

Supplemental Materials

Polarization or Deliberation?

Comparing Incidental and Purposive Political Discussion in Online Communities

I . Exploratory analysis of full dataset of political discussion

To note, before adopting human coding of opinion expression in political discussion, we have adopted four different natural language processing approaches to have a try on uncovering the opinions expressed in the comments, while receiving less than acceptable performance to do further analysis. Here are the four approaches and corresponding reflections:

- (1) Use the language using similarity between social media comments and congressional debate texts to infer the political leaning of comments (Demszky et al., 2019). There was a congressional debate on gun control policy on Oct. 2, 2017, right after the Vegas mass shooting event. With coding debate records from democratic and republican speakers as partisan on either side, we used their speeches as the standards for getting the political leaning of comments, by TF-IDF similarity between them. Yet, after validation, we found that less than 40% accuracy was achieved by this approach, and we also found a lot of words commonly used in comments were not included in the congressional speeches, which might be the reason why it didn't work well.
- (2) LDA topic modeling and topic labeling to infer the political leaning of large scale of comments (Baden et al., 2020). With a LDA model trained by all comments from the dataset, we then coded the topics following the process suggested by Baden et al. However, one important assumption for this approach to be valid is that the two sides of polarized comments should address different issues or concerns. However, in the mass shooting and gun control discussions, no matter pro-gun or anti-gun viewpoints will touch the similar topics of gun policy across international contexts and different states, mental health issues, or race and racism. As a result, it is very difficult for the topics to make effective distinguishment for partisan bias, resulting in a less than 40% accuracy.
- (3) Use word embedding model to measure language similarity between social media comments and partisan comments (Zhang et al., 2022). With comments from r/democrats as liberal-leaning comments and r/conservatives as conservative-leaning comments, we measure the political bias of any comments from other subreddits use their cosine similarity with the partisan comments. However, due to the limited number of comments from these two partisan communities, a lot of features of comments can not be captured by the model, thus resulting in a less than 30% accuracy.
- (4) Use fine-tuning BERT (Bidirectional Encoder Representations from Transformers) model to construct a political bias classifier (Han et al., 2023). With 1,000 comments human labeled comments as pro-gun, anti-gun, and moderate (neutral/mixed), we have trained a

BERT model for this labeling task. After 5 epochs, we reached the performance with a precision of .53, recall of .49, and F1 score of .49 overall. Though probably the best among the four approaches, the performance index is still far from qualified for further statistical analysis. Thus, we decided to make a stratified sample and conduct a higher-quality manually coding content analysis against this task.

II. Codebook for identifying the partisan attitude of Reddit comments

Two coders for this assignment will code the random comments from Reddit into five categories in terms of their opinions on gun control and mass shooting issues. These categories include:

- (1) pro-gun. Comments with this category typically show the justification towards the current or less strict gun ownership laws, and/or express negative attitudes against the call for more gun regulations. It might be demonstrated by different ways, including highlighting the necessity for having gun to do self-defense, attributing the mass shooting event to other social factors rather than gun ownership, drawing on the Second Amendment or NRA (National Rifle Association) to show citizens' rights to keep and bear guns. Some examples and the reasons they are categorized as "anti-gun" are as follows:

Pro-gun comment texts	Memos
short answer because i'm busy and on mobile. make people not want to shoot each other. eliminate stigma and increase availability for mental health care. help the poor so they don't need to rob. help those with addictions, etc.\n\nmake the people happy and the amount of gun violence will drop without passing any laws regarding guns.	It suggests addressing the root causes of violence, like mental health issues, poverty, and addiction, rather than implementing new gun control laws. The focus is on improving societal conditions to reduce the desire or need for individuals to engage in violence, implying that this approach would be more effective than legislating gun control. This perspective typically aligns with pro-gun viewpoints, which often argue that factors other than the availability of guns are the primary drivers of gun violence.
neither russian nor canadian citizens may legally carry firearms for self-defense, unless you consider a shotgun or rifle to be something to fit inside your waistband. \n\npretty much anywhere in the world ecept america, it is illegal to protect yourself with a firearm on your person. you must trust the government to protect you, and put your faith in the goodness of other people. yeah sure.	While it maintains a neutral tone by questioning the necessity of using a gun for self-defense, the underlying implication is a skepticism about the need for firearms for personal protection, especially when compared to other countries where gun ownership is less common, therefore the commenter is supporting regulation on gun use and ownership.
the issue at hand is mental illness not any tools or weapons, you don't blame the spoon for making you fat, so don't blame a gun for the actions of a murderer. our focus should be on preventing mental illness and this preventative action can be taken at the start of a life simply by being supportive of your children, everyone needs to read this article, unfortunately most people	It argues that the focus in discussions about gun violence should be on mental illness rather than on the guns themselves, using the analogy of not blaming a spoon for causing obesity. By suggesting that the root cause of gun violence is mental illness and not the firearms, the comment aligns with a common pro-gun viewpoint that emphasizes factors other than gun accessibility as the primary issues to be addressed. This comment is quite reasonable since it's also against the easy echo

probably won't because it won't fit their echo chamber narrative of anti gun vs pro gun.	chamber between two straightforward polarizing point of view.
> when was the last time a gunman was killed by an armed civilian? night club bar = gun free zone. school = gun free zone. vegas = 32 stories above ground locked in a room = impossible for a gun carrying citizen to do anything about.\n\n	It seems to critique the concept of gun-free zones by pointing out instances where shootings occurred in areas where civilians are not allowed to carry firearms. The mention of different scenarios where an armed civilian couldn't intervene due to restrictions or practical limitations suggests an argument in favor of allowing more widespread carrying of guns by civilians.

- (2) anti-gun. Comments with this category typically show the supportive attitude towards more strict regulations on gun ownership, trade, and use in the everyday lives. It might express the commenter's ideas in different ways, including highlighting the harmful outcomes of widely used guns, the potential harm from illegal gun owners and mass shooting for the public, the comparison between other countries with stricter gun control laws and the US to show the latter should have stricter policy on guns. Some examples and the reasons they are categorized as "anti-gun" are as follows:

Anti-gun comment texts	Memos
if people violate the social contract that affords them certain rights, they forfeit them. for example, should someone go to prison if they are convicted of a crime that warrants it? if someone commits a violent crime, should they be able to possess a firearm? if someone commits a DUI, should they be able to drive immediately afterwards?	It discusses the concept of forfeiting certain rights, including the right to possess a firearm, as a consequence of violating social contracts or laws. By questioning whether individuals who commit violent crimes or DUIs should retain the right to possess firearms or drive, the comment implicitly supports the idea of more regulation and restriction on gun ownership, particularly for individuals who have demonstrated a disregard for laws and public safety.
i don't know how to put this politely, so i'll be blunt.\n\nif a 12-year-old "bothers" you (are they robbing you?), i'm not going to recommend shooting them, unless they are attempting to take your life (and i can't really see an unprovoked attempted murder taking place that often). \n\nyour situation, of being a disabled person at the mercy of anyone with a knife, is a potential issue anywhere in the world. why do you think you need a gun, when an australaian/english/german/italian/etc don't?	While it maintains a neutral tone by questioning the necessity of using a gun for self-defense, the underlying implication is a skepticism about the need for firearms for personal protection, especially when compared to other countries where gun ownership is less common, therefore the commenter is supporting regulation on gun use and ownership.
like how conservatives always deflect	This comment is expressing the negative attitude

the gun control discussion after every mass shooting.	against the republicans who usually don't support gun control, so it's actually support gun control laws and democratic leaning.
look everyone!!!! that's why the brown pulse victims were ignored by the kek-in-chief who instead spouted pro-gun/anti-muslim bullshit. the rednecks got well-wishes and decency. remember when he declared that this would never happen again because the big bad rednecks had guns? stop blaming liberals and blame your piece of shit incompetent mistake.	This comment is pretty extreme in opposing the republicans' pro-gun and anti-muslim viewpoints by calling the republicans rednecks.

- (3) neutral. Comments under this category don't express an explicit or clear point of view on whether strict gun control laws are needed or not, but focus on discussing other related topics in the gun issue contexts. As a result, we cannot tell whether the commenter has clear viewpoints on gun control. These related issues might include law enforcement by police, mental health issues, suicide rates, other kinds of crimes. (Notice that if the comments draw on these issues but also to express a clear and salient point of view towards guns, it should be categorized as "anti-gun" or "pro-gun".)

Neutral comment texts	Memos
well a guy with a gun has the power to kill someone who is vulnerable to bullets (so...everyone). so if a african american has a gun and he shoots a white person he eerted power over that white person and could therefore be called racist by your definition.	It discusses the power dynamic involved when someone possesses a gun and the potential consequences of using it, but it does not explicitly express a stance in favor of or against gun control. Instead, it seems to be a response to a discussion about the intersection of race and gun violence.
>. but i'm not sure i want to live in a world where someone can gun a pedestrian down right in front of a police officer and then be completely off the hook \n\nirl, the cop guns down the civilian and gets off	It doesn't explicitly argue for or against gun control but instead seems to comment on the perceived inconsistencies and issues within law enforcement and the justice system, particularly regarding the use of firearms. The comment reflects a critical view of how incidents involving firearms are handled, especially when law enforcement is involved, but it doesn't clearly align with a pro-gun or anti-gun stance.
they justify it by saying it's a slippery slope and gun control eventually means no guns.	It describes a common argument used by some individuals in the gun debate, specifically the "slippery slope" argument used by those opposed to gun control. The comment itself does not express a personal stance on gun control; rather, it explains a rationale often given by people who are wary of gun control leading to more extreme

	restrictions or a total ban on guns.
if you don't have \$10 to give to a cause, then no, frankly you're not going to be a big influence unless you have great influence with others. why do you think the NRA has a large membership. it's to influence politicians. it's money but it's also a shit ton of people who always vote one issue. if there was an pro competition for broadband group with the numbers of the tea party or the NRA, (even without giving a dime) you honestly think that politicians aren't going to give a shit?! come on. campaigns cost money to run. there has been money in politics since the birth of this country. to act like it's not is hopelessly naive.	It doesn't directly address the issue of gun control, but rather comments on the influence of organizations like the NRA (National Rifle Association) in political matters. The focus of the comment is on the impact of money and large membership in influencing politicians and policy, using the NRA as an example. It discusses the broader context of political influence and campaign financing, rather than expressing a specific stance on gun rights or gun control. The reference to the NRA's role in politics is more about illustrating a point on political influence rather than advocating for or against gun policies.

- (4) mixed. Comments under this category are expressing (more or less) both reasonable sections for supporting gun rights and gun control, and usually they lead to a not explicit attitude for others to tell from the commenter about the gun issues.

Mixed comment texts	Memos
real talk - i love guns, i think there should be gun licenses, they shouldn't register your specific firearms, but should include endorsement for classes of weapon and accessory.\n\ni have seen some dumbass motherfuckers do some stupidass shit with guns.	It expresses a personal fondness for guns (indicating a pro-gun attitude) but also supports the idea of gun licenses and endorsements for classes of weapons and accessories, which aligns more with gun control advocacy (an anti-gun stance). The support for licensing and regulation indicates a recognition of the need for some level of control over gun ownership, despite the overall fondness for firearms.
do you oppose seat belts? driver's licenses? \n\nyou're right that some regulations are good, and some are overly restrictive. i don't think that it follows that, say, restricting certain models of firearm is the same as 55mph speedlimit. i think that's closer to seatbelts and drivers licenses. \n\ncan you tell me _why_ these regulations would be foolish?	While it doesn't explicitly endorse or oppose gun control, it does engage with the topic by comparing firearm regulations to other types of safety measures, like seat belts and driver's licenses. This comparison suggests a nuanced view that recognizes the complexity of the issue. The commenter acknowledges the value of some regulations while questioning others, indicating a perspective that considers both sides of the gun regulation debate.
you say that like people that support the second amendment all support trump. i'm in the south so a good chunk of the	It describes the scenario that different from the typical stereotype, there are democrats that also support gun rights. It shows the potential mixed

people i know are firmly gun toting republicans, but even they're going "damn, i might have to vote democrat net time".	partisan and actual attitude towards the gun control.
wait, what? how are people going to bring their guns into the hotel? vegas is home to lots of shooting and sporting events, not to mention shot show which is the largest gun industry event in the world. there's no plausible argument to eclude guns from hotel rooms. \n\nwe can create a world where we are so safe that nothing bad like this ever happens, but it would be so restricted and so fucking absurd no one would want to live in it. sometimes there's no solution.	It implies the dual effects of strict gun control – including both making the society safer but also very restricted. So it expresses the mixed attitude on whether we should adopt the strict laws, and implies this also by showing that there is no easy solution.

- (5) irrelevant. Among all the comments to code, few of them might be either too short to connect to any issue, or make it hard to tell about what they are talking about without further contexts, or they are just addressing something unrelated to the gun rights discussions. When it happens, it should be categorized as “irrelevant”, while this category should be very few in the whole sample.

Irrelevant comment texts	Memos
[@roseannndemoro](\n\n* vegas shooting survivors can't afford to pay medical bills, forced to use gofundme\n\n it's time for #medicareforall!	
paging the nra	
maybe the nfl can get black people to stop shooting black people while they are at it.	
you can own machine guns. \n\nfor a \$200 ta stamp, a 6-12 month wait for batf paperwork to clear, and the low low price of \$15-25k anyone (who can pass the background check, gets local law enforcement approval, and can afford it) can own a full auto gun.	

III. GPT-assisted labeling process

With several cycles of experimenting to develop a best strategy for ChatGPT-3.5-turbo model to make best estimate of whether any comment from the dataset is substantially discussing the mass shooting and gun rights issue, we have developed the following prompts that can be replicated and utilized in future similar studies:

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few_shot_examples = [
    {"label": "political", "text": "the gun death rate alone in the us is more than 10 per 100k. this is also heavily concentrated in certain areas."},
    {"label": "political", "text": "yeah i edited it just before you replied. it was a typo before, my bad. of course there's plenty of third world countries with higher murder rates. but not eactly the people the us should have to compete with. i don't know why you'd remove the gang violence then compare it. other countries have gang violence as well. switzerland has 4-5 less guns per person than that of the us, not eactly a fair comparison. and the gun culture in switzerland is very different to the us. i'm 100% not trying to offend anyone. i'm just trying to get to the core of the issue. no-one should ever be able to kill 50+ people themselves, and injure 500. clearly there's a problem that needs to be addressed. this isn't the first time we've seen someone mowing down people with a gun (orlando), yet nothing seems to have changed since the last."},
    {"label": "political", "text": "i was thinking about posting this to my fb feed, but i'm worried my friends will see it as me 'politicizing the tragedy'. but this is *such* an important highlight of the delusion in not only trump's head, but those with 'good guy with a gun' wet dreams.  "},
    {"label": "non-political", "text": "i'm bill burr. my whole schtick, my gimmick of you will, is to be the ultra cynical skeptical conspiracy theorist guy who doesn't trust anyone. therefore in furtherance of this i blindly married a horrible mindless black retard who almost immediately cheated on me and will certainly divorce me in the net few months.\n\nwhen i put a gun in my mouth, i hope my last thoughts will be "anthony cumia was right."},
    {"label": "non-political", "text": "i feel drivers licenses are a flawed issue as well. so many people 'depend' on being able to drive that we've practically set it as an entitlement
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when it should be a privilege based on ability. \nbut you're right. especially considering the amount of hoops one has to jump through to be able to legally purchase / obtain / poses a firearm."},

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    {"label": "non-political", "text": "if i'm not mistaken, a bit of tampering with the proper equipment can unlock the 'automatic feature.'\n\nyes and no. to get a true automatic, you have to modify the weapon significantly with the right parts. to get a pseudo-automatic (which is likely what the vegas shooter had), you just need a bump-stock or trigger crank."}
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]
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"role": "system", "content": "You are a helpful research assistant, and you are going to label Reddit comments into different categories for further research.",
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"role": "user", "content": f"Please evaluate whether the following Reddit comment discusses political or public issues related to gun, gun control, mass shooting, or gun and partisan politics. Here are some examples that you can learn from: {few_shot_examples}. Respond with only 'yes' if it does or only 'no' if it doesn't. Comment: {comment_to_code}"
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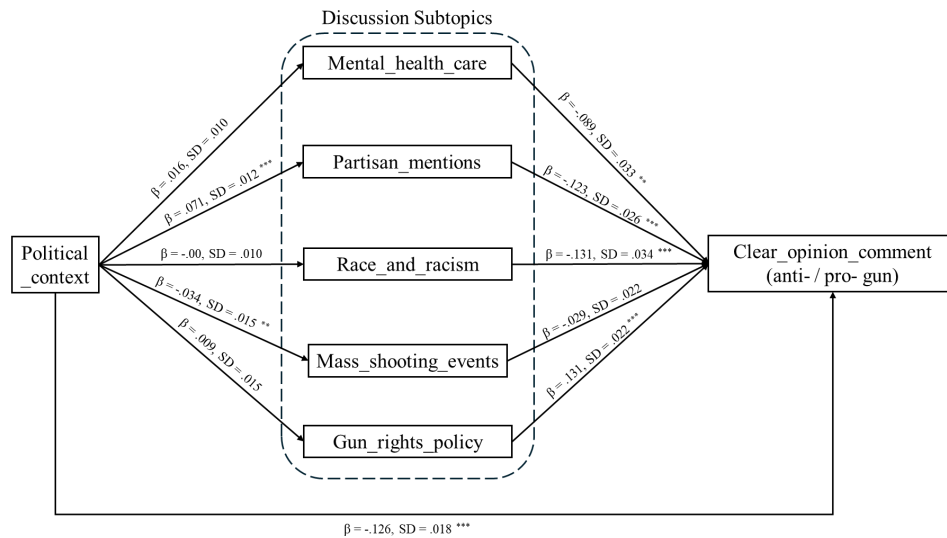
IV. Potential mediation mechanisms or alternative explanations for current findings

What might be the reasons or mechanisms for why incidental political discussion shows a higher level of polarization than purposive counterparts? Considering incidental political discussions usually don't have the same discussion depth and complexity as purposive ones (Wojcieszak & Mutz, 2009), we conducted a further analysis to test whether discussion depth serves as mediation or alternative explanations for the outcomes. Adopting an inductive approach, based on both LDA topic modeling results and qualitative reading of comments, we summarized the most salient five substantial sub-topics in the current dataset: (1) gun rights policy, which indicates whether the current policy should (or not) change to restrict gun ownership; (2) mass shooting events, mostly regarding the single Vegas mass shooting event, and also touching other similar shootings; (3) mental health and healthcare, which is a common frame of attributes for shootings, usually calling for more attention on mental health of shooters and improving healthcare system to make it; (4) partisan mentions, which attributes the gun issue to the division of two parties' competition, such that NRA funds the Republican party's vote largely; (5) race and racism, linking the shooter and their racial identity, usually containing stigma against minorities like blacks or muslims. Among the five commonly existing topics, (1) and (2) are primary, direct, and centric topics of gun issues, while (3) - (5) are related and indirect topics but with depth into attributes or other significant socio-political issues.

How does these sub-topics impact the opinion expressed in any comment? Based on a keyword approach (i.e. to judge whether comments touched these sub-topics based on whether a topical keyword appeared in the comment text), we conducted an exploratory analysis for the relationship between political contexts, discussion sub-topics, and partisan opinion in the comment. The results are presented in the following figure.

Binary Variables

	Positive	Negative	Positive Proportion	Negative Proportion
<i>political_context</i>	1483	1483	50%	50%
<i>clear_opinion_comment</i>	1292	1674	43.6%	56.4%
<i>mental_health_care</i>	237	2729	8.0%	92%
<i>partisan_mentions</i>	399	2567	13.5%	86.5%
<i>race_and_racism</i>	214	2752	7.2%	92.8%
<i>mass_shooting_events</i>	636	2330	21.4%	78.6%
<i>gun_rights_policy</i>	2337	629	78.8%	21.2%



As the figure shows, partisan mentioning serves as a significant mediation mechanism from political context to comment with a clear partisan opinion, which means political subreddits are more likely to include comments that attribute the gun issue to partisan contexts ($\beta = .071$, $SD = .012$, $p < .001$), and also, when the comments take this frame, they are less likely to express either anti- or pro-gun opinion ($\beta = -.123$, $SD = .026$, $p < .001$).

Another salient finding to note is that, among the five subtopics, if the comment includes the gun rights policy, it is *more* likely to contain a clear partisan opinion; however, if it contains any of the three indirect sub-topics, it is significantly *less* likely to contain a partisan opinion. That may introduce an alternative explanation of discussion depth – a comment with more discussion depth is less likely to express a clear partisan opinion. Due to purposive political discussion usually containing comments with deeper discussion than incidental political discussion, it is a mechanism worth testing in the future studies.

References

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