American State Lawmakers' Hardly Change How They Legislate Firearms After an In-District Mass Shooting

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Abstract

Mass shootings are among the most visible and tragic events in American public life, yet their impact on policymaking remains unclear. While theory and anecdotes suggest that American lawmakers—motivated by constituent opinion, media attention, and the urgency of local tragedy—should respond legislatively to shootings in their jurisdiction, recent evidence raises doubts about whether such events generate sufficient electoral or institutional incentives for change. Using a comprehensive dataset on sponsorship and voting on firearms legislation across nearly all U.S. states from 2009–2022, we find little consistent evidence that in-district mass shootings affect policymaker behavior. These findings suggest that even highly salient and localized tragedies may be insufficient to shift legislative action, posing a challenge to theories of democratic responsiveness and crisis-driven policy change.

Keywords: Mass shootings; gun control; responsiveness; representation

Introduction

The number of gun-related deaths in the United States has been steadily rising over the past half-century and reached a peak in 2023 (Gramlich, 2025). The gun death rate is notably higher in the United States than in most other developed nations (Fox, 2024) and in several American states (e.g., New Mexico, Louisiana, Alabama) the gun death rate is comparable to that observed in developing nations with substantial drug trades (e.g., Colombia, Bolivia, Mexico) (Gramlich, 2025; Santhanam, 2018). When it comes to one of the most acute and horrific forms of gun violence—mass shootings—the United States leads the developed world by far in the number of shooting events annually (Silva and Capellan, 2019). In fact, mass shootings have been steadily increasing in the United States over the past half-century, with more than half of all recorded mass shootings since 1966 occurring in the last 20 years (Bendix, 2023). Mass shootings have occurred in nearly all 50 American states (Barnard et al., 2023), and hundreds of communities have experienced these tragic events, and, as they continue to occur, more and more American's lives will be touched by these horrors.

Against this backdrop of acute and persistent gun violence in America sits a growing scholarly literature exploring the political consequences of mass shootings. Recent research on the effects of mass shootings uncovers a general increase in the perceived importance of preventing shootings (Kantack and Paschall, 2020), public support for firearms restrictions (Filindra et al., 2020; Frey and Kirk, 2021), and mass political action (e.g., information-seeking, petition signing, and donations) oriented toward achieving gun control (Reny et al., 2023). Like other traumatic events (e.g., terrorist attacks and natural disasters), mass shootings occur in specific locations, directly exposing host communities and nearby residents to loss and tragedy (Marsh, 2023). An expanding vein of research finds that living in close proximity to a mass shooting generates emotional distress (Rossin-Slater et al., 2020), elevates the personal importance of gun policy (Yousaf, 2021), and is associated with heightened reported support for gun control (Newman and Hartman, 2019; Hartman and Newman, 2019) and voting for ballot measures that restrict access to firearms (Markarian and Newman, 2024).

This growing stock of scholarship has furthered our understanding of the impact of mass shootings on ordinary Americans. However, conspicuously missing from the scientific literature is a systematic investigation of the impact of mass shootings on the behavior of *political elites*—specifically, elected lawmakers with the legal authority to introduce and pass firearms legislation. While past research has analyzed the votes of American lawmakers on firearms legislation, these studies do not consider how exposure to mass shootings shapes legislators' votes(Lipford, 2000; Medoff et al., 1995; Price et al., 2002; Richards, 2017; Thomas et al., 2008).

A few studies examine the impact of mass shootings on firearms legislation passage and introduction across U.S. states (Goel and Nelson, 2024; Luca et al., 2020; Reich and Barth, 2017); however, the unit of analysis in those studies is the state, leaving unanswered whether individual lawmakers respond to mass shootings affecting their constituents through legislative action on firearms. Because individual legislator decisions are ultimately responsible for translating public preferences into public outcomes, focusing on the individual legislator is critical. In short, the scholarly literature offers growing evidence that ordinary Americans "do something" in response to mass shootings; however, it is unclear whether the efforts by citizens to engage with gun policy and promote gun control in the wake of mass shootings are met with attempts by their elected legislators to pass policies to curb gun violence.

This leads us to our motivating research question: Do mass shootings within a district prompt legislators representing that district to shift their legislative behavior on firearms? We ask this question in light of one of the broader, perennial questions in American politics: Why does the United States not have stricter gun laws? This broader question is underscored by the fact that, despite experiencing high levels of gun violence (including mass shootings), gun laws are nevertheless more permissive in the United States than in many other developed nations (Harkinson and Lee, 2013; Masters, 2022). Indeed, in other Western nations, the occurrence of deadly mass shootings was followed by substantial changes in firearms legislation. For example, the 1996 Dunblane Massacre led to a permanent ban on ownership of most handguns in the United Kingdom, the 1996 Port Arthur Massacre led the Australian Government to ban automatic and semi-automatic weapons, and the 2002 Erfurt School Massacre led the German government to increase the minimum age for legal access to firearms and ban pump-action shotguns. However, similar tragedies in the United States have not provoked comparable stricter firearms legislation.

The literature on "focusing events" (Birkland, 1997; Kingdon, 1995), which provides an overarching theoretical framework for scholars exploring the political effects of mass shootings, contends that sudden and vivid events that cause harm can push event-relevant issues to the top of the political agenda, as the public and interest groups demand fixes for perceived policy failures. Applied to mass shootings, this framework implies that mass shootings will cause both ordinary citizens and political elites to pay greater attention to gun violence and that this shift in the political agenda on firearms may culminate in the implementation of new policies intended to curtail gun violence. Some anecdotal evidence supports this expectation. For example, within three weeks of the 2018 mass shooting at Marjory Stoneman Douglas High School in Parkland, Florida, that state enacted one of the most restrictive gun laws in its history. Anecdotal evidence extends to individual lawmakers who experience in-district mass shootings: Illinois State Representative Bob Morgan—whose district includes the city of Highland Park—sponsored and helped pass Illinois's assault-weapons ban, the Protect Illinois Communities Act, following the 2022 Highland Park Independence Day parade shooting. Turning from anecdote to systematic evidence, recent research finds that legislators comment more about gun control on social media following in-state mass shootings Markarian (2024). Yet, whether individual lawmakers change their legislative behavior in response to proximal mass shooting remains untested. To our knowledge, no published study systematically examines whether individual lawmakers alter their legislative behavior on firearms in response to a mass shooting in their constituency.

This clear gap in the literature is accompanied by theoretical and empirical challenges to the "focusing events" framework. In fact, a countervailing set of theory and findings suggests lawmakers may not significantly alter their legislative behavior in response to mass shootings. In general, legislators exhibit remarkable stability in their voting behavior across their careers, regardless of changing constituent preferences (Poole, 2007). Indeed, when legislators' ideologies conflict with their constituents', they are more likely to vote their own ideological position than those of their constituents' (Matsusaka, 2025). And even after redistricting, legislators do not significantly adapt their voting behavior to reflect their new constituents' preferences (Lo et al., 2012). While legislators may not change their behavior much in response to changing constituent preferences, constituents can still achieve responsiveness by replacing non-responsive legislators with new, more congruent representatives (Canes-Wrone et al., 2002; Erikson et al., 2002).

Research on legislative responses to firearms policy specifically has found limited evidence of responsiveness. In their extensive examination of the congruence between state laws and the policy preference of state residents, Lax and Phillips (2012) found that state firearm laws stand out as conspicuously incongruent with resident preferences. State laws align with what the majority of state residents want less than 25% of the time. In fact, legislators often mistakenly perceive that their constituents are more conservative on gun policy than they actually are—much more so than on other policy issues (Broockman and Skovron, 2018). And, while prior research finds that people who live near a mass shooting become more supportive of gun control

and vote for ballot initiatives to regulate firearms, these shifts in public preferences and voting on firearms do not appear to translate into changes over the choice between Democratic or Republican candidates in federal, state, or local elections (Hassell and Holbein, 2025), which may help explain the pronounced level of policy incongruence observed on firearms across the American states.

In short, existing research offers compelling evidence that ordinary Americans react to mass shootings—emotionally, attitudinally, and behaviorally—but it remains unclear whether their elected representatives do the same. Theoretical frameworks yield competing expectations. The "focusing events" literature suggests that salient crises like mass shootings could prompt political elites to prioritize gun violence and act to prevent its recurrence. Yet a large body of research on legislative behavior highlights remarkable ideological and behavioral stability among lawmakers, particularly in domains such as gun policy where responsiveness to public opinion is limited and often biased. As a result, it is uncertain whether even highly visible and locally traumatic events are sufficient to alter legislators' actions. Our study addresses these issues by examining whether U.S. state legislators change their bill-sponsorship and voting behavior on firearms legislation in response to mass shootings in their districts.

Results

We begin by asking whether in-district mass shootings prompt legislator *adaptation*—that is, changes in incumbents' own behavior—and whether adaptation responses differ between Democratic and Republican legislators. Black circles and bars in Figure 1 report HTE-robust two-way fixed effects estimates at the legislator level (legislator and year fixed effects) with linear time trends across four treatment definitions: (1) any in-district mass shooting, (2) a large in-district mass shooting (8+ fatalities), (3) a recent in-district mass shooting (within two years), and (4) a recent large in-district mass shooting (8+ fatalities, within two years).[1] We then allow in-district shootings to shape behavior through *replacement*—changes in who represents the district—*as well as adaptation*. To do so, we estimate HTE-robust two-way fixed effects models with district fixed effects and linear time trends, which are shown as gray circles and bars.[2] The dependent variable in the left column of the figure plots the estimated effect of our treatment variables on gun policy ideology scores, while the outcome variables in the middle and right columns are gun control and gun rights bill sponsorship shares that capture the ideological inclination of the gun laws legislators sponsored.

The adaptation models yield no consistent or meaningful effects. Across treatments, samples, and outcomes, point estimates cluster near zero and are statistically indistinguishable from no effect. Looking at the top left panel, we see that, on average, in-district mass shootings are not associated with shifts in legislators' roll call voting behavior on gun policy. In short, in-district mass shootings do not appear to change how legislators representing those districts vote on firearm legislation: their roll call votes are neither more pro-gun control nor more pro-gun rights in the years after the shooting compared to the years before the shooting, accounting for national year-to-year trends affecting all legislators and pre-existing trends in legislators' own districts.

Similarly, looking at the top center and top right panels, we find no evidence legislators change in the gun policy sponsorship behavior after an in-district mass shooting, even in the short-term or after a large, salient event. A legislator's *share* of sponsored gun legislation that is pro–gun control or pro–gun rights remains essentially unchanged following an in-district shooting. In other words, legislators exposed to a mass shooting in their district do not appear to sponsor a more restrictive or permissive mix of firearm bills than they did before the shooting.

These null patterns persist when we analyze Democrats and Republicans separately in the second and third row of panels. Taken together, the results provide little evidence of systematic legislator adaptation in either direction: relative to their peers, legislators exposed to mass shootings in their districts exhibit no meaningful change in their gun policy behavior.

Turning to the specification that allows for change induced through legislator *replacement*, in the top left panel we again find that across treatments and samples, in-district mass shootings do not produce robust, consistent shifts in legislators' gun-policy ideology scores. We do, however, observe in the top center panel evidence that representatives of districts who experienced a large mass shooting sponsor a greater *share* of gun-control legislation than more distant peers. After a large in-district mass shooting, the share of a legislator's sponsored gun bills that are pro–gun control rises on average by roughly 3 to 4 percentage points. These effects are modest and not universal across all exposure measures. However, as we focus on the center panels in each row, recent, large mass shootings appear to

[1] Full model results are available in SI-B.

[2] Redistricting (primarily in 2012) complicates the fixed effects structure of these models; see the Methods and Materials section for details.

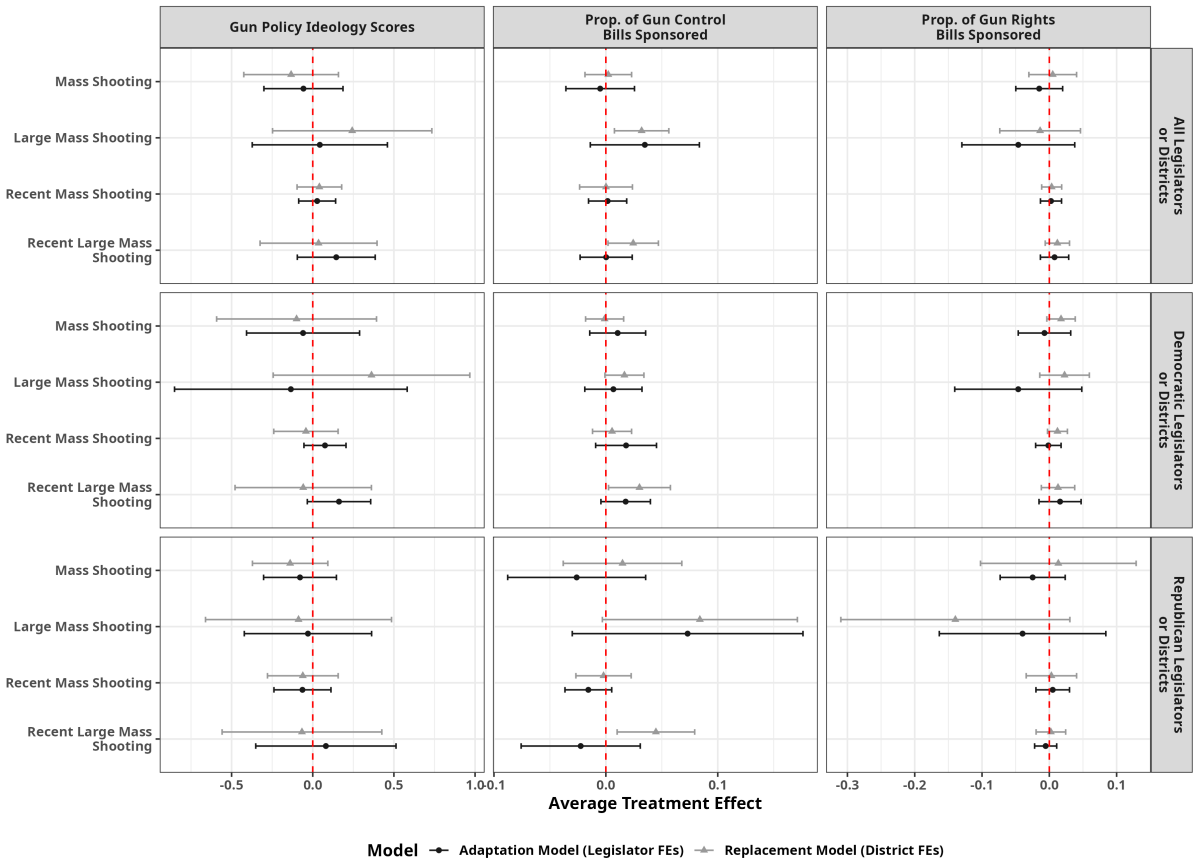

Figure 1: Average Treatment Effects on Legislative Behavior by Treatment Type, Outcome, and Legislator Party or District Partisan Lean

Note: Points show observation-weighted, HTE-robust average treatment effects estimated with two-way fixed effects (TWFE) with unit-specific linear trends using the `fect` estimator. Black circles are models at the *legislator* level (legislator and year fixed effects). Grey circles are at the *district* level (district and year fixed effects), allowing changes via electoral replacement as well as adaptation. Horizontal bars are 95% confidence intervals. Columns display outcomes: gun policy ideology scores, the proportion of sponsored bills favoring gun control, and the proportion favoring gun rights. Rows split all legislators, Democrats, and Republicans. Treatment definitions (top-to-bottom within each panel): any in-district mass shooting; large in-district mass shooting (8+ fatalities, excluding the shooter); recent in-district shooting (within two years); recent large in-district shooting (within two years). All models include district-level controls for income inequality, total population (logged), proportion male, proportion under age 18, proportion over age 55, proportion non-Hispanic white, proportion married, proportion with a college degree or higher, median household income, proportion unemployed, proportion employed in protective services, and proportion of military veterans. Full model results are provided in SI-B. The vertical dashed line marks zero effect.

consistently shape the gun control sponsorship behavior of both Democrats and Republicans, with the largest effects in Republican-leaning districts.

Beyond this limited and modest pattern in sponsorship portfolios observed in models allowing for changes in behavior induced through *replacement*, we find no significant, robust evidence that in-district mass shootings alter state legislators' behavior on gun policy. In sum, the results point to a narrow conclusion: on average, in-district mass shootings neither induce meaningful legislative behavioral change among incumbents nor lead to the systematic replacement of legislators holding different positions on gun policy. This non-responsiveness holds over short and longer horizons, across parties, and even after the most severe events.

Robustness Checks

We conduct several robustness and exploratory checks to assess whether the generally null results reflect genuine non-effects rather than limited power or measurement.

First, our dependent variable capturing legislator's voting on state gun legislation does not account for potential variation in the salience, scope, rigor, or importance of these laws. For example, null results in Figure 1 could occur if treated legislators voted in favor of gun control bills half the time before and after an in-district mass shooting; however, if the gun control legislation put to a vote after an in-district shooting were larger in scope, rigor, salience, or overall importance, then voting

"Yes" on this bill may reflect a shift in behavior not captured by our current gun policy ideology scaling method. Moreover, some of the firearms legislation used to construct legislators' ideology scores relate to hunting activity, which, while relevant to firearms access, may differ from what gun control or rights activists may consider hot-button gun legislation. To address these issues, we drew on RAND's dataset of significant state gun laws (Cherney et al., 2018) and assessed whether legislators recently exposed to an in-dsitrict mass shooting were more likely to support an important restrictive law or oppose an important permissive law than in-state peers who did not experience an in-district or proximal mass shooting,[3] controlling for party affiliation, prior gun control ideology, and district characteristics. We present these results in 2, where we find no evidence that proximal exposure affects the' roll-call behavior of legislators even on this narrow set of important laws. Full model results and additional tests at alternative distance thresholds are presented in SI-C.

Second, in SI-D, we broaden our definition of proximity, largely replicating the analysis in Figure 1. Instead of treating only legislators with an in-district event as exposed, we code exposure by distance from district centroids (within 25 or 50 miles). The null results in Figure 1 largely persist under these alternative thresholds, though we find modest pro–gun control shifts in roll call behavior among all legislators—particularly for those representing districts within 25 miles of a mass shooting or within 50 miles of a large event. These effects are somewhat stronger among legislators from Republican-leaning districts.

Third, in SI-E, we vary the definition of "large" events. We consider legislators as treated if: (i) cumulative deaths across one or more in-district events exceed eight; (ii) any event has 15+ victims killed or injured (rather than focusing only on deaths); or (iii) the *most recent* in-district event has 8+ fatalities (rather than any in-district event). Our results remain null across pooled and subgroup analyses and are not substantively different than the results presented in the main text.

Finally, we analyze whether mass shootings change a state's gun policy agenda. Specifically, we analyze whether in the year prior to, the year of, and the year after a mass shooting in a state, there is variation in the total number of gun bills introduced, the number of gun control bills introduced, and the number of gun rights bills introduced. We find no significant change in the firearm agenda pre and post-shooting, both in terms of the total number of firearm bills introduced, and the policy direction of bills introduced (see SI-F).

[3]Votes are coded so that "1" represents that more restrictive positions and "0" the less restrictive position. Therefore, "yes" votes on restrictive bills are coded as "1" and no votes are coded as "0," while votes on permissive bills were recoded so that "1" represents voting "no" and "0" represents voting "yes" on the bill.

Conclusion

To better understand whether legislators respond to in-district mass shootings by changing how they legislate on gun policy, we analyze nearly all state legislators over more than a decade, accounting for multiple measures of exposure, outcomes, and model specifications. The results are strikingly consistent: in-district mass shootings do not meaningfully change lawmakers' behavior on gun policy. Across legislator- and district-fixed-effects designs, with and without unit trends, and under "most likely" definitions (recent, large events), point estimates are generally clustered near zero and rarely survive modest robustness checks. There is one detectable pattern: large, in-district mass shootings slightly increase the share of pro-gun control bills in legislators' portfolios of sponsored firearm laws when we allow for system-level responsiveness through legislators' adaptation or replacement. However, these effects are relatively small, model-dependent, and are observed only in response to the most deadly events. In short, we uncover little evidence of systematic adaptation by incumbents or replacement effects that move districts toward different legislative positions following nearby mass shootings.

These findings carry clear implications for theories of responsiveness and for the "focusing event" framework. First, they suggest that even salient, localized tragedies rarely produce elite behavioral change where it matters most. Second, they qualify inferences drawn from mass-level studies: shifts in public salience, attitudes, and even revealed preferences (e.g., ballot initiatives) do not necessarily translate into elite action within legislatures. Put differently, the pathway from mass response to policy change appears to be interrupted—by partisan polarization, durable legislator preferences, strategic agenda control, or electoral incentives that are too weak or too diffuse to overcome status quo forces. For scholars, this underscores the need to theorize the distinct conditions under which attention shocks move elites, as opposed to the conditions under which they mobilize citizens.

At the same time, our analysis has limits that point to constructive avenues for future work. Mass shootings may act as system-wide shocks that "treat" many legislators simultaneously, compressing observable within-unit contrasts and lowering statistical power in difference-in-differences designs. Legislators may also channel responses into domains that are harder to measure with bill texts

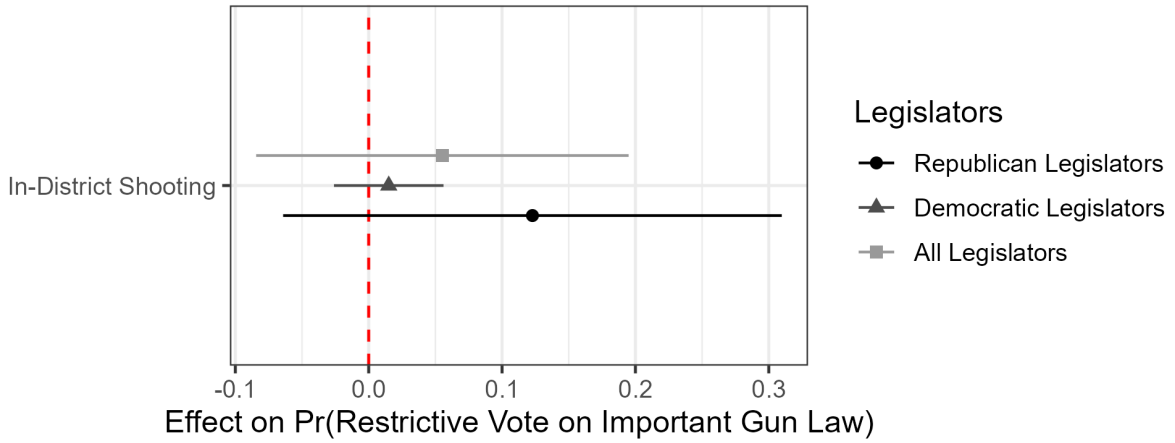

Figure 2: Average Treatment Effect on Probability of Voting Yes (No) on Restrictive (Permissive) Gun Law

Note: Points show coefficients from OLS regression. Horizontal bars are 95% confidence intervals from state-clustered standard errors. Treatment is based on recent shootings (within two years) at specified distance. All models include controls for legislators' estimated gun control ideology the prior year, and district-level controls for estimated political ideology, income inequality, total population (logged), proportion male, proportion under age 18, proportion over age 55, proportion non-Hispanic white, proportion married, proportion with a college degree or higher, median household income, proportion unemployed, proportion employed in protective services, and proportion of military veterans. The "All Legislators" model controls for legislators' party affiliation. Full model results are provided in SI-C. The vertical dashed line marks zero effect.

and roll calls—committee negotiations, agenda placement, or framing in hearings. Legislators may also change their legislative behavior on and redirect activity to adjacent policy areas (e.g., mental health, school security, emergency preparedness) rather than firearms per se; our deliberately gun-focused outcomes would miss these substitutions. Data constraints also remain: roll-call coverage varies across states and years; identifying gun policy is necessarily imperfect; and redistricting complicates district fixed-effects designs. Future research could (a) exploit richer digital traces (hearing transcripts, amendment logs, whip counts), (b) examine timing heterogeneity around electoral cycles and leadership changes, (c) model substitution into non-gun policies, and (d) connect shocks to party agenda–setting, not just individual behavior. Designs that couple elite behavior with constituency-level opinion change—and that track mobilization by organized interests—would further clarify why attention shocks stall inside legislatures.

Finally, the normative stakes are substantial. If even the most visible and devastating local tragedies seldom move state legislative behavior on gun policy, preventing gun violence cannot rely on episodic agenda shocks alone. Democratic accountability may be attenuated when public engagement rises but institutional responses do not: constituents can "do something" while laws remain unchanged. For practitioners, our results counsel strategies that emphasize sustained mobilization, coalition-building that alters party agendas, and mechanisms outside routine lawmaking (e.g., direct democracy where available, executive and administrative levers, procurement and corporate policy, or litigation). For citizens, the lesson is sobering: in the current institutional environment, durable shifts in representation on gun policy likely require durable shifts in partisan control, candidate recruitment, and the incentives that legislators face. Exposure to mass shootings alone is unlikely to move legislators' policy positions.

Materials & Methods

To assess if mass shootings influence the behavior of lawmakers, we turn to the American states—from where firearm laws primarily emanate—and analyze bill sponsorship and roll call voting behavior of individual state legislators. Across the 50 states, there are 99 state legislative chambers comprising over 7,300 elected state legislators—a far greater number of units to analyze than in America's national legislature. In addition to offering a large sample and statistical power, state legislative districts are smaller than federal districts, creating more geographically intimate constituencies where in-district mass shootings may serve as locally salient focusing events.

We constructed a district-year panel dataset that captures individual lawmakers' legislative behavior over time, nested within their districts. This structure allows us to use a *staggered*

difference-in-differences design where we compare within-legislator (or, in separate analyses, within-district) changes in behavior before and after a mass shooting to concurrent changes among legislators whose districts did not experience a shooting. This approach isolates the behavioral shift attributable to proximal exposure to a mass shooting, controlling for broader temporal and contextual influences.

We take a broad approach to measuring exposure to mass shootings and legislative behavior and to account for potential treatment heterogeneity. Exposure is defined across multiple spatial thresholds (within-district, within 25 miles, within 50 miles) and temporal windows (ever vs. past two years), while distinguishing especially large or deadly events. We then estimate doubly robust difference-in-differences models analyzing changes within-legislator and, separately, within-district. Within-legislator models allow us to compare individual lawmakers' legislative behavior after a shooting in their district to their own behavior before a shooting (analogous to a within-subject experimental design), allowing us to asses whether individual legislators adapt their legislative behavior on firearms in response to an in-district mass shooting. Within-district models allow us to compare the legislative behavior of whichever lawmaker represents a district after a mass shooting to that of whichever legislator represented the district before the shooting, accounting for possible legislator replacement through elections. These latter models allow for more avenues for democratic responsiveness even if legislators are themselves not changing their behavior.

Legislative Behavior on Firearms

We built our core panel from legislative records provided by LegiScan, a comprehensive legislative tracking and data service that aggregates, standardizes, and provides structured information on bills, votes, and legislative activity across all 50 U.S. states. We downloaded all available LegiScan CSV files covering 2009–2022, including bill-level metadata, sponsorship and co-sponsorship records, legislator profiles, and roll call votes.

We identify firearms legislation using the keyword-matching strategy employed by Luca et al. (2020), flagging any bill whose title or summary description contained: "firearm," "handgun," "pistol," "revolver," "rifle," "shotgun," "long-gun," or "assault weapon." Additionally, we enhanced this keyword list to include legislation that contains the word "gun," which was not a key word used by Luca et al. (2020) but is commonly found in the title of gun control legislation.[4] In total, nearly 17,000 bills across all states from 2009-2022 contain at least one of these terms.

We used these sources to construct a district-year panel capturing legislative behavior on firearms legislation. Specifically, using ideal point estimation—a statistical technique used to infer legislators' underlying policy preferences ("ideological positions") from their roll-call votes—we measured legislator voting behavior on firearm bills using roll call decisions made by each individual state legislator during the study period. We estimated ideal points for each legislator in each year following the strategy introduced by Martin and Quinn (2002). Ideal points, a common measurement strategy in political science similar to principal components analysis, are individual-level measures of legislator behavior that roughly capture the probability that a legislator, all else equal, will vote yes on a firearms bill. Negative values indicate legislators likely to vote yes on gun control bills and positive values indicate legislators likely to vote yes on gun rights bills.

This strategy is useful for two reasons. First, ideal point estimation recovers bill-level parameters that measure how much legislators' preferences affect legislators' vote choice on that bill. A positive bill-level parameter indicates that pro gun rights legislators are more likely to vote yes, and a negative one indicates that pro gun control legislators are more likely to vote yes, and the size of the parameter indicates how much more likely legislators are to vote for the bill. We validated our ideal point estimation with hand-coded classifications of bills labeling a subset of legislation as pro gun control, pro gun rights, or neutral.[5] Second, the legislator-level ideal point estimates give us comparable measures of preferences over gun policy that change over time and encode information from every vote on firearm policy a legislator has taken across their career. We estimate an ideal point parameter for each legislator in each legislative session on the same scale.

Each legislator's ideal point on firearm policy in each year forms one of our dependent variables. The left panel of Figure 3 displays the distribution of gun control ideal points, standardized within state, and separated by party to show that the scores have face validity. Democrats tend to be more in favor of gun control (negative values), and Republicans tend to be more in favor of gun rights (positive values), which comports with expectations. The middle panel shows that gun control ideal points are correlated with vote share for the Democratic Party in each district. The right

[4] We specifically exclude legislation that refers to non-firearm versions of guns such as paintball guns, laser guns, spear guns, etc. (n=322).

[5] Hand coding instructions provided to research assistants are available in SI-A).

panel displays the distribution of bill-level parameters separated by hand-coded bills classified as pro gun control, pro gun rights, or neutral. As expected, bills hand-coded as pro gun control have, on average, bill-level parameters to the left of the distribution, and bills hand-coded as pro gun rights have, on average, bill-level parameters to the right of the distribution. Bills hand-coded as concerning gun policy but neutral in nature are somewhere in the middle.[6] To classify bills as pro gun control or pro gun rights throughout the paper, we split the sample of votes based on whether each vote's estimated parameter is negative (pro gun control) or positive (pro gun rights). The bill-level parameter encodes how the probability a legislator votes yes is related to that legislator's ideology score. So, a positive discrimination parameter indicates that legislators with positive ideology scores (pro gun rights) are more likely to vote yes.

Using bill-level parameters, we label each piece of firearm legislation as pro gun control if its policy score falls below zero and pro gun rights if its score exceeds zero. Scores below zero indicate that legislators that are more pro gun control are more likely to vote yes on a bill, and scores above zero indicate that legislators that are more pro gun rights are more likely to vote yes on a bill. This classification allows us to characterize each legislator's portfolio of sponsored bills in terms of policy direction. From these classifications, we calculate the share of sponsored gun bills that favor gun control, defined as the number of restrictive (pro gun control) bills a legislator sponsors divided by the total number of gun-related bills introduced. Similarly, we compute the share of sponsored gun bills that favor gun rights, defined analogously as the proportion of permissive (pro gun rights) bills among all gun-related bills introduced.

We used shares rather than counts to provide a comparable measure of legislators' relative emphasis on restrictive versus permissive firearm policy across states, sessions, and institutional contexts. State legislatures differ widely in the number of gun-related bills introduced and in formal limits on bill sponsorship, which makes absolute counts difficult to compare. By focusing on the composition—or "mix"—of each legislator's gun policy sponsorships, we capture their directional engagement with gun policy while minimizing distortion from cross-state and temporal differences in legislative volume or agenda size.

We were ultimately able to construct an unbalanced panel of state legislative districts—upper and lower chambers—in 48 states,[7] for all years where roll call votes are available.[8] We observe the legislative behavior for 11,100 unique legislators serving between 2009 and 2022, yielding an overall dataset containing nearly 60,000 legislator-year observations.

Mass Shooting Data

We linked district–year records to mass shooting events from The Violence Project (TVP), a nonprofit, nonpartisan research center funded by the National Institute of Justice to track mass shootings using a rigorous multi-coder process (Peterson and Densley, 2019). Following the Congressional Research Service's definition, TVP defines a mass shooting as:

> A multiple homicide incident in which four or more victims are murdered with firearms—not including the offender(s)—within one event, with at least some of the murders occurring in a public location or locations in close geographical proximity (e.g., a workplace, school, restaurant, or other public settings), and not attributable to another underlying criminal activity or commonplace circumstance (armed robbery, criminal competition, insurance fraud, argument, or romantic triangle).

Legislators or districts are considered "treated" if they experienced a mass shooting within a district's boundaries. In robustness tests, we consider treatment by spatial proximity, measuring whether legislators or districts experienced a mass shooting within 25 miles of the district centroid or within 50 miles of the district centroid (see SI-C). Of approximately 6,365 districts, across the period, 409 districts experienced a shooting within their boundaries, 2,698 within 25 miles, and 3,838 within 50 miles.

We also varied how we measured treated units based on timing. We coded (1) whether a district ever experienced a mass shooting during the panel, or (2) whether a district experienced a mass shooting within the previous two years. The former captures potential long-run effects—such as shifts in constituent preferences—while the latter captures short-run effects during periods of heightened salience.

Finally, we considered treatment "intensity" by focusing on larger and more deadly mass shootings,

[6] For more information on hand-coding of legislation, see SI-G.

[7] Due to inconsistent district naming conventions, we were unable to merge district-level demographic data for New Hampshire and Vermont with legislative data. Therefore, we dropped these states from the analysis.

[8] LegiScan's coverage of roll call votes varies by state, especially in earlier years, leading to an unbalance panel. For example, roll call votes from California are available for all years, but roll call votes from Kentucky are only available since 2018.

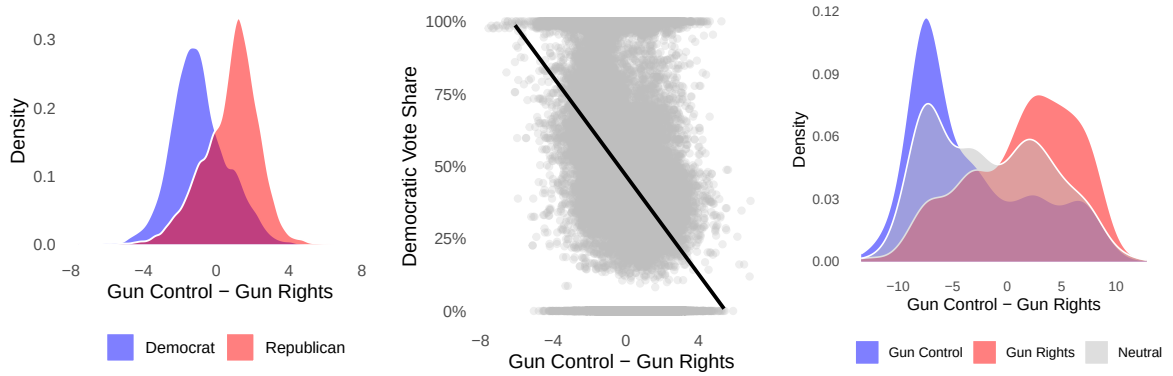

Figure 3: Gun Control Ideal Point Validation.

which are known to generate more media attention (Silva and Capellan, 2019), public engagement with gun policy (Reny et al., 2023), and demand for gun control (Newman and Hartman, 2019). In our main models, we define large shootings as those with eight or more victims (excluding the shooter). This threshold is roughly the average death toll for mass shootings during our study period and encompasses highly salient shootings like those in Newtown, Connecticut, Charleston, South Carolina, Parkland, Florida, and Las Vegas, Nevada. In robustness checks, we test alternative salience definitions, including thresholds based on total victims (killed and injured) and cumulative fatalities across multiple events.

Control Variables

Demographic controls come from the American Community Survey (ACS), accessed via IPUMS-NHGIS, along with district shapefiles for spatial matching.[9] Additionally, we merged in Warshaw and Tausanovitch (2022) Subnational Ideology and Presidential Vote Estimates, which uses multilevel regression with post-stratification (MRP) to estimate district-level Democratic presidential vote share used to subset our analysis.

Modeling Strategy

We estimate effects using staggered difference-in-differences specifications, implemented with the `FEct` package, which provides heterogeneous treatment effect (HTE)-robust estimators. These doubly robust estimators combine outcome modeling with inverse probability weighting, reducing bias due to treatment effect heterogeneity (Liu et al., 2024). Unlike alternative estimators, `FEct` accommodates treatment reversal, allowing us to examine whether effects are limited to recent events.

We asses changes through both legislator *adaptation* or *replacement*. Our *adaptation* models use legislator and year fixed effects to capture within-legislator changes in behavior following treatment exposure. This approach isolates changes in the behavior of the same legislator over time but does not capture shifts that occur when a district elects a new legislator. Our *replacement* models allows us to assess whether legislator adaptation as well as legislator replacement—through elections, retirements, or recalls—drive changes. The models use district and year fixed effects, capturing within-district changes regardless of legislator turnover. However, district fixed effects cannot be used across redistricting cycles (notably before and after 2012), limiting the time horizon for these models and sacrificing statistical leverage as we cannot test for within-unit changes across redistricting periods.[10]

All models include linear time trends which relax the parallel trends assumption by allowing for gradual, unit-specific trajectories in the outcome variable. This is particularly relevant here because mass shootings are not randomly distributed—they occur more often in areas trending liberal (Hassell and Holbein, 2025).

Subgroup Analyses

For the legislator fixed effects models, we conduct separate analyses on the full set of legislators, on Democratic legislators only, and on Republican legislators only.[11] For the district fixed effects models,

[9] Our demographic controls include income inequality (Gini coefficient), total population (logged), proportion male, proportion under age 18, proportion over age 55, proportion non-Hispanic white, proportion married, proportion with a college degree or higher, median household income, proportion unemployed, proportion employed in protective services, and proportion of military veterans.

[10] The `FEct` requires single unit-year observations. In some case, such as when a legislator is replaced or when they move from lower to upper chambers halfway through their term, duplicate unit-year observations arise. Therefore, we remove all duplicated unit-year observations for modeling purposes.

[11] Nebraska is excluded from the partisan models because of its nonpartisan legislature.

we similarly estimate effects for all districts, for districts that leaned Democratic in the previous presidential election (defined as the Democratic presidential candidate receiving at least 55 percent of the vote), and for districts that leaned Republican in the previous presidential election (defined as the Democratic presidential candidate receiving less than 45 percent of the vote). This approach allows us to assess whether responsiveness to proximate mass shootings varies systematically by party affiliation or by the partisan lean of the constituency.

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Competing interests

The authors declare no competing interests.

Data and materials availability

All data are from publicly available sources described in **MATERIALS AND METHODS**. Replication code and processed data will be made available in a public repository upon publication. Interim access is available upon reasonable request.