radius, 1 or more gunshots



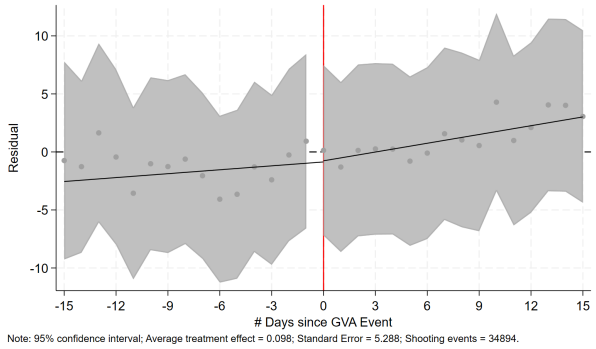
(b) Panel B: Number of visits within 0.5 mile radius, 2 or more gunshots

A shooting incident might have different impacts in neighborhoods that experience persistent, high levels of gun violence versus neighborhoods that rarely experience gun violence. For example, compounding gun violence might exacerbate an incident's impact, or such compounding might to some degree limit a local resident's reaction to an additional incident. To estimate this, we categorize censor-active blocks across the whole sample into five quintiles based on the number of shootings that happen in each block over the study

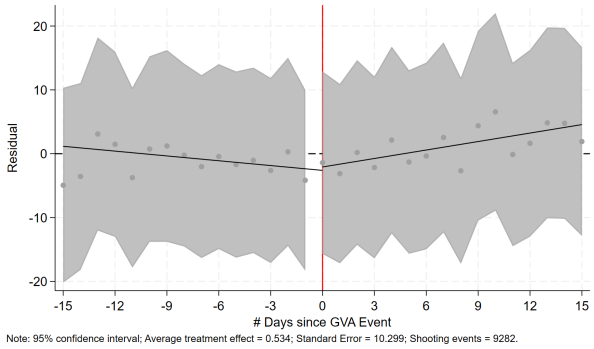
period. We rerun our main estimate, now focusing on each gunfire quintile one at a time. Looking at **??**, we find neither potential aforementioned narrative to hold, and we observe that single incidents of shots being fired in areas with different levels of overall gun violence show a similar absence of change in subsequent business visits.

Next, we turn our attention to instances of gun violence victimization, and ask the question how visits to nearby businesses changes in the wake of someone being killed or injured by a gun. Analysis in this section includes the entire city, not just areas covered with acoustic detection, as we have citywide victimization data. As seen in Figure 5, we find that such instances do not lead to changes in visits to businesses, we are able reject even economically minimal changes, estimating a precise null effect.

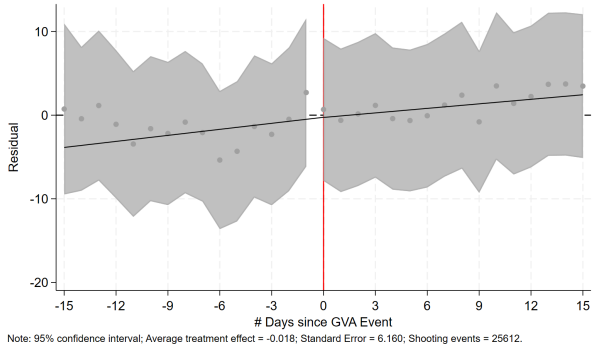
Figure 5: The impact of gun violence victimization on visits to businesses



(a) Panel A: Number of visits within 0.5 mile radius, at least one person killed or injured



(b) Panel B: Number of visits within 0.5 mile radius, at least one person killed



(c) Panel C: Number of visits within 0.5 mile radius, at least one person injured

A shooting incident might have different impacts in neighborhoods that experience persistent, high levels of gun violence versus neighborhoods that rarely experience gun violence. For example, compounding gun violence might exacerbate an incident's impact, or such compounding might to some degree limit a local resident's reaction to an additional incident.

To estimate this, we rank each city census tract for all 17 cities in terms of the block's number of gun violence

victims (number of people injured or killed over the 5 years).[12] Then, for each city, we create quintiles (5 groups), quintile 1 capturing the 20% least violent tracts for each city, quintile 2 capturing the next 20%, while quintile 5 capturing the tracts in each city with the most gun violence victims. We observe that the number of gun violence victims is indeed substantially different in these different quintiles, with tracts in qiuntile 1 experiencing an average of 21 victims over the five year, quintile 2 has 96 victims, quintile 3 has 206 victims, quintile 4 has 428 victims, and quintile 5 has 824 victims.

We rerun our estimate, now focusing on each victimization quintile one at a time. We find neither potential aforementioned narrative to hold, and we observe that recent shootings in areas with different levels of overall gun victimization show a similar absence of change in subsequent business visits.

In an alternative specification, we redefine the violence classification using the number of shootings instead of the number of individuals victimized. In this specification, we focus only on censor-active city blocks (which is where we have data on the number of shootings), and categorize censor-active blocks into five quintiles based on the number of shootings that happen in each block over the study period.[13] We find that just as in neighborhoods with many any few victims, neighborhoods with many and few shootings also exhibit similar, insignificant changes after instances of gun violence.

In both specifications above, we have created quintiles in each city separately, such that estimates for quintile 1 (least violent) are based on the effect of shootings in the least violent 20% of Baltimore blocks and the least violent 20% of Boston blocks, and so on. In our final specification in this setting, we reclassify blocks across all cities, such that now the 20% least violent blocks will be drawn from ranking all cities' blocks at once. (For example, a city that rarely experiences violence might have most of its blocks fall into the least violent quintile in this setup.) We then re-estimate the regressions, and find that the null effect persists for this alternative definition of quintiles as well.

4.1 Business types

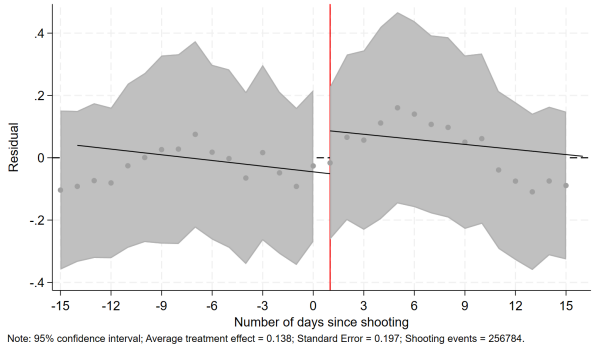
In this section, we explore whether the impact of shootings differs by business type. We opt to explore a wide cross-section of store types to enrich our understanding of the average pattern observed above. We focus on store types potentially tied to substance use (bars that serve alcohol, liquor and convenience stores), where substance use challenges have been documented in correlational settings to go hand in hand with witnessing community violence (Harper, 2023); store types related to food consumption (supermarkets and limited service restaurants); and key other facets of many individuals' life, like their health (measured as visits to pharmacies rather than to hospitals, as a small subset of victims of gun crime receive treatment in hospitals, potentially conflating victim and non-victim overall trends (Sharkey, 2018)), education (Sharkey *et al.* (2014) and Gershenson & Tekin (2018) causally document a decline in student test scores after local gun violence, while Monteiro & Rocha (2017) in an international setting suggest that teacher absences increase during times of gang battles), and religious activity (visits to churches, temples, etc).

[12] As victimization is a less frequent event than shootings, we create the classification based on census tracts, a geographical unit larger than the census blocks used elsewhere in this study.

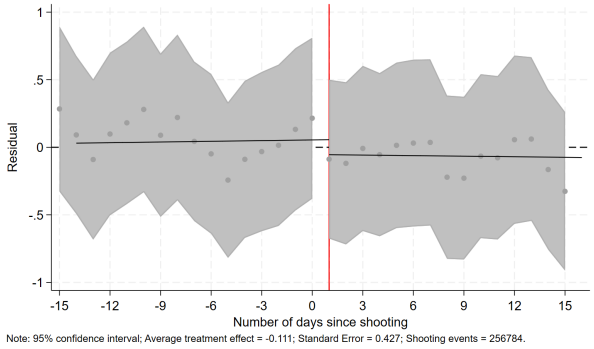
[13] As before, this analysis will inevitably be impacted by the share of blocks a city opts to cover with censors.

We find that visits remain unchanged to these specific business types as well, it does not appear to be the case that specific business types experienced an increase or decline in visit in the immediately following days after incidents of gun violence.

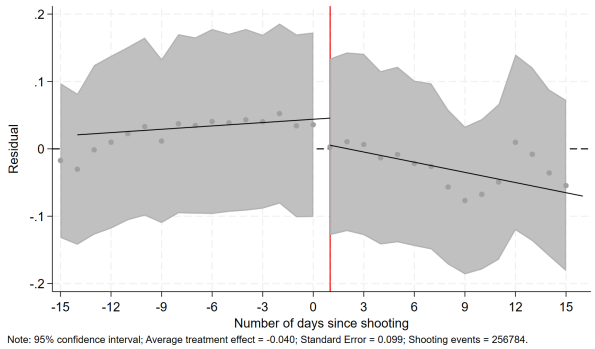
Figure 6: The impact of shootings on visits to various business points of interest (within 0.5 miles, after 1 or more gunshots)



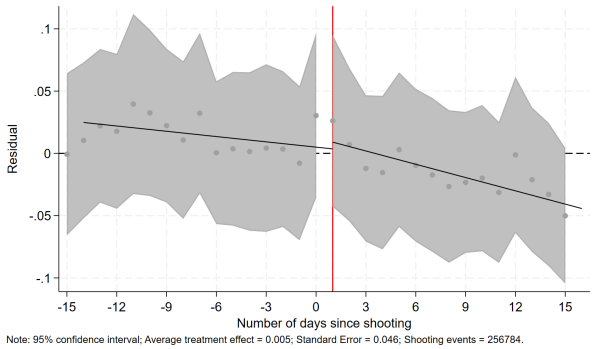
(a) Panel A: Number of visits to supermarkets and grocery stores



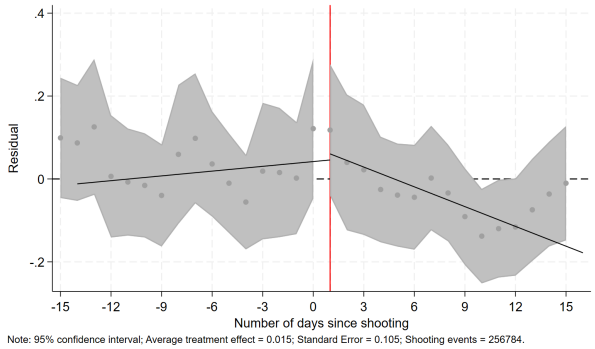
(b) Panel B: Number of visits to limited service restaurants



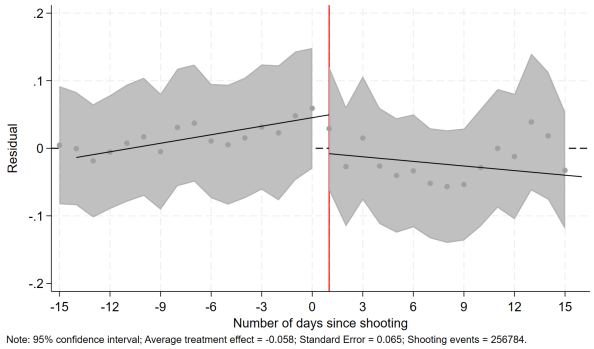
(c) Panel C: Number of visits to convenience stores



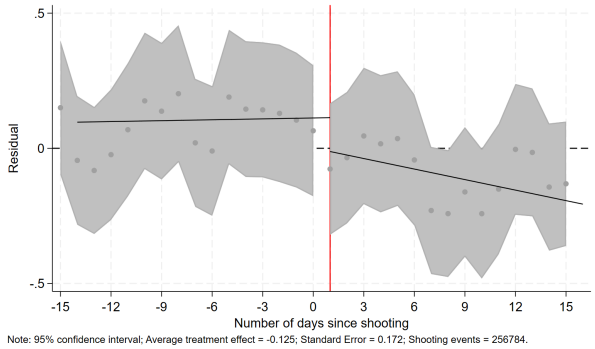
(d) Panel D: Number of visits to liquor stores



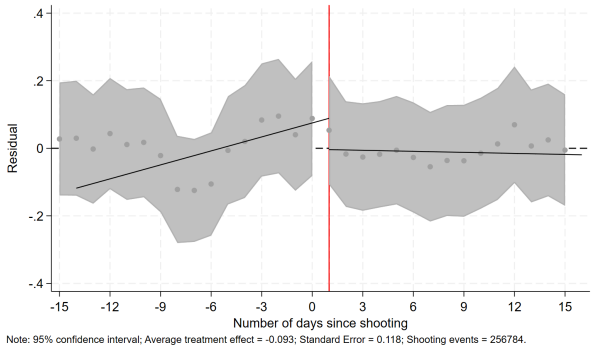
(e) Panel E: Number of visits to bars and nightclubs



(f) Panel F: Number of visits to pharmacies



(g) Panel G: Number of visits to elementary and secondary schools



(h) Panel H: Number of visits to religious organizations (such as churches, temples, etc)

References

ANG, DESMOND, BENCSIK, PANKA, BRUHN, JESSE, & DERENONCOURT, ELLORA. 2025. Community Engagement with Law Enforcement after High-Profile Acts of Police Violence. *American Economic Review: Insights*, **7**(1), 124–142.

BAKER, AL. 2007. A Hail of Bullets, a Heap of Uncertainty. *The New York Times*, Dec.

BHATT, MONICA P, HELLER, SARA B, KAPUSTIN, MAX, BERTRAND, MARIANNE, & BLATTMAN, CHRISTOPHER. 2024. Predicting and Preventing Gun Violence: An Experimental Evaluation of READI Chicago*. *The Quarterly Journal of Economics*, **139**(1), 1–56.

BLACKBURN, EMILY, & MARES, DENNIS. 2019. The Hidden Costs of Police Technology: Evaluating Acoustic Gunshot Detection Systems. *Police Chief Magazine*, Apr.

CARR, JILLIAN, & DOLEAC, JENNIFER L. 2016. The geography, incidence, and underreporting of gun violence: new evidence using ShotSpotter data. *Incidence, and Underreporting of Gun Violence: New Evidence Using Shotspotter Data (April 26, 2016)*.

CUELLAR, MIGUEL, & JUNG, HYUNSEOK. 2025. Mass Shootings, Community Mobility, and the Relocation of Economic Activity. *Papers*, Feb. Number: 2502.19640 Publisher: arXiv.org.

CURRIE, JANET, DURSUN, BAHADIR, HATCH, MICHAEL, & TEKIN, ERDAL. 2023 (Oct.). *The Hidden Cost of Firearm Violence on Infants in Utero*. Tech. rept. w31774. National Bureau of Economic Research, Cambridge, MA.

DECIBEL PRO. 2021. How Many Decibels Is A Gunshot | How Far Away Can You Hear a Gunshot. *Decibel Meter App | Best Digital Sound Level Meter For Your Smartphone*, May.

DONNER, CHRISTOPHER M., & POPOVICH, NICOLE. 2019. Hitting (or missing) the mark: An examination of police shooting accuracy in officer-involved shooting incidents. *Policing*, **42**(3), 474–489. Num Pages: 16 Place: Bradford, United Kingdom Publisher: Emerald Group Publishing Limited.

ELECTRONIC FRONTIER FOUNDATION. *Gunshot Detection*.

GERSHENSON, SETH, & TEKIN, ERDAL. 2018. The Effect of Community Traumatic Events on Student Achievement: Evidence from the Beltway Sniper Attacks. *Education Finance and Policy*, **13**(4), 513–544.

GOODE, ERICA. 2012. Shots fired, pinpointed and argued over. *New York Times*.

GUARIGLIA, MATTHEW. 2021 (July). *It's Time for Police to Stop Using ShotSpotter*.

GUN VIOLENCE ARCHIVE. *About*.

GWIDT, DAVID. 2024 (Mar.). *ShotSpotter Leak Shows That Surveillance Tech is Used to Overpolice Black and Brown Communities*. Tech. rept. ACLU of Wisconsin.

HARPER, CHRISTOPHER R. 2023. Witnessing Community Violence, Gun Carrying, and Associations with Substance Use and Suicide Risk Among High School Students — Youth Risk Behavior Survey, United States, 2021. *MMWR Supplements*, **72**.

IRVIN-ERICKSON, YASEMIN, LA VIGNE, NANCY, LEVINE, NED, TIRY, EMILY, & BIELER, SAMUEL. 2017. What does Gunshot Detection Technology tell us about gun violence? *Applied Geography*, **86**(Sept.), 262–273.

JOHNS HOPKINS CENTER FOR GUN VIOLENCE SOLUTIONS. 2024. Gun Violence in the United States 2022. Sept.

KOPER, CHRISTOPHER S., BAAS, GRETCHEN, TAYLOR, BRUCE G., LIU, WEIWEI, & SHERIDAN-JOHNSON, JACKIE. 2025. Validating open-source data on fatal police shootings against self-reports from a national sample of police agencies. *Injury Epidemiology*, **12**(1), 68.

LI, ZHENLONG, NING, HUAN, JING, FENGRUI, & LESSANI, M. NASER. 2024. Understanding the bias of mobile location data across spatial scales and over time: A comprehensive analysis of SafeGraph data in the United States. *PLOS ONE*, **19**(1), e0294430.

LOCKE, STEPHEN, TOMA, MICHAEL, & BECK, JASON. 2024. The impact of gunfire on residential property values. *Applied Economics*, Sept., 1–14.

LOEFFLER, CHARLES, & FLAXMAN, SETH. 2018. Is Gun Violence Contagious? A Spatiotemporal Test. *Journal of Quantitative Criminology*, **34**(4), 999–1017.

MAHER, ROBERT C. 2006. Summary of Gun Shot Acoustics. Apr.

MAZEROLLE, LORRAINE G., FRANK, JAMES, ROGAN, DENNIS, & WATKINS, CORY. 2000. A field evaluation of the ShotSpotter gunshot location system: Final report on the Redwood City field trial. *US DOJ report*.

MELLO, STEVEN. 2019. More COPS, less crime. *Journal of Public Economics*, **172**(Apr.), 174–200.

MONTEIRO, JOANA, & ROCHA, RUDI. 2017. Drug Battles and School Achievement: Evidence from Rio de Janeiro's Favelas. *The Review of Economics and Statistics*, **99**(2), 213–228.

NATIONAL SAFETY COUNCIL. 2024. *Pedestrians and Car Crashes*.

NEUMARK, DAVID, & SAVYCH, BOGDAN. 2022. Effects of opioid-related policies on opioid utilization, nature of medical care, and duration of disability. *American Journal of Health Economics*, Oct. Publisher: The University of Chicago Press.

OFFICE OF MANAGEMENT AND BUDGET. 2022. *North American Industry Classification System*. Tech. rept. Executive Office of the President.

ROBBINS, REBECCA, AFFOUF, MAHMOUD, MASIAKOS, PETER T., IYER, JAY M., GRIGGS, CORNELIA, KLERMAN, ELIZABETH B., & SACKS, CHANA A. 2024. Estimating Community Disruption from Nighttime Gunshots in 6 U.S. Cities, 2015 to 2021. *Journal of General Internal Medicine*, **39**(13), 2380–2389.

SHARKEY, PATRICK. 2018. The Long Reach of Violence: A Broader Perspective on Data, Theory, and Evidence on the Prevalence and Consequences of Exposure to Violence. *Annual Review of Criminology*, **1**(1), 85–102. _eprint: https://doi.org/10.1146/annurev-criminol-032317-092316.

SHARKEY, PATRICK, SCHWARTZ, AMY ELLEN, ELLEN, INGRID GOULD, & LACOE, JOHANNA. 2014. High Stakes in the Classroom, High Stakes on the Street: The Effects of Community Violence on Student's Standardized Test Performance. *Sociological Science*, **1**(May), 199–220.

SHYBALKINA, IULIIA. 2022. Place-Based Small Business Support and its Implications for Neighborhood Revitalization. *Economic Development Quarterly*, **36**(4), 355–370. Publisher: SAGE Publications Inc.

SONI, APARNA, & TEKIN, ERDAL. 2023. How Do Mass Shootings Affect Community Wellbeing? *Journal of Human Resources*, June. Publisher: University of Wisconsin Press Section: Articles.

STANLEY, JAY. 2021 (Aug.). *Four Problems with the ShotSpotter Gunshot Detection System | ACLU*.

WATKINS, CORY, MAZEROLLE, LORRAINE, ROGAN, DENNIS P., & FRANK, JAMES. 2002. Technological approaches to controlling random gunfire: Results of a gunshot detection system field test.

Appendix A

Figures

Figure A1: Study cities

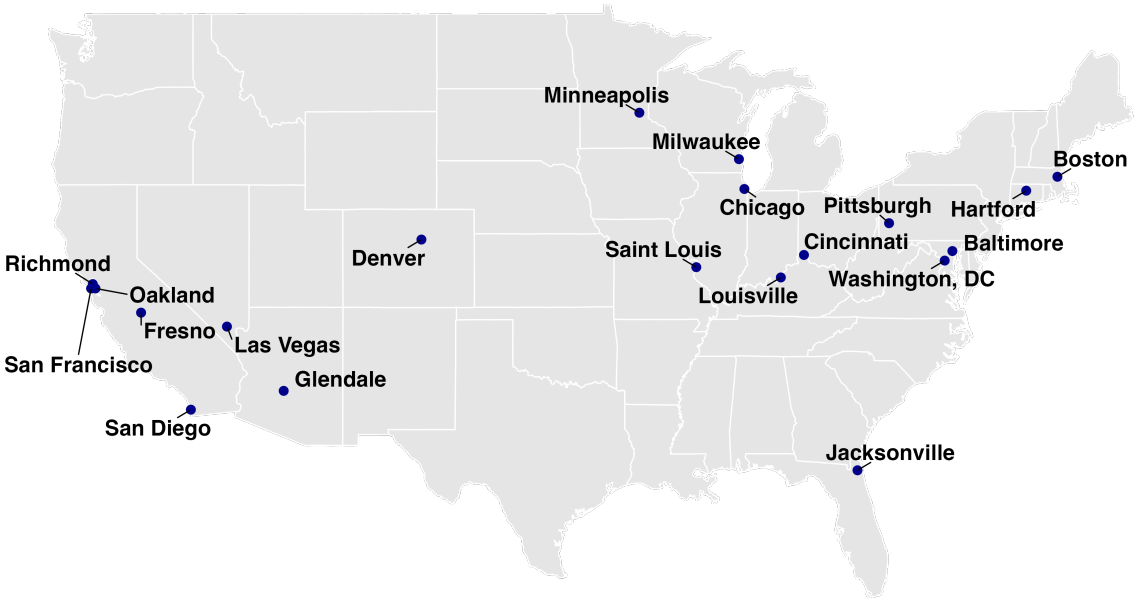
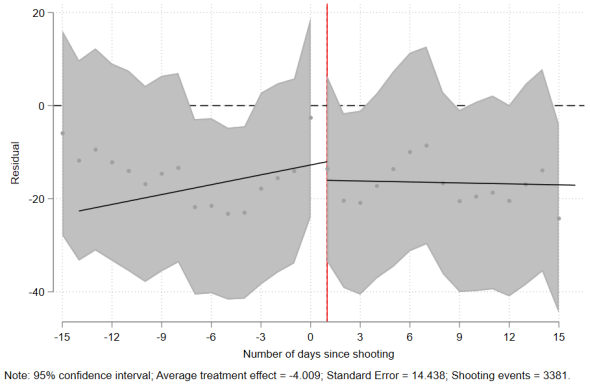
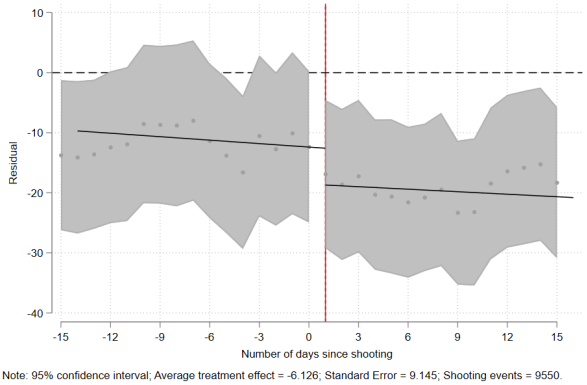


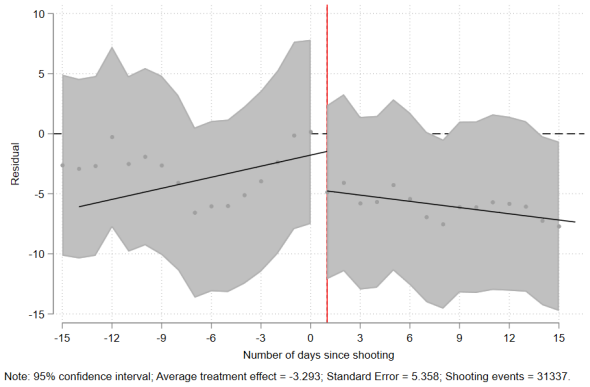
Figure A2: The impact of shootings on visits to businesses in more and less violent neighborhoods



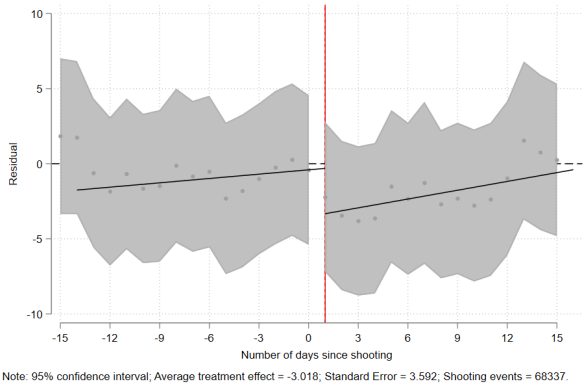
(a) Panel A: Number of visits within 0.5 mile radius after 1 or more gunshots in the least violent neighborhoods (quintile 1)



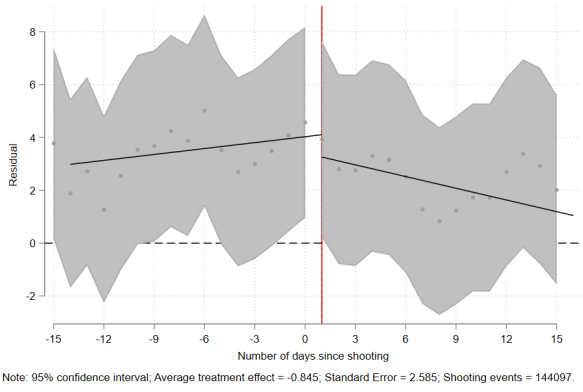
(b) Panel B: Number of visits within 0.5 mile radius after 1 or more gunshots in the second least violent neighborhoods (quintile 2)



(c) Panel C: Number of visits within 0.5 mile radius after 1 or more gunshots in neighborhoods with a medium amount of violence (quintile 3)



(d) Panel D: Number of visits within 0.5 mile radius after 1 or more gunshots in the second most violent neighborhoods (quintile 4)



(e) Panel E: Number of visits within 0.5 mile radius after 1 or more gunshots in the most violent neighborhoods (quintile 5)

Tables

Table A1: Acoustic Gunshot Detection Data Coverage

City	Start date	End date	Shooting incident data	Shot count data
Baltimore	May 2018	November 2022	Yes	—
Boston	January 2018	November 2022	Yes	Yes
Chicago	January 2018	February 2020	Yes	Yes
Cincinnati	January 2018	November 2022	Yes	—
Denver	January 2018	November 2022	Yes	Yes
Fresno	January 2018	November 2022	Yes	Yes
Glendale	January 2020	November 2022	Yes	—
Hartford	January 2018	November 2022	Yes	Yes
Jacksonville	January 2018	November 2022	Yes	Yes
Las Vegas	March 2018	November 2022	Yes	Yes
Louisville	January 2018	November 2022	Yes	Yes
Milwaukee	January 2018	November 2022	Yes	—
Minneapolis	January 2018	November 2022	Yes	—
New York	January 2018	November 2022	Yes	—
Oakland	January 2018	November 2022	Yes	Yes
Pittsburgh	January 2018	November 2022	Yes	Yes
Richmond (CA)	October 2019	November 2020	Yes	—
San Diego	January 2018	September 2021	Yes	—
San Francisco	January 2018	November 2022	Yes	—
Washington, DC	January 2018	November 2022	Yes	—

Table A2: Business types and visits to such businesses

Business type	Business NAICS code	Businesses	Visits
Supermarkets, grocery stores	445110	29,541	81,710,030
Limited service restaurants	722513	70,025	243,461,259
Convenience stores	445120	12,191	28,748,686
Liquor stores	445310	14,094	17,982,198
Bars (serves alcoholic beverages)	722410	32,935	76,552,045
Pharmacies	446110	25,663	55,697,546
Elementary and secondary schools	611110	33,741	134,452,882
Religious organizations (such as churches, temples, etc)	813110	113,678	88,572,807

Notes: Business types are defined by the North American Industry Classification System (NAICS) and associated with each business by SafeGraph. Businesses types listed above are a brief summary for each NAICS code; read more about the detailed classifications belonging to each NAICS code at Office of Management and Budget (2022).