The Effects of Mass Shootings on Gun Sales: Motivations, Mechanisms, Policies and Regulations

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Abstract

Surges in firearm sales after mass shootings have been well documented in the United States. This study presents three main findings regarding the impact of mass shootings on firearm demand and the moderating roles played by political and regulatory climates. First, mass shootings led to an immediate but temporary increase in gun sales. This effect continued for approximately 3–6 months after the incidents and was larger for shootings with a greater number of fatalities. Second, the association between mass shootings and gun sales was significant only under Democratic presidents. The party affiliation of the state legislature and state-level gun control did not moderate this association. Third, the increased firearm sales after mass shootings did not result in a higher level of firearm ownership. It appeared most purchases were made by current gun owners stockpiling additional firearms, thus indicating the fear of stricter gun control as a likely motivation. This study offers the following policy implications: (a) the public debates concerning gun violence could have the unintended consequence of raising gun demand among current owners, (b) the message of tightening gun control could increase the total stock of firearms in circulation, and (c) the regulations to prevent future mass shootings may be better addressed by the state government as a state-level regulation does not trigger demand response among potential consumers.

Keywords: mass shooting; firearm demand; background check; firearm suicide; fear; gun control

JEL classification: D12, H75, I18.

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1. Introduction

On June 12, 2016, a 29-year-old security guard left his van outside Pulse nightclub in Orlando, Florida, with a semiautomatic rifle and handgun. Later that night, he turned into an active shooter who killed 49 people and wounded 53 others in one of the deadliest mass shootings in US history. In the wake of this shooting, the public debate on the issue of gun violence emerged, covering a wide range of topics, including background checks, mental health screening, and tracking gun access. One side of the debate argues that increased firearm ownership by law-abiding citizens can prevent future gun violence (Kruis et al., 2021). Supporters of stricter gun control counter that restricting access to certain types of firearms would result in safer communities (Santaella-Tenorio et al., 2016). As the debate develops in Congress and the White House, news media reports that gun enthusiasts line up at gun shops to buy more firearms and ammunition.

The academic literature has documented surges in firearm sales after high-profile mass shootings. A study on the 2012 Newtown shooting and 2015 San Bernardino shooting showed that the incidents were associated with a 40–50% increase in handgun acquisitions over the expected volume in California and adjacent regions (Studdert et al., 2017). A study of six mass shootings from 2000 to 2010 showed a delayed but significant increase in federal background checks, an important barometer of national firearm sales (Wallace, 2015). The consumer response to mass shootings has been found to be particularly strong when shootings were committed by internationally influenced terrorists or occurred during Obama's presidency (Chau, 2018). Moreover, the association between mass shootings and handgun sales is more pronounced when the incidents garnered extensive media coverage (Liu and Wiebe, 2019).

Why do people buy guns after mass shootings? One possible explanation is that mass shootings increase the fear for personal safety, and this fear response motivates people to arm themselves. Mass shootings are not the deadliest form of homicide, but they may incite the most fear among the public because of their random nature and the inability to predict and prevent them (Fox and DeLateur, 2014). The Gallup poll in 2019 showed that about half of Americans were "very" or "somewhat" worried about being a victim of a future terrorist attack (Gallup, 2019). In a survey immediately after the El Paso shooting, approximately 48% of the respondents expressed concerns about possible high-profile mass shootings in their communities. The fear that a family member or oneself could be the next victim of a mass shooting could spur the desire for self-protection and create a demand for self-protective measures, including owning a handgun (Azrael

et al., 2017, Cook and Ludwig, 1996, Ehrlich and Saito, 2010). Indeed, gun owners cite personal safety or protection as their primary reason for owning firearms (Pew Research Center, 2017).

An alternative hypothesis is that mass shootings increase the concerns over future access to firearms. The media coverage of mass shootings and ensuing discussion of gun control might incur fear of additional legal restrictions on firearms (Porfiri et al., 2019). Consequently, potential consumers might opt to purchase firearms immediately. For example, a New York Times article reported surges in gun sales after calls for stricter gun regulations (Aisch and Keller, 2016). Similarly, there was a dramatic increase in gun sales in the months prior to the 2008 US presidential election, in which Obama emerged as a favorite to win (Depetris-Chauvin, 2015). The fear that Obama would push for stricter gun regulations was considered a primary contributing factor to the stockpiling behaviors among gun owners. A Bloomberg article explained that the association between mass shootings and gun sales broke down under the Trump administration (Rojanasakul, 2017). It appears that in a more permissive regulatory environment, gun consumers no longer find mass shootings as a trigger for stricter gun control.

The fear of stricter gun control could be partially due to the increased legislative activity after mass shootings. A single mass shooting has been associated with a 15% increase in firearm bills submitted to the State Congress in the year after the incident (Luca et al., 2020). Moreover, incidents with greater fatalities have been found to evoke larger policy responses, with each additional fatality leading to 2.5% more bills being introduced. The association between mass shootings and legislative activity appears to be further magnified by media coverage, indicating the role of public attention and salience in policymaking. The overall regulatory climate could complicate the consumer response to mass shootings because Democrats and Republicans respond differently to gun violence. Depending on which party is in power, gun control might be tightened or retained after mass shootings.

Given the interactions between mass shootings and policy changes, it is likely that the consumer response to mass shootings varies according to the regulatory environment and governing political party. While there has been scholarly research on gun sales after mass shootings (Brock and Routon, 2020, Chau, 2018, Studdert et al., 2017, Wallace, 2015), as well as a number of investigations into the time series patterns (Liu and Wiebe, 2019), prior research has not considered the potential influence of regulatory and political environments on the association between mass shootings and firearm demand. Existing studies have suggested that the surge in gun

sales might be more salient under Democrat-controlled legislature (Rojanasakul, 2017) and in states with strong gun control (Depetris-Chauvin, 2015). As Democrats generally favor more restrictive gun laws, mass shootings occurring under a Democrat-led government would lead to additional regulations on firearm access and use. Hence, potential gun buyers may feel that they need to buy firearms before it is too late. However, we might not see a comparable consumer response under Republican-controlled legislature because they generally oppose new gun restrictions (Luca et al., 2020).

It is also possible that under a Democrat-led government, people arm themselves with fear that the government may not offer protection against mass shootings. Democrats are generally believed to be weak in terms of crimes and violations (Holian, 2004). Those who agree with this view may find mass shootings as a confirmation of their belief and thus increase the demand for protective weapons.

This study examined the association between mass shootings and gun sales, focusing on three issues that remain unanswered in the literature: (a) whether mass shootings lead to a permanent or temporary increase in gun sales and how long the effect persists, (b) how regulatory climates and the governing political party moderate the association between mass shootings and gun sales, and (c) whether the surge in gun sales is driven by self-protection motives or fear of stricter gun control. To answer our research questions, we constructed novel data of federal background checks matched with administrative data on state characteristics and firearm law provisions from 1999 to 2016. We then estimated a series of dynamic regression models that link the count of federal background checks to shooting-related characteristics and indicators of federal and state regulatory environments. The results showed that an uptick in gun sales emerged immediately after mass shootings and lasted approximately 3–6 months. We also found that the association between mass shootings and gun sales was moderated by the party affiliation of the federal government. Finally, we found suggestive evidence that mass shootings did not result in a higher prevalence of gun ownership. This result points to the stockpiling behaviors of current gun owners as the likely explanation for the increased firearm demand after mass shootings.

This study contributes to the literature in several ways. First, we examine the association between mass shootings and firearm demand at the national level. Utilizing data from 49 US states, this study provides generalizable results concerning consumer responses to mass casualty shootings in the US. Second, this study offers comprehensive analyses of how the party affiliation

of the government and firearm regulatory climate influence consumer response to mass shootings. Our findings suggest that public debates concerning gun violence could have the unintended consequence of raising firearm demand, and hence policymakers need to consider the approaches with the least repercussions among potential gun buyers. Finally, we parse out the motivations for gun purchases by examining the association between the proxy of gun ownership and mass shootings. Prior research has used qualitative research designs involving interviews at gun shops or descriptive analyses of opinion surveys, and thus could not offer generalizable evidence on the motivations behind gun-buying behaviors. In the current study, we use data drawn from various administrative sources to show that increases in gun sales after mass shootings are partially explained by current gun owners' stockpiling behaviors.

2. Methods

2.1. Data description

2.1.1. Proxy for gun sales

As there is no federal tracking of firearm ownership, this study used the number of background checks for firearm transactions as a proxy for firearm demand (Brock and Routon, 2020, Chau, 2018, Depetris-Chauvin, 2015, Lang, 2013, Wallace, 2015). Since November 1998, the Federal Bureau of Investigation (FBI) has mandated all federal firearms licensees (FFLs) to conduct background checks on consumers seeking to obtain firearms. When a prospective buyer completes the appropriate form, the FFLs initiate the background check through the National Instant Criminal Background Check System (NICS) to verify the consumer's eligibility for gun ownership. The dealer cannot proceed with the transaction if the NICS shows any match concerning major criminal activities. The FBI has been publishing monthly NICS background checks for each state since December 1998.

Although the NICS counts are the best proxy for firearm purchases (Stroebe et al., 2017), they do not necessarily capture the exact number of gun sales. There could be cases where the background check is confirmed as negative or the consumer decides not to buy a weapon after filing for a background check, in which case the request does not lead to a transaction. Moreover, the NICS does not capture firearm sales through secondary markets. Firearms are often sold over

the internet or at gun shows by unlicensed vendors. These transactions are not subject to federal firearm regulations and background check requirements. Lastly, NICS data often include applications for handgun permits or concealed carry licenses. Background check data can overstate firearm sales because these applications do not necessarily involve the transfer of firearms.

Despite these limitations, the NICS data have been shown to provide a reliable estimate of actual gun sales. According to Lang (2016), approximately 96% of the national gun supply from 1999 to 2012 is explained by the number of background checks. Moreover, the time trends in background check counts are highly correlated with the trends in tax revenues from firearm sales (Depetris-Chauvin, 2015). Subsequent research generally agrees that the NICS measure is the closest approximation of gun sales in the US (Wallace, 2015).

This study used the NICS data for 49 US states from January 1999 to December 2016. The sample excluded states and regions where (a) gun ownership has been prohibited by state law (District of Columbia, Guam, Northern Mariana Islands, Puerto Rico, and the Virgin Islands) or (b) the local political system is unicameral and nonpartisan (Nebraska). The study period was set to end in 2016 because some covariates for 2017 were not available at the time of the study.

2.1.2. Mass shootings

The definition of "mass shooting" varies across studies and government institutions. The FBI defines a mass shooting as an incident in which four or more victims are killed by gunfire at one or more locations without a cooling-off period (Federal Bureau of Investigation, 2008). Mass public shootings are conceptualized as murders committed with firearms in which violence is not a means to an end. This definition excludes domestic gun violence involving family members and felony-related incidents in which the shooter pursues criminal profit or is killed in the name of a terrorist ideology.

Data on the shooting incidents were obtained from an inventory compiled by the *Mother Jones* news organization (Follman et al., 2017). The *Mother Jones* database collects information on incidents that meet the following criteria: (a) four or more people were killed (not including the perpetrator), (b) the shootings were carried out by fewer than two shooters, (c) the shootings occurred in a public place, and (d) the shootings were not related to armed robbery or gang activities. These data also include a few cases of spree killings. Starting in January 2013, shootings involving three deaths were included to be consistent with the lower threshold proposed by the US

Congress. These selection rules identify mass shootings that are random and public in nature and are broadly consistent with the CRS definition of a mass public shooting. A total of 59 mass public shootings that occurred in 31 states were included in our analytic sample.

As there is no commonly accepted definition of a mass shooting, we also analyzed the FBI data on active shootings (Federal Bureau of Investigation, 2017). This database includes mass public shootings and mass murders in private places, such as homes and workplaces. Shootings from armed robberies or gang violence were not included in the data. Our estimates of the mass shooting effect are expected to be robust to different definitions of shooting because active shootings in private and public settings receive similar degrees of media coverage. To enable the comparison with primary data, we included cases involving three or more fatalities to the active shooting data. Supplementary Tables S1 and S2 in Appendix present a list of mass public shootings and active shootings.

Our measures of mass shootings included the number of fatalities and injuries. To separate the regional effects from the national effects, we constructed two sets of variables: state-level variables that assign the number of fatalities and injuries to the state where the shooting occurred and the nationwide variables that link fatality and injury counts to all states.

2.1.3. Empirical specification

The state fixed effects linear regressions were used to examine the impact of mass shootings on firearm demand. The regression equation for state *i* at time *t* is given by

$$y_{i,t} = \alpha + z'_{i,t}\beta + x'_{i,t}\gamma + \tau_i + \varepsilon_{i,t} \quad (1)$$

where $i = 1, \cdots, 49$ and $t = 1, \cdots, 216$; $y_{i,t}$ indicates the monthly NICS background checks; $z_{i,t}$ is a vector of mass shooting variables; and $x_{i,t}$ is a covariate matrix. To account for the large variation in background checks, we transformed $y_{i,t}$ using a logarithmic function. All regressions included the year and month fixed effects to account for the mean differences in firearm demand across years and the potential seasonality in firearm demand. Standard errors were clustered at the state level. The 2010 state population was used as a sampling weight to assign a greater weight to large states.

The error term consists of a time-invariant state-specific component τ_i and a classical i.i.d. error term $\varepsilon_{i,t}$. The consistency of the coefficient estimates requires the expectation of τ_i

conditional on the covariates being zero. As this assumption rarely holds in practice, we differenced out τ_i and exploited only the within-state variation.

We also estimated a dynamic panel model to incorporate the dynamics of mass shooting effects. This model included a lagged outcome variable as a regressor to examine the short- and long-term responses of firearm demand to mass shootings. The shooting effect may last a few months as the debate over gun control unfolds through Congress and the media or owing to the network effect in which members of unarmed households purchase guns to protect themselves from newly armed neighbors. The dynamic model can be expressed as follows:

$$y_{i,t} = \sum_{j=1}^{p} \alpha_j \, y_{i,t-j} + z'_{i,t}\beta + x'_{i,t}\gamma + \tau_i + \varepsilon_{i,t} \quad (2)$$

where p denotes the number of lags. Coefficient β captures the immediate response of the background checks to a mass shooting that occurs within a month. The long-run coefficients are identified as $\beta/1 - \sum_{j=1}^{p} \alpha_j$, which measure the total adjustment of background checks throughout the period. The sum of the coefficients on the lagged regressors $\sum_{j=1}^{p} \alpha_j$ captures the persistence of the process; as $|\alpha_j|$ is the portion of the short-run adjustment translating to the next month, the closer it is to 1, the higher the persistence in the background check. We also estimated the median lag of the process to assess the speed of the long-run adjustments. The calculations $-ln(2) \,/\, ln(\sum_{j=1}^{p} \alpha_j)$ and $-ln(4) \,/\, ln(\sum_{j=1}^{p} \alpha_j)$ indicate the number of years required to complete 50% and 75% of the long-run adjustment, respectively.

The dynamic panel model rests on the following assumptions: (a) the error term $\varepsilon_{i,t}$ is serially uncorrelated and (b) mass shootings and background checks are stationary processes conditional on the state and year fixed effects. Under these two assumptions, Eq. (2) can be estimated using a standard within-group estimator. Although this approach results in the failure of the strict exogeneity assumption, the bias in the estimate of α is expected to be small with sufficiently long panels. Nickell (1981) showed that within-group estimates of the dynamic panel model have an asymptotic bias of the order 1/T. In our setting with 216 time periods, this bias was almost negligible.

2.1.4. Covariates

The regression models included several state-level covariates correlated with firearm demand. First, we controlled for the population estimate for each year to account for the size of

potential gun buyers. These data were drawn from the State Population Totals of the US Census Bureau. We did not include other demographic characteristics, such as gender and race, because their within-group variation was small over time. Second, the regressions included the annual average real gross domestic product (GDP) and unemployment rate for each state. These variables accounted for changes in average purchasing power. The GDP data were obtained from the Bureau of Economic Analysis, and the unemployment data were obtained from the Bureau of Labor Statistics–Local Area Unemployment Statistics. Third, we included the number of violent crimes per year in each state. The data for this measure were based on the uniform crime reporting statistics of the FBI, which provide the number of murders, manslaughter, rape, robbery, and aggravated assault incidents reported over a year. Given that more than 60% of gun sales are for self-defense (Cook and Ludwig, 1998), this measure is expected to capture the response to the fear of victimization. Fourth, we controlled for the variables reflecting political attitudes. To account for differences in gun control environments between administrations, we defined binary indicators for Presidents Clinton, Bush, Obama, and Trump. In addition, we included variables reflecting whether the governor was a Democrat, the fraction of Democrats in the State House, and the fraction of Democrats in the State Senate. The data for these variables were obtained from the University of Kentucky Center for Poverty Research. Finally, we included the variables reflecting the number of firearm-related laws in each state and whether the state has a stand-your-ground (SYG) law. As firearm supply depends on the stringency of state gun laws, these variables were assumed to net out the confounding effect of changing gun supply. The data on state firearm law provisions were provided by Siegel et al. (2017), and the effective dates for the SYG law were based on McClellan and Tekin (2017). The indicators of population, the number of violent crimes, and GDP were transformed using a logarithmic function. Table 1 presents the definitions and sources of our variables.

[Insert Table 1 about here]

4. Results

Table 2 presents the OLS estimates of the determinants of the NICS background checks. The casualty counts are based on the revised *Mother Jones* data. Columns (1) to (3) present the estimates for the state fixed effects model given in Eq. (1). Columns (4) and (5) show the estimates

of the dynamic panel model in Eq. (2). The regression models include all the covariates discussed above. For brevity, we omit the estimates that were not significant at the 10% level.

The model in column (1) of Table 2 includes the total number of casualties (fatalities and injuries) from mass public shootings as regressors. Evaluating the covariates first, we find significant impacts of major terrorist attacks, presidential elections, and concerns about gun control (captured by the Obama effect and a Democratic governor) on firearm background checks. For instance, the firearm demand under the Obama administration was 15.2% greater than that under the Clinton administration. This effect size is similar to Depetris-Chauvin (2015), who attributed an approximately 21–32% increase in firearm demand to the Obama effect. The regression model explains 74.8% of the within-state variation in background checks. Most of this identification comes from year and month fixed effects (F-statistic for joint significance of year dummies = 49.1 and month dummies = 501.5). Next, we find that the coefficient of total casualties is positive and significant at the 1% level. Given that the mean number of total casualties is 15.8, this represents an approximately 0.79% increase in firearm background checks after a mass shooting. The sign of the coefficient is expected because high-profile shootings lead to greater increases in background checks.

In column (2) of Table 2, we split the total number of casualties into fatalities and injuries. As expected, only the number of fatalities is significantly associated with firearm background checks. Evaluated at the sample mean of fatality counts, each mass public shooting is responsible for a 1.38% increase. The model in column (3) controls for casualty indicators specific to the state of occurrence. Including these two variables allows us to separate the regional effect of mass shootings from the impact on other states. If people react more sensitively to shootings that occur in adjacent areas, these variables may carry larger coefficient estimates. Although we find evidence that supports this claim, we do not estimate these coefficients with greater precision to reject the null hypothesis at the desired significance level. This may have occurred because only a few observations receive treatment. As these localized effects cannot be reliably estimated, we do not include such variables in the remaining analyses.

Column (4) of Table 2 controls for a single lag of the logged background checks on the right-hand side. We find a sizable degree of persistence in firearm demand changes, with a coefficient of 0.794 on lagged background checks. This suggests that the long-run adjustment is approximately five times larger than the immediate response. However, according to our

calculation, it takes only six months to complete 75% of the long-run adjustment. The mass shooting effect appears to persist beyond the month when the shooting occurred but does not permanently shift the firearm demand upward.

Column (5) of Table 2 adds three additional lags to the outcome variable. The sequential exogeneity assumption requires that a sufficient number of lags of the outcome be included on the right side to eliminate the residual serial correlation in the error term. Although the implied dynamics are now richer in this specification, these additional lagged outcome variables do not differ from zero at the 10% level. Therefore, the coefficient estimates and other test statistics are similar. The coefficient on the number of fatalities is now 0.0013, and the implied long-run impact is a 0.66% increase in background checks.

The adjusted t-statistic from the Levin, Lin, and Chu test for a unit root is also reported at the bottom (Levin et al., 2002). The statistics are −23.3 and −5.7, which reject a unit root in the process for log background checks and support our assumption about background checks being stationary.

[Insert Table 2 about here]

Table 3 re-estimates the models in Table 2 by using the active shooting data from the FBI. As discussed above, this database uses a wider net to include all forms of gun violence regardless of motive, location, or victim–offender relationship. Specifically, this database expands the *Mother Jones* data to include several cases involving family members or cases that occurred in private locations, such as homes and workplaces. Overall, our estimates of the shooting effect remain qualitatively unchanged with these broader data. The long-run impact of firearm demand is still approximately five times larger than the immediate effect, and these adjustments are short-lived. These results suggest that our estimation results are quite robust to how "mass shooting" is defined.

[Insert Table 3 about here]

Table 4 examines whether the surge in gun sales is driven by a few high-profile mass shootings. One may argue that gun sales spike only after major mass shootings and that our analysis is highly dependent on few of the deadliest attacks. To verify this argument, we exclude incidents that yielded the highest number of casualties and re-estimate the models. During our study period, the 2016 Orlando nightclub shooting was the deadliest in terms of fatalities, followed by the Virginia Tech, Sandy Hook, San Bernardino, and Binghamton shootings. To remove these cases, we exclude the states of Florida, Virginia, Connecticut, California, and New York from the

sample. In columns (1) to (3), the coefficient estimates of fatalities and injuries are the same and have similar standard error estimates. Column (4) uses only the data for the states excluded from the sample and presents a much larger point estimate of fatalities. It is clear that more background checks are carried out after high-profile mass shootings but that gun sales in general are very responsive to all types of mass public shootings.

[Insert Table 4 about here]

Next, we evaluate the claim that this surge in gun sales after mass shootings is motivated by the fear of impending gun control. Reports have indicated that firearm sales skyrocketed before the 2008 and 2012 presidential elections and increased consistently under the Obama administration (Depetris-Chauvin, 2015). A recent analysis from BuzzFeed News showed that gun sales did not respond to the 2017 Las Vegas or Virginia Tech shootings, which occurred under Republican presidents (Aldhous, 2017). If gun sales increase because of the fear of stricter gun regulations, this relationship between mass shootings and gun sale increases would have been more pronounced for the periods when Democrats led the federal or local governments.

To test this argument, we interact the number of fatalities with the indicators reflecting political environment and gun regulations (Table 5). In column (1), we find that the mass shooting effect is significantly different from zero only for the Democrat-led White House. Under the Bush administration, mass shooting was not significantly associated with gun sales at the 10% level. Column (2) includes the interaction between fatality counts and the number of state gun law provisions. We find that mass shootings are followed by a larger increase in gun sales when more gun regulations are in place. This pattern is broadly in line with the first column as more firearm laws were enacted under the second Obama administration. The next column examines the role of local political climate. Surprisingly, no significant moderating effect of having a Democratic governor is observed. Although most US gun legislation is enacted at the state level, gun consumers' responses to mass shootings are not driven by the state government's political party. Column (4) adds the interactions between the fatality counts and census region dummies. Consistent with column (3), there is no evidence that consumers in the Northeast (a traditionally Democratic-leaning area) are more responsive to mass shootings than are those in the South (a traditionally Republican-leaning area). In the last column, the number of fatalities interacts with indicators reflecting a Democratic president and governor. The first linear restriction ($\alpha + \beta + \gamma + \delta = 0$) in the bottom panel shows the mass shooting effect when the president and governor are

Democrats. The second linear restriction ($\alpha + \beta = 0$) corresponds to a Democratic president and Republican governor. Likewise, the third linear restriction ($\alpha + \gamma = 0$) identifies observations under a Democratic governor and Republican president. Overall, whether the governor is a Democrat has no influence on the gun sales–mass shooting correlation. It is largely an ambiguous fear of future gun control at the national level that increases firearm demand after mass shootings.

[Insert Table 5 about here]

Our findings allow us to infer the characteristics of consumers who throng gun stores after mass shootings. If the fear of new gun laws plays a major role in this pattern, most of these consumers might be pre-gun owners who stockpile weapons that will be subject to anticipated regulations. Although there are no data on the type of weapons purchased, we can indirectly test whether this increase represents more new gun owners or more guns per owner. In Table 6, household gun ownership is regressed on the indicator for mass shooting and covariates. If a mass shooting is not followed by an increase in gun ownership, this can be seen as evidence of stockpiling behavior among pre-gun owners.

We use the percentage of suicides committed with firearms at the state level as a proxy for gun ownership. This measure explains approximately 80% of the variation in actual gun ownership (Siegel et al., 2013) and has been validated in the literature (Cook and Ludwig, 2006; Price et al., 2004; Ruddell and Mays, 2005). As gun ownership is essentially a stock that continues to grow over time, the mass shooting effect is redefined to take 1 for the first mass public shooting and onwards in each state and 0 otherwise. The regressors include all state-level covariates, except for two terrorist attacks and presidential elections. Panel A of Table 6 presents three regression models for firearm suicide rates. As a robustness check, in panel B, we replicate the same regression analysis for the (age-adjusted) firearm homicide rates. Gun ownership is highly correlated with firearm homicide rates (Siegel et al., 2013); therefore, similar estimation results are expected for the two panels.

The first two columns of each panel in Table 6 show no evidence that firearm ownership increases after mass shootings. The mass shooting estimates do not carry the expected signs. In columns (3) and (6), we use the mass shooting indicator as an instrument that affects gun ownership only indirectly through jumps in cumulative gun sales. Although the test statistics confirm the validity of the instrument, none of the models show evidence of an increase in gun

ownership. These results support our hypothesis regarding stockpiling behaviors among pre-gun owners.

[Insert Table 6 about here]

5. Conclusion

This study examined the association between mass shootings and firearm sales and the moderating roles of political and regulatory climates. The results showed that mass shootings were associated with an immediate but temporary increase in gun sales from January 1999 to December 2016. The increase in firearm sales persisted for 3–6 months after the incidents and was larger for the shootings with a greater number of fatalities. The estimated mass shooting effects were robust to the definition of mass shooting, data sources, and identification assumptions in the empirical modeling. We also found that the association between mass shootings and firearm sales was significant only when the president was a Democrat. The party affiliation of the state legislature or state-level gun control policies did not moderate the impact of mass shootings. Lastly, we found suggestive evidence that increased gun sales after mass shootings did not result in an increase in firearm ownership. Using the percentage of suicides committed with firearms as a proxy for gun ownership, we found that mass shootings were generally uncorrelated with the prevalence of gun ownership. The increase in gun sales after mass shootings seemed to be due to current gun owners stockpiling additional firearms in anticipation of tougher gun control by the federal government.

Our findings support the fear-driven hypothesis that consumers respond to expected restrictions on firearm ownership after mass shootings (Stroebe et al., 2017). The consumer response to the federal regulatory climate could be driven by the public image that the federal government leads regulatory actions against firearm manufacturers and owners. Although regulations related to the storage, carry, and use of firearms are enforced at the state level, most individuals would misconceive the nature of gun control and act upon the fear that the federal government will soon restrict their use of firearms. This fear response might be further reinforced by the national media devoting significant coverage to the loopholes in existing gun laws and their contribution to mass shootings (Porfiri et al., 2019). As shootings become more focal in people's minds, calls for regulation by political leaders may sound more plausible and amenable to action. News reports on politicians pleading for stricter firearm regulations, accompanied by emotional

remarks from prominent political figures, could cause anxiety among potential gun buyers and prompt impulse buying behavior.

Our finding that gun demand is magnified by the federal political climate leads to the question of whether firearms should be regulated at the federal or state level. In the US, it is mostly the state government that sets and enforces regulations on firearms. The federal government provides the minimum floor of regulations, and the state government builds upon them to enact varying degrees of regulations. For instance, the federal government regulates the access to and ownership of firearms by prohibiting the transfer of guns to potentially dangerous individuals and limiting access to military or assault weapons. State-level regulations are structured at more granular scales, setting the standards for how guns should be stored, who has the right to carry concealed weapons, and what training must be undertaken by gun owners. Given the public's reaction to the federal regulatory climate, it might be better for the state government to lead regulatory actions against gun violence. In this case, they may consider revising state laws and policies in a way that prevents the use of firearms by potential shooters. Addressing gun violence at the state level may draw less attention from national media and avoid unnecessary consumer responses to potential regulation issues. The state-led approach might effectively strengthen gun regulations without causing stockpiling behaviors among potential gun buyers.

Our suggestion to focus on state-level regulations should not be viewed as a general solution to address gun violence. Instead, gun violence may be better addressed by federal and state governments working together. As the state government has the authority to directly regulate individual access to firearms while drawing less attention from the public, they may experiment with tougher regulations aimed at preventing firearm access among potential shooters. If state laws and policies demonstrate successful results in reducing mass shootings, they then become alternatives for inclusion in federal regulations. In this case, federal laws would serve as the minimum floor for the state program, and the state programs set nationally uniform regulations upon which states can build.

A systematic review of the literature evaluated three common gun laws that regulate the storage, carry, and use of firearms (Schell et al., 2020). These laws include child access prevention laws, concealed carry laws, gun-free zones, and SYG laws, all of which are administered primarily at the state level. Overall, firearm deaths are lower in states with the most restrictive combination of these policies relative to the permissive legal regime. Similarly, shall-issue concealed-carry laws

were shown to reduce the incidence of shootings and the number of casualties from incidents (Lott, 2003). Prior literature generally agrees that strengthening state-level regulations on the storage, carry, and use of firearms is an appropriate policy response to mass shootings (RAND, 2020). Our findings herein and the literature review show that the state-led regulation of firearms would help avoid unnecessary upticks in gun sales after mass shootings and lead to greater reductions in gun deaths.

This study has several limitations. First, the number of federal background checks is an imperfect proxy for gun sales. The NICS data capture only gun purchase attempts made by licensed retailers in the primary market and thus omit firearm transfers between private parties. Firearms can be obtained at a gun show or traded between individuals without going through background checks. Although the number of background checks exceeds the number of firearms manufactured (Lang, 2016), it is considered the closest approximation for federal gun sales in the United States (Brock and Routon, 2020). Second, the study period was restricted to 1999–2016. Given the limited time frame of this study, we could not analyze a number of high-profile mass shootings that occurred under the Trump administration. Extending our analysis with more recent data would allow us to obtain reliable estimates of how regulatory climates moderate the relationship between mass shootings and gun demand.

Despite the limitations in the data, this study expands our understanding of consumer response to mass shootings and how federal and state regulatory climates affect gun sales. The increased firearm demand after mass shootings has been evidenced in several shooting cases, but the motivations and underlying mechanisms have yet to be fully understood. In this study, we found an immediate but temporary increase in firearm sales and the moderating roles of federal regulatory climate. Our results also showed that the association between mass shootings and gun sales was significant only under Democratic presidents, and this association did not result in increased gun ownership. Politicians and lawmakers need to be aware that political messages advocating stricter gun control may have unintended consequences for consumers and misdirect their behavior in the firearm market. A nudge-based policy could be considered as an alternative way to curb gun sales and reduce gun violence.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jpolmod.2022.10.005.

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Tables

Table 1
Definition of variables

	Definition	Source
Background check and mass shooting variables:		
Background check count	Number of monthly background check for each state	NICS, FBI
Fatalities	Number of victims killed (not including perpetrator)	*Mother Jones* data
Injuries	Number of victims injured (not including perpetrator)	*Mother Jones* data
Total casualties	Number of victims killed or injured (not including perpetrator)	*Mother Jones* data
State-level variables:		
Total population	Annual population estimate	Census Bureau
Violent crimes	Number of murder, manslaughter, rape, robbery, and aggravate assault reported per year	Uniform Crime Reporting statistics, FBI
Gross Domestic Product	Real gross domestic product per year	Regional data, Bureau of Economic Analysis
Unemployment rate	Unemployment rate in civilian noninstitutional population per year	Local area unemployment statistics, Bureau of Labor Statistics
Firearm law provisions	Number of firearm-related law provisions in each year	Siegel et al. (2017)
Stand-your-ground law (0,1)	1 if state has SYG law in a particular month of the year, 0 otherwise	McClellan and Tekin (2017)
Democrat governor (0,1)	1 if state governor is Democrat in each month of the year, 0 otherwise	Book of the States
Fraction of Democrats in state House	Number of Democrats in state House divided by total number of representatives	Book of the States
Fraction of Democrats in state Senate	Number of Democrats in state Senate divided by total number of representatives	Book of the States
National-level variables:		
9/11 attacks (0,1)	1 for September 2001, 0 otherwise	
Boston marathon terror (0,1)	1 for May 2013, 0 otherwise	
Clinton effect (0,1)	1 from January 1999 to October 2000, 0 otherwise	
Bush effect (0,1)	1 from November 2000 to October 2008, 0 otherwise	
Obama effect (0,1)	1 from November 2008 to October 2016, 0 otherwise	
Trump effect (0,1)	1 beginning in November 2016, 0 otherwise	
Presidential election (0,1)	1 for October and November in 2000, 2004, 2008, 2012, and 2016, 0 otherwise	

Table 2
Regression estimates using *Mother Jones* data

Outcome variable:	Log of firearm background checks				
		Linear model		Dynamic model	
	(1)	(2)	(3)	(4)	(5)
Log(background check) first lag				0.7936***	0.7654***
				(0.0319)	(0.0349)
Log(background check) second lag					-0.0219
					(0.0390)
Log(background check) third lag					0.0518
					(0.0712)
Log(background check) fourth lag					0.0180
					(0.0487)
Total casualties	0.0005***				
	(0.0001)				
Fatalities		0.0017***	0.0014***	0.0013***	0.0012***
		(0.0004)	(0.0005)	(0.0003)	(0.0003)
Injuries		-0.0003	-0.0003	0.0002	0.0002
		(0.0003)	(0.0004)	(0.0002)	(0.0002)
Fatalities (state-of-occurrence)			0.0073		
			(0.0048)		
Injuries (state-of-occurrence)			-0.0006		
			(0.0044)		
9/11 attacks	0.2091***	0.2092***	0.2092***	0.1789***	0.1821***
	(0.0194)	(0.0194)	(0.0195)	(0.0206)	(0.0205)
Boston marathon terror	0.0671**	0.0635**	0.0637**	0.0033	-0.0087
	(0.0253)	(0.0253)	(0.0254)	(0.0210)	(0.0276)
Democratic governor	0.0529**	0.0529**	0.0526**	0.0097**	0.0084*
	(0.0211)	(0.0211)	(0.0210)	(0.0045)	(0.0045)
Presidential election effect	0.0413***	0.0408***	0.0407***	0.0754***	0.0708***
	(0.0071)	(0.0072)	(0.0072)	(0.0050)	(0.0053)
Obama effect	0.1517***	0.1550***	0.1551***	-0.0316	-0.0214
	(0.0182)	(0.0185)	(0.0187)	(0.0204)	(0.0192)
Long run effect of fatalities				0.0064***	0.0066***
				(0.0017)	(0.0019)
Unit root test: adjusted *t*-statistics				-23.3	-5.7
Median lag of the process				3.0	3.4
75th percentile lag of the process				6.0	6.7
Observations	10,584	10,584	10,584	10,535	10,388
R-squared (within)	0.748	0.748	0.749	0.908	0.908
Number of states	49	49	49	49	49

Notes: Regression models control for all covariates including year and month fixed effects. Robust standard errors in parentheses are clustered at the state levels. Significance levels are indicated by *, **, and *** for 10, 5, and 1 percent level, respectively.

Table 3
Regression estimates using FBI Active Shooting data

Outcome variable:	Log of firearm background checks				
	Linear model			Dynamic model	
	(1)	(2)	(3)	(4)	(5)
Log(background check) first lag				0.7939***	0.7655***
				(0.0319)	(0.0348)
Log(background check) second lag					-0.0210
					(0.0392)
Log(background check) third lag					0.0562
					(0.0708)
Log(background check) fourth lag					0.0122
					(0.0485)
Total casualties	0.0007***				
	(0.0001)				
Fatalities		0.0030***	0.0027***	0.0030***	0.0029***
		(0.0003)	(0.0004)	(0.0003)	(0.0003)
Injuries		-0.0011***	-0.0011**	-0.0006***	-0.0006***
		(0.0003)	(0.0004)	(0.0002)	(0.0002)
Fatalities (state-of-occurrence)			0.0092**		
			(0.0043)		
Injuries (state-of-occurrence)			-0.0019		
			(0.0040)		
9/11 attacks	0.2090***	0.2095***	0.2098***	0.1790***	0.1820***
	(0.0194)	(0.0194)	(0.0196)	(0.0206)	(0.0205)
Boston marathon terror	0.0682***	0.0626**	0.0627**	0.0022	-0.0086
	(0.0253)	(0.0252)	(0.0253)	(0.0211)	(0.0277)
Democratic governor	0.0529**	0.0529**	0.0525**	0.0097**	0.0084*
	(0.0211)	(0.0211)	(0.0210)	(0.0045)	(0.0045)
Presidential election effect	0.0415***	0.0392***	0.0387***	0.0743***	0.0697***
	(0.0070)	(0.0072)	(0.0071)	(0.0050)	(0.0053)
Obama effect	0.1515***	0.1590***	0.1592***	-0.0274	-0.0174
	(0.0182)	(0.0186)	(0.0187)	(0.0204)	(0.0193)
Long run effect of fatalities				0.0145***	0.0157***
				(0.0026)	(0.0032)
Unit root test: adjusted *t*-statistics				-23.3	-5.7
Median lag of the process				3.0	3.3
75th percentile lag of the process				6.0	6.7
Observations	10,584	10,584	10,584	10,535	10,388
R-squared (within)	0.748	0.749	0.749	0.909	0.908
Number of states	49	49	49	49	49

Notes: Regression models control for all covariates including year and month fixed effects. Robust standard errors in parentheses are clustered at the state levels. Significance levels are indicated by *, **, and *** for 10, 5, and 1 percent level, respectively.

Table 4
Robustness checks

Outcome variable:	Log of firearm background checks			
	Excludes FL	Excludes FL, VA, and CT	Excludes FL, VA, CT, CA, and NY	Limits to FL, VA, CT, CA, and NY
	(1)	(2)	(3)	(4)
Fatalities	0.0016***	0.0016***	0.0016***	0.0027**
	(0.0004)	(0.0004)	(0.0004)	(0.0010)
Injuries	-0.0003	-0.0003	-0.0003	-0.0009
	(0.0003)	(0.0004)	(0.0004)	(0.0010)
Observations	10,368	9,936	9,504	1,080
Number of states	48	46	44	5

Notes: Regression models control for all covariates including year and month fixed effects. Casualty counts are obtained from *Mother Jones* data. Robust standard errors in parentheses are clustered at the state levels. Significance levels are indicated by *, **, and *** for 10, 5, and 1 percent level, respectively.

Table 5
Interaction effects

Outcome variable:	Log of firearm background checks				
	(1)	(2)	(3)	(4)	(5)
α: Fatalities	-0.0006	-0.0001	0.0017***	0.0013	-0.0001
	(0.0007)	(0.0007)	(0.0005)	(0.0008)	(0.0021)
β: Fatalities × Democratic president	0.0034***				0.0027
	(0.0006)				(0.0024)
Fatalities × Firearm law provisions (/10)		0.0005**			
		(0.0002)			
γ: Fatalities × Democratic governor			-0.0001		-0.0010
			(0.0011)		(0.0031)
Fatalities × Northeast				0.0003	
				(0.0012)	
Fatalities × Midwest				-0.0004	
				(0.0019)	
Fatalities × West				0.0017	
				(0.0019)	
δ: Fatalities × Democratic president × Democratic governor					0.0015
					(0.0040)
Observations	10,584	10,584	10,584	10,584	10,584
Number of states	49	49	49	49	49
Linear restrictions (*F*-test)					
α + β + γ + δ = 0					0.0031***
					(0.0009)
α + β = 0	0.0028***				0.0026***
	(0.0003)				(0.0005)
α + γ = 0			0.0016*		-0.0011
			(0.0009)		(0.0010)
γ + δ = 0					0.0005
					(0.0013)

Notes: Regression models control for all covariates including year and month fixed effects. Casualty counts are obtained from *Mother Jones* data. Robust standard errors in parentheses are clustered at the state levels. Significance levels are indicated by *, **, and *** for 10, 5, and 1 percent level, respectively.

Table 6
Models for firearm ownership

Outcome variable:	Firearm suicide rates			Firearm homicide rates		
Estimator:	OLS	OLS	2SLS	OLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
α: Post mass shooting	-0.143*	-0.093		-0.190	-0.365	
	(0.077)	(0.104)		(0.183)	(0.220)	
β: Fatalities × Obama effect		-0.101			0.356*	
		(0.112)			(0.203)	
Log(cumulative background checks)			-1.038			-0.467
			(0.917)			(1.120)
Observations	816	816	816	728	728	728
Number of states	48	48	48	48	48	48
Linear restrictions (*F*-test)						
α + β = 0		-0.194**			-0.009	
		(0.084)			(0.190)	

Notes: Regression models control for all covariates including year fixed effects. Mass shooting data is obtained from *Mother Jones*. Robust standard errors in parentheses are clustered at the state levels. Significance levels are indicated by *, **, and *** for 10, 5, and 1 percent level, respectively.

Appendix A. Supplementary data

Supplementary Table S1
List of mass public shooting in the United States, 1999-2016

Year	Month	Case	Location	Fatality	Injury
2016	9	Cascade Mall shooting	Burlington, WA	5	0
2016	7	Baton Rouge police shooting	Baton Rouge, LA	3	3
2016	7	Dallas police shooting	Dallas, TX	5	11
2016	6	Orlando nightclub massacre	Orlando, FL	49	53
2016	2	Excel Industries mass shooting	Hesston, KS	3	14
2016	2	Kalamazoo shooting spree	Kalamazoo County, MI	6	2
2015	12	San Bernardino mass shooting	San Bernardino, CA	14	21
2015	11	Planned Parenthood clinic	Colorado Springs, CO	3	9
2015	10	Colorado Springs shooting rampage	Colorado Springs, CO	3	0
2015	10	Umpqua Community College shooting	Roseburg, OR	9	9
2015	7	Chattanooga military recruitment center	Chattanooga, TN	5	2
2015	6	Charleston Church Shooting	Charleston, SC	9	1
2015	6	Trestle Trail bridge shooting	Menasha, WI	3	1
2014	10	Marysville-Pilchuck High School shooting	Marysville, WA	5	1
2014	5	Isla Vista mass murder	Santa Barbara, CA	6	13
2014	4	Jewish Community Center shooting	Overland Park, KS	3	0
2014	4	Fort Hood shooting 2	Fort Hood, TX	3	12
2014	2	Alturas tribal shooting	Alturas, CA	4	2
2013	9	Washington Navy Yard shooting	Washington, D.C.	12	8
2013	7	Hialeah apartment shooting	Hialeah, FL	7	0
2013	6	Santa Monica rampage	Santa Monica, CA	6	3
2013	4	Pinewood Village Apartment shooting	Federal Way, WA	5	0
2013	3	Mohawk Valley shootings	Herkimer County, NY	5	2
2012	12	Sandy Hook Elementary massacre	Newtown, CT	27	2
2012	9	Accent Signage Systems shooting	Minneapolis, MN	7	1
2012	8	Sikh temple shooting	Oak Creek, WI	7	3
2012	7	Aurora theater shooting	Aurora, CO	12	70
2012	5	Seattle cafe shooting	Seattle, WA	6	1
2012	4	Oikos University killings	Oakland, CA	7	3
2012	2	Su Jung Health Sauna shooting	Norcross, GA	5	0
2011	10	Seal Beach shooting	Seal Beach, CA	8	1
2011	9	IHOP shooting	Carson City, NV	5	7
2011	1	Tucson shooting	Tucson, AZ	6	13
2010	8	Hartford Beer Distributor shooting	Manchester, CT	9	2
2009	11	Coffee shop police killings	Parkland, WA	4	1
2009	11	Fort Hood massacre	Fort Hood, TX	13	30
2009	4	Binghamton shootings	Binghamton, NY	14	4
2009	3	Carthage nursing home shooting	Carthage, NC	8	3
2008	6	Atlantis Plastics shooting	Henderson, KY	6	1
2008	2	Northern Illinois University shooting	DeKalb, IL	5	21
2008	2	Kirkwood City Council shooting	Kirkwood, MO	6	2
2007	12	Westroads Mall shooting	Omaha, NE	9	4
2007	10	Crandon shooting	Crandon, WI	6	1
2007	4	Virginia Tech massacre	Blacksburg, VA	32	23
2007	2	Trolley Square shooting	Salt Lake City, UT	6	4
2006	10	Amish school shooting	Lancaster County, PA	6	5
2006	3	Capitol Hill massacre	Seattle, WA	7	2

2006	1	Goleta postal shootings	Goleta, CA	8	0
2005	3	Red Lake massacre	Red Lake, MN	10	5
2005	3	Living Church of God shooting	Brookfield, WI	7	4
2004	12	Damageplan show shooting	Columbus, OH	5	7
2003	7	Lockheed Martin shooting	Meridian, MS	7	8
2001	2	Navistar shooting	Melrose Park, IL	5	4
2000	12	Wakefield massacre	Wakefield, MA	7	0
1999	12	Hotel shooting	Tampa, FL	5	3
1999	11	Xerox killings	Honolulu, HI	7	0
1999	9	Wedgwood Baptist Church shooting	Fort Worth, TX	8	7
1999	7	Atlanta day trading spree killings	Atlanta, GA	9	13
1999	4	Columbine High School massacre	Littleton, CO	13	24

Source: Data from *Mother Jones*' organization (Follman et al., 2017).

Supplementary Table S2

List of active shooting in the United States, 1999-2016

Year	Month	Case	Location	Fatality	Injury
2016	9	Cascade Mall	Burlington, Washington	5	0
2016	7	House Party in Mukilteo, Washington	Mukilteo, Washington	3	1
2016	7	B-Quik Convenience Store, Benny's Car Wash, Hair Crown Beauty Supply	Baton Rouge, Louisiana	3	3
2016	7	Protest in Dallas, Texas	Dallas, Texas	5	9
2016	6	Pulse Nightclub	Orlando, Florida	49	53
2016	2	Excel Industries; Newton and Hesston, Kansas	Newton, Kansas	3	14
2016	2	Multiple Locations in Kalamazoo, Michigan	Kalamazoo, Michigan	6	2
2015	12	Inland Regional Center	San Bernardino, California	14	22
2015	11	Planned Parenthood – Colorado Springs Westside Health Center	Colorado Springs, Colorado	3	9
2015	10	Neighborhood in Colorado Springs, Colorado	Colorado Springs, Colorado	3	0
2015	10	Umpqua Community College	Roseburg, Oregon	9	7
2015	7	Two Military Centers in Chattanooga, Tennessee	Chattanooga, Tennessee	5	2
2015	6	Emanuel African Methodist Episcopal Church	Charleston, South Carolina	9	0
2015	5	Trestle Trail Bridge, Wisconsin	Menasha, Wisconsin	3	1
2015	1	Multiple Locations in Moscow, Idaho	Moscow, Idaho	3	1
2014	10	Marysville-Pilchuck High School	Marysville, Washington	4	3
2014	6	Cici's Pizza and Walmart	Las Vegas, Nevada	3	0
2014	5	Multiple Locations in Isla Vista, California	Isla Vista, California	6	14
2014	5	Residence and Construction Site in Jonesboro, Arkansas	Jonesboro, Arkansas	3	4
2014	4	Jewish Community Center of Greater Kansas City and Village Shalom Retirement Community	Overland Park, Kansas	3	0
2014	4	Fort Hood Army Base	Texas	3	12
2014	2	Cedarville Rancheria Tribal Office	Alturas, California	4	2
2013	9	Washington Navy Yard Building 197	Washington, D.C.	12	7
2013	8	Pennsylvania Municipal Building	Saylorsburg, Pennsylvania	3	2
2013	7	Hialeah Apartment Building	Hialeah, Florida	6	0
2013	6	Santa Monica College and Residence	Santa Monica, California	5	4
2013	4	Pinewood Village Apartments	Federal Way, Washington	4	0
2013	3	John's Barbershop and Gaffey's Clean Car Center	Herkimer, New York	4	2
2013	12	Frankstown Township, Pennsylvania	Frankstown Township, Pennsylvania	3	3
2012	12	Sandy Hook Elementary School and Residence	Newtown, Connecticut	27	2
2012	10	Azana Day Salon	Brookfield, Wisconsin	3	4
2012	10	Las Dominicanas M&M Hair Salon	Casselberry, Florida	3	1
2012	9	Accent Signage Systems	Minneapolis, Minnesota	6	2
2012	8	Sikh Temple of Wisconsin	Oak Creek, Wisconsin	6	4
2012	7	Cinemark Century 16	Aurora, Colorado	12	58
2012	5	Café Racer	Seattle, Washington	5	0
2012	4	Streets of Tulsa, Oklahoma	Tulsa, Oklahoma	3	2
2012	4	Oikos University	Oakland, California	7	3
2012	2	Chardon High School	Chardon, Ohio	3	3
2012	1	McBride Lumber Company	Star, North Carolina	3	1
2011	10	Salon Meritage	Seal Beach, California	7	1
2011	10	Lehigh Southwest Cement Plant	Cupertino, California	3	7
2011	9	International House of Pancakes	Carson City, Nevada	4	7

2011	8	Copley Township Neighborhood, Ohio	Copley Township, Ohio	7	1
2011	1	Safeway Grocery	Tucson, Arizona	6	13
2010	8	Hartford Beer Distribution Center	Manchester, Connecticut	8	2
2010	6	Yoyito Café	Hialeah, Florida	4	3
2010	2	Shelby Center, University of Alabama	Tuscaloosa, AL	3	3
2010	1	Residence in Brooksville, Florida	Brooksville, Florida	3	2
2010	1	Penske Truck Rental	Kennesaw, Georgia	3	2
2010	1	ABB Plant	St. Louis, Missouri	3	5
2012	12	Sandy Hook Elementary School and Residence	Newtown, Connecticut	27	2
2012	10	Azana Day Salon	Brookfield, Wisconsin	3	4
2012	10	Las Dominicanas M&M Hair Salon	Casselberry, Florida	3	1
2012	9	Accent Signage Systems	Minneapolis, Minnesota	6	2
2012	8	Sikh Temple of Wisconsin	Oak Creek, Wisconsin	6	4
2012	7	Cinemark Century 16	Aurora, Colorado	12	58
2012	5	Café Racer	Seattle, Washington	5	0
2012	4	Streets of Tulsa, Oklahoma	Tulsa, Oklahoma	3	2
2012	4	Oikos University	Oakland, California	7	3
2012	2	Chardon High School	Chardon, Ohio	3	3
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2010	1	Residence in Brooksville, Florida	Brooksville, Florida	3	2
2010	1	Penske Truck Rental	Kennesaw, Georgia	3	2
2010	1	ABB Plant	St. Louis, Missouri	3	5
2009	11	Forza Coffee Shop	Pierce County, Washington	4	0
2009	11	Fort Hood Soldier Readiness Processing Center	Fort Hood, Texas	13	32
2009	8	LA Fitness	Township, Pennsylvania	3	9
2009	4	American Civic Association Center	Binghamton, New York	13	4
2009	3	Pinelake Health and Rehabilitation Center	Carthage, North Carolina	8	3
2009	3	Coffee and Geneva Counties, Alabama	southeast Alabama	10	1
2008	9	Interstate 5 in Skagit County, Washington	Skagit County, Washington	6	4
2008	6	Atlantis Plastics Factory	Henderson, Kentucky	5	1
2008	2	Cole Hall Auditorium, Northern Illinois University	DeKalb, Illinois	5	16
2008	2	Kirkwood City Hall	Kirkwood, Missouri	6	0
2007	12	Von Maur in Westroads Mall	Omaha, Nebraska	8	4
2007	10	Residence in Crandon, Wisconsin	Crandon, Wisconsin	6	1
2007	5	Residence, Latah County Courthouse, and First Presbyterian Church	Moscow, Idaho	3	3
2007	4	Virginia Tech massacre	Blacksburg, Virginia	32	23
2007	2	ZigZag Net, Inc.	Philadelphia, Pennsylvania	3	1
2007	2	Trolley Square Mall	Salt Lake City, Utah	5	4
2006	10	West Nickel Mines School	Bart Township, Pennsylvania	5	5
2006	3	Residence in Capitol Hill Neighborhood, Seattle, Washington	Seattle, Washington	6	2

2006	1	Santa Barbara U.S. Postal Processing and Distribution Center	Goleta, California	6	0
2005	8	California Auto Specialist and Apartment Complex	Colton, California	3	3
2005	3	Red Lake High School and Residence	Red Lake, Minnesota	9	6
2005	3	Living Church of God	Brookfield, Wisconsin	7	4
2004	11	Private Property near Meteor, Wisconsin	Meteor, Wisconsin	6	2
2004	7	ConAgra Plant	Kansas City, Kansas	6	2
2003	8	Windy City Core Supply, Inc.	Chicago, Illinois	6	0
2003	7	Gold Leaf Nursery	Boynton Beach, Florida	3	0
2003	7	Lockheed Martin shooting	Meridian, Mississippi	6	8
2003	7	Modine Manufacturing Company	Jefferson City, Missouri	3	5
2003	2	Labor Ready, Inc.	Huntsville, Alabama	4	1
2002	3	Bertrand Products, Inc.	South Bend, Indiana	4	5
2002	1	Appalachian School of Law	Grundy, Virginia	3	3
2001	2	Navistar International Corporation Factory	Melrose Park, Illinois	4	4
2001	1	Amko Trading Store	Houston, TX	4	0
2000	12	Edgewater Technology, Inc.	Wakefield, Massachusetts	7	0
1999	12	Hotel shooting	Tampa, Florida	5	3
1999	11	Xerox killings	Honolulu, Hawaii	7	0
1999	9	Wedgwood Baptist Church shooting	Fort Worth, Texas	8	7
1999	7	Atlanta day trading spree killings	Atlanta, Georgia	9	13
1999	4	Columbine High School massacre	Littleton, Colorado	13	24

Source: Data from the FBI active shooting cases (Federal Bureau of Investigation, 2017).