



# Pivotal voting: The opportunity to tip group decisions skews juries and other voting outcomes

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Many important social and policy decisions are made by small groups of people (e.g., juries, college admissions officers, or corporate boards) with the hope that a collective process will yield better and fairer decisions. In many instances, it is possible for these groups to fail to reach a decision by not garnering a minimum number of votes (e.g., hung juries). Our research finds that pivotal voters vote to avoid such decision failure—voters who can “tip” their group into a punishment decision will be more likely to do so. This effect is distinct from well-known social pressures to simply conform with others or reach unanimity. Using observational data from Louisiana court cases, we find a sharp discontinuity in juries’ voting decisions at the threshold between indecision and conviction (Study 1). In a third-party punishment paradigm, pivotal voters were more likely to vote to punish a target than nonpivotal voters, even when holding social information constant (Study 2), and adopted harsher views about the target’s deservingness of punishment (Study 3). Using vignettes, we find that pivotal voters are judged to be differentially responsible for the outcomes of their votes—those who “block” the group from reaching a punishment decision are deemed more responsible for the outcome than those who “fall in line” (Study 4). These findings provide insight into how we might improve group decision-making environments to ensure that their outcomes accurately reflect group members’ actual beliefs and not the influence of social pressures.

group decision-making | decision/indecision aversion | tipping points | social pressure

Important social and policy decisions are often determined by groups of people with the expectation that using collective decision processes will yield better and fairer decisions (1). Boards of education decide what policies and practices public school systems adopt across the country, the Federal Open Market Committee decides how interest rates and the money supply in the United States will be handled, admissions offices evaluate whether or not applicants will be admitted to their universities, and juries in court cases throughout the United States deliver verdicts that determine whether defendants will serve time in prison or walk free.

An important feature of many group decision-making processes is that, in order to arrive at a decision, a minimum number of voters must agree—a voting threshold must be crossed. One common example of a voting threshold is a simple majority (i.e., 50% + 1 vote), yet there are many other voting threshold rules as well. For example, some US congressional decisions require a two-thirds majority, and most criminal jury trials in the United States require unanimity to deliver a verdict. In instances where the voting threshold is something other than a simple majority or when an even number of voters are evenly split among two factions (i.e., a tie), it is possible for groups to fail to decide (e.g., as happens with hung juries). The current research examines how this possibility of indecision may sway individual voters toward voting for outcomes that conflict with the conclusions they would naturally reach.

In 2020, the US Supreme Court took up the issue of setting jury voting thresholds for criminal trials. Prior to 2020, most states used unanimous voting thresholds, while some used nonunanimous thresholds, as in Louisiana. The court ultimately decided to outlaw nonunanimous voting thresholds across the United States—and did so based in part on the seemingly innocuous but critical assumption that jurors vote for what they believe based on the evidence and deliberations, independent of where the voting threshold lies (2). The present research calls this view into question. We find that how group members vote is dramatically influenced by the relative proximity of the group’s current vote to the minimum number of votes needed to reach a final decision. To our knowledge, this topic has not been explored by previous research.

To understand this pattern of group behavior, imagine two juries that determine whether or not a defendant should be found guilty. Each jury consists of 12 jurors. Importantly, for each jury, there is a minimum threshold where some minimum

## Significance

Group decision-making processes have enormous impacts on the well-being and functioning of any society. Our studies shed light on a pervasive dysfunction in group decision-making that warrants examination: Group members often vote merely to help their group reach a decision. This finding applies to mundane and life-changing decisions alike, with especially severe consequences for moral decisions, like jury convictions. These findings improve our understanding of why jurors regularly vote to convict defendants despite believing in their innocence. This research provides valuable insights into how to restructure group decision-making environments to ensure that the outcomes of group decisions better reflect their members’ actual beliefs and not the ones they adopt simply to avoid indecision.

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number of jurors (e.g., 10) must agree in order to render a final verdict. If fewer than this number of jurors agree on a verdict, then the jury hangs and the fate of the defendant will depend on whether the prosecutor decides to retry the case with another jury\* and on what verdict that next jury would deliver (3).

In the first jury, suppose the vote at a given moment is 9 votes to convict (and 2 to acquit) and the minimum voting threshold is 10 votes.<sup>†</sup> Alexis has yet to vote. As she is deciding her position, she holds the pivotal vote that determines whether the jury will render a verdict at all. How will she vote? Certainly, she may feel social pressure to join the majority by voting to convict, especially if she feels a desire to affiliate with that faction. Beyond this pressure to conform, however, she may also feel a desire for her group to merely reach a decision to avoid losing the opportunity to render a verdict at all. Both pressures steer her toward voting to convict.

Now consider the second jury. In this jury, the current vote is also 9 votes to convict (and 2 to acquit), but here the minimum voting threshold is 11 votes. Brianna has yet to vote. As she is deciding her position, she does not hold a pivotal vote and thus will not determine whether the jury will render a verdict at all. How will she vote? While she, too, may feel pressure to conform with the majority by voting to convict, she will be unlikely to vote for conviction simply to render a verdict because her vote cannot push the group vote across the minimum voting threshold. That is, regardless of whether she votes “guilty” or “not guilty,” it is impossible for her to vote to pull the group out of a state of indecision (hung jury) and into a conclusive state of decision (a final verdict).

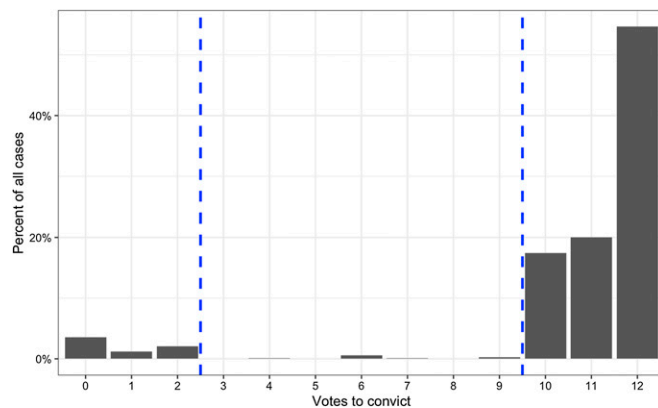
In this research, we will contrast the experiences of Alexis and Brianna and explore the psychology of being a pivotal voter.<sup>‡</sup> More specifically, we hypothesize that the opportunity for group-level decisiveness dramatically influences how pivotal voters vote, which skews group voting outcomes as a result.

In this paper, we present results from one observational dataset and three preregistered laboratory experiments. These studies provide evidence that pivotal voters are more likely to vote in favor of punishment than they otherwise would as nonpivotal voters and that they appear to adopt harsher views in order to rationalize their votes. In Study 1, we use data from Louisiana court cases ( $n = 1,960$ ) to show that juries that are subject to nonunanimous voting threshold rules disproportionately reach conviction verdicts by votes that just barely cross voting thresholds—a pattern consistent with the proposed effect and inconsistent with classic conformity pressure explanations. In Study 2a, we conceptually replicate Study 1 by conducting a laboratory experiment in which participants decide whether to punish another participant for selfish behavior in a third-party

\*In practice, the rate at which hung jury cases are retried is not well-estimated. However, Hannaford-Agor et al. (3) indicate the rate at which mistrials (due to jury deadlock) are retried with a new jury is 32%. Cases that are not retried with a new jury either resolve as plea agreements (31.8%), are dismissed (21.6%), or are retried as a bench trial (2.4%).

<sup>†</sup>Considering a snapshot is instructive even if the group does not vote sequentially in practice. For example, the snapshot could represent the forecast of votes a given voter has in mind while determining her own vote. Alternatively, in group decision settings with multiple rounds or where voters can see the votes of others and then change their minds, such a snapshot would speak to the moment between a given voter seeing the votes of others and determining her own vote.

<sup>‡</sup>A third scenario that one could consider is that of Christine. For her, the minimum voting threshold is 10 votes and the current vote is 10 votes to convict (and 1 to acquit). Again, she may feel pressure to conform and join the majority by voting to convict; however, her vote will have no impact on the final outcome because the jury will convict regardless of her vote (i.e., the threshold of 10 votes has already been reached). We find that the desire to produce a firm answer is greatly motivating—therefore, the fundamental motivations of Alexis and Brianna are different from those of Christine. We leave the psychology of holding out after the group is guaranteed to produce a firm answer to future research. The current research will sharply focus on comparing the state of indecision without the power to change it (Alexis) to the state of indecision with the power to change it (Brianna).



**Fig. 1.** The percentage of total Louisiana juries in criminal court cases from 2011 to 2016 with a given final distribution of votes to convict (vs. acquit). All juries consisted of 12 jurors. The blue dashed lines indicate the minimum voting threshold for a given outcome based on Louisiana’s deliberation laws (during this time period)—two or fewer votes to convict resulted in a not guilty verdict; three to nine votes to convict resulted in a hung jury; 10 or more votes to convict resulted in a guilty verdict.

punishment paradigm, in which we find that pivotal voters were more likely to vote to punish than nonpivotal voters. In Study 2b, we use the same paradigm to test the likelihood of voting for acquittals and here we do not find that pivotal voters behave any differently than nonpivotal voters. In Study 3, we test a potential psychological mechanism underlying the effect by examining private beliefs. Not only are pivotal voters more likely to punish the target than nonpivotal voters but we find that they also convince themselves that the targets deserve it more. In Study 4, we further probe mechanism by examining how people evaluate pivotal voters, which may offer insight into pivotal voters’ own subjective experiences. Participants read vignettes involving pivotal voters and make responsibility judgments about them. We find that pivotal voters are deemed to be more responsible for the outcome when their vote blocks the group from reaching a final verdict to convict (i.e., thus leading to a hung jury) vs. when they “tip” the group into reaching such a verdict. Together, these findings suggest that pivotal voters may be more likely to both vote for punishment outcomes and update their beliefs correspondingly, not because of how they privately interpret the evidence or circumstances but because they find it aversive to bear the responsibility of causing a “nonoutcome” for their group. An overview of our findings can be found in Table 1.

Past research in several literatures makes diverging predictions about how voters may behave in group decision-making contexts where choices can lead to inconclusive outcomes. Social forces like conformity and polarization suggest that voters will seek to align their votes with others, leading groups to either vote unanimously for a given outcome (4–6) or split into separate factions that unite around separate outcomes (7–9). Aside from social pressures, the mere potential for group indecision can also have material impacts on group decisiveness—one possibility is that the option not to decide, or to defer, could push individual group members to prevent group decisions altogether. When making especially difficult decisions (e.g., judging a defendant’s guilt), individuals can experience negative feelings associated with the stress of potentially making a regrettable choice (10–12). In group decision-making contexts, individual voters could cope with such stress by voting, when able, to maintain their group’s state of indecision. That is, a pivotal voter could prefer a hung jury outcome that defers a decision to another

**Table 1. Overview of studies and main findings**

Study	<i>n</i>	Main finding	Comparison of interest	Statistical test
1	1,960	Jury trials disproportionately end with just enough votes for a conviction.	No. of trials ending with just enough votes to convict vs. one too few	$\chi^2 = 91.18$ , <i>df</i> = 1, <i>P</i> < 0.001
2a	261	The opportunity to “tip” a group vote into punishment causes participants to vote to punish others more.	Likelihood of voting to punish by pivotal vs. nonpivotal voters	$\chi^2 = 9.20$ , <i>df</i> = 1, <i>P</i> = 0.002
2b	298	The opportunity to “tip” a group vote into acquittal does not cause participants to vote to acquit others more.	Likelihood of voting to acquit by pivotal vs. nonpivotal voters	$\chi^2 = 0.03$ , <i>df</i> = 1, <i>P</i> = 0.870
3	1,633	(1) The opportunity to “tip” a group vote into punishment causes participants to vote to punish others more across various group votes and voting thresholds; (2) These participants believe targets deserve to be punished more.	(1) Likelihood of voting to punish by pivotal vs. nonpivotal voters; (2) Deservingness judgment by pivotal vs. nonpivotal voters	(1) $\beta_{pivotal} = 0.46$ , <i>SE</i> = 0.12, <i>P</i> < 0.001 (2) $\beta_{pivotal} = 0.49$ , <i>SE</i> = 0.20, <i>P</i> = 0.016
4	505	The opportunity to “tip” a group vote into punishment causes voters to be judged as more responsible for outcomes if they vote against the group.	Responsibility attributions about pivotal voters who “tip” vs. do not “tip”	$\beta_{hung\ jury} = 0.29$ , <i>SE</i> = 0.12, <i>P</i> = 0.021

jury, rather than allow themselves to be complicit in delivering what could be an unjust verdict.

Whereas social pressure accounts predict voting distributions that collect around the point of unanimity, and indecision accounts predict distributions that collect somewhere below the minimum voting threshold, a motivation to meet a group’s goals (such as by reaching a final decision) (13–15) and avoid disagreement (16) would instead predict voting distributions that collect at the exact point where the minimum voting threshold is crossed—precisely where the minimal conditions for a conclusive outcome are met. Our research thus integrates three literatures which have conflicting predictions for group decisions where there is a possibility of decision failure: classic conformity (unanimity), deferral and avoidance of choice (decision aversion), and goal attainment (indecision aversion).

First, we acknowledge the long-standing finding that people are more likely to take actions taken by others (4–6)—the well-documented effect of classic conformity pressure. Importantly, our proposed effect goes above and beyond this pressure. Controlling for conformity pressure, we provide evidence that in group decision-making contexts, the tension between preferring to avoid or defer a decision and preferring conclusive outcomes strongly favors conclusive outcomes in punishment contexts. Further, we present evidence that suggests this behavior operates through a change in private attitudes resulting from a sense of obligation or expectations from the group, thus disentangling the normative and informational influences described by Deutsch and Gerard (17). That is, despite voters’ initial private desire for any given outcome, they are motivated to rationalize pulling their group out of a state of indecision and into a state of decision. This individual-level drive causes group voting distributions to cluster not around unanimity, nor around some point below the minimum threshold, but at the exact point at which a voting threshold for a decisive punishment is crossed.

In addition to these social mechanisms, we find some evidence of a cognitive mechanism underlying the proposed effect. The rich literature on the need for cognitive closure demonstrates that people often have a desire for knowledge or a firm answer (18). Previous research has shown that this desire to close epistemic gaps can be conceptualized both as a stable

personality trait as well as a motivational tendency that can be induced by a given decision-making context (e.g., under time pressure; refs. 19–22). In particular, past work shows that need for closure has enormous consequences for how group members interact with each other, all in an effort to receive or acquire firm knowledge from the environment (e.g., by preferring autocratic leaders and silencing dissent; ref. 23). Our research extends this literature by suggesting that group affiliation may heighten a need for closure which manifests as a need to produce a firm, decisive answer (e.g., to punish others). Taken together, we demonstrate that the effect of being a pivotal voter holds in high-stakes field settings and the laboratory for a variety of moral decisions in a punishment context. In supplemental work, we also show that the effect holds true for objective decisions with financial incentives and is moderated by the degree of affiliation among group members (*SI Appendix, Supplemental Study S2*). This work thus extends and generalizes findings from recent work on impasse aversion (16) beyond mere framing effects and negotiation contexts and provides further insight into the psychological mechanisms explaining why inherent value is placed on decision and agreement over indecision and impasse. For more details on each study see *Materials and Methods*.

Our work has major implications for jury trials and group decision-making contexts at large that use voting thresholds with the potential for indecision (e.g., non-simple-majority voting thresholds). In jury contexts, these findings suggest that many defendants who have been convicted (even by unanimous juries) may not have in fact been considered guilty by all members of the jury, for reasons beyond mere conformity. As a result, innocent people are likely being imprisoned due to the predictable and systematic influence of our proposed effect. These findings also extend beyond the criminal justice system—the possibility of indecision is fundamentally aversive for groups and their members in contexts of all kinds, especially when group members feel more connected to each other. These potential negative ramifications stand in opposition to the overwhelmingly positive literature on the benefits of affiliation among group members (24–28). In these situations, much care must be taken to structure group dynamics (e.g., by blinding votes and increasing commitment to votes once submitted) to ensure that they trend toward voting

outcomes that reflect group members' true beliefs, rather than trend toward conclusive outcomes for their own sake.

## Study 1 Results

Our first study ( $n = 1,960$ ) uses a large dataset of criminal jury trial outcomes in Louisiana, where a unique feature of their legal system (prior to 2018) allows us to tease apart the effects of thresholds from conformity pressures: Unanimity among jurors was not required to reach group decisions (i.e., verdicts).<sup>§</sup> Instead, a minimum of 10 out of 12 jurors were required to agree in order to render a conviction or acquittal; failing to reach this minimum threshold resulted in a hung jury, which meant no decision was reached and the defendant might or might not go on to be retried in another trial. When the threshold is unanimity, it is impossible to distinguish between indecision aversion and conformity pressure, which makes Louisiana prior to 2018 an ideal setting to study our proposed effect. Consistent with the effect, and in sharp contrast to a classic conformity model, Fig. 1. shows a significant discontinuity in the jury voting distribution at the exact point at which a conviction threshold is crossed (i.e., at 10 votes to convict). Indeed, fewer than 1% of Louisiana juries in our data conclude with nine votes to convict (i.e., one fewer than the minimum number of votes to convict, which represents a hung jury) while 17% conclude with 10 votes to convict (i.e., the exact minimum to convict, which avoids a hung jury outcome;  $\chi^2 = 91.18$ , degrees of freedom [df] = 1,  $P < 0.001$ ). This pattern suggests that pivotal voters disproportionately vote to tip group votes into conclusive decisions to convict. Moreover, remaining holdouts (nonpivotal minorities) often still resist unanimity pressure, resulting in decisive, but nonunanimous, outcomes. These results provide evidence against a purely classic conformity account which would predict the most votes to amass at 12 to 0 votes to convict and no votes at 10 to 2 or 11 to 1 and an indecision attraction account which would predict votes to amass between 3 to 9 and 9 to 3 (inclusive) where no verdicts are possible. On the other hand, it is not clear that such a discontinuity exists for acquittals: 2% of cases end with just enough votes for an acquittal while exactly 0% end just shy of the threshold.<sup>¶</sup> These results also suggest an asymmetry in the pivotal voter effect—the motivation to tip only has an effect when on the cusp of convicting, not acquitting. Given the nonexperimental nature of these data, however, these findings should be interpreted with caution. We cannot rule out that the observed pattern is driven by confounds that are orthogonal to our effect, such as jury composition and the strength of evidence. To resolve these potential confounds, we further investigate this pivotal voting phenomenon in three experimental studies.

## Study 2a Results

In a second study ( $n = 261$ ), we designed a test of the effect in a more controlled setting. We conducted a preregistered online experiment in which participants served as judges in a third-party punishment game. Participants were informed that they would be a part of a group with three other participants and would decide whether or not to punish another participant playing the role of the dictator in a dictator game. To render a

<sup>§</sup>In 2018, after the period we study, the people of Louisiana voted to require the unanimous agreement of jurors (12 out of 12 jurors), rather than the previous threshold of 10 of 12 jurors to convict defendants charged with felonies.

<sup>¶</sup>We believe conducting formal inference is not meaningful given the small sample size (40 cases) and presence of a zero cell, but descriptively there appears to be little evidence of a discontinuity.

decision, the group had to reach a minimum threshold of either three votes (simple majority) or four votes (unanimity). Failure to reach the threshold meant the decision would ostensibly be handed off to another group. First, all participants learned that the dictator made a selfish decision (to share \$0.20 of a \$1.00 endowment and keep \$0.80 for themselves). Then, participants entered group deliberations, where they learned that the other group members voted two to one in favor of punishing the dictator. In the four-vote-threshold condition, no group decision was possible regardless of how participants voted, thus making them a nonpivotal voter. In the three-vote-threshold condition, participants were able to cast the decisive vote (for group punishment vs. submitting “no answer”), thus making them the pivotal voter. A key benefit of this paradigm is our ability to vary whether participants were pivotal while holding the number of other group members' votes constant. This allows us to estimate the marginal impact of being a pivotal voter above and beyond classic conformity effects.

Our main dependent variable is the rate at which participants voted to punish the dictator (punish = 1, do not punish = 0). We find that being a pivotal voter led to a large difference in the probability of voting for punishment: 60.00% of pivotal voters punish, while only 40.46% of nonpivotal voters punish ( $\chi^2 = 9.20$ , df = 1,  $P = 0.002$ ). These results corroborate the findings from Study 1—the opportunity to cast a decisive vote increases one's willingness to vote with the majority faction and dole out punishment.<sup>#</sup>

## Study 2b Results

In a study nearly identical to Study 2a, we designed a separate and complementary preregistered online experiment ( $n = 298$ ) that investigated the effect of being pivotal for acquittal, as opposed to punishment. Participants were again assigned to three- and four-vote-threshold conditions, but unlike Study 2a they were faced with a two-to-one vote in favor of acquitting the dictator. This meant participants were given an opportunity to either tip their group vote into an acquittal outcome or to render no answer, causing the decision to be ostensibly handed off to another group. Contrary to Study 2a and our preregistered predictions, we find that pivotal voters are no more likely to vote to acquit: 74.21% of pivotal voters vote to acquit while 73.38% of nonpivotal voters vote to acquit ( $\chi^2 = 0.03$ , df = 1,  $P = 0.870$ ).<sup>||</sup> Together, the results of Studies 2a and 2b demonstrate an asymmetry whereby the effect of being a pivotal voter can only stand to harm targets, which threatens the integrity of institutions that rely on group decisions to dole out fair punishments.<sup>\*\*</sup>

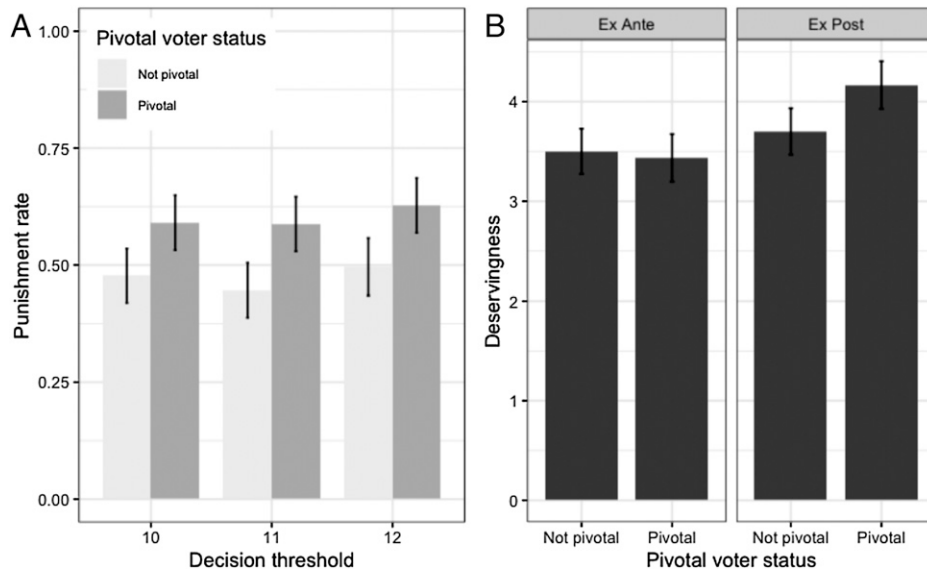
## Study 3 Results

In a preregistered third study ( $n = 1,633$ ), we tested our hypothesis using group sizes that more closely resemble actual juries and we measured judgments about targets to assess whether belief

<sup>#</sup>In *SI Appendix* we include Study S1, which provides more specific policy guidance on reducing the observed effect. We interact the two conditions from Study 2a with blinded votes. When the votes are blinded, participants know the threshold to reach a vote, but they do not know how their group mates have voted, which means they do not know how far from the threshold they are. Full results are described in *SI Appendix*.

<sup>||</sup>For the remainder of the paper, we focus on punishment outcomes specifically, given the disproportionate prevalence with which jury verdicts end in convictions, as opposed to acquittals. For example, 92.10% of trials in the Study 1 data end in conviction compared to the 6.79% that end in acquittal.

<sup>\*\*</sup>While punishment decisions are intrinsically important, we do not believe that the effect is unique to punishments. In *SI Appendix, Supplemental Study S2* we show the effect in a nonmoral domain where we find a symmetric effect of tipping between two counter-balanced options in an incentive-compatible, nonmoral group trivia game.



**Fig. 2.** The rate at which participants chose to punish a selfish dictator in a dictator game (A) and the extent to which participants believed the dictator deserved to be punished (B). Participants were assigned to one of three “decision threshold” conditions and were assigned to be pivotal voters (one vote away from the threshold) or nonpivotal voters (two votes away from the threshold). “Ex ante” and “Ex post” are relative to learning the social information (i.e., other votes). All beliefs are elicited after the details of “the case” are known. Error bars depict 95% confidence intervals.

updating may explain why pivotal voters become more likely to vote for conclusive group decisions. We used a design similar to Study 2, in which we manipulated whether participants were pivotal or nonpivotal voters, except that we also increased the group size to 12 judges, we included three voting threshold conditions, and we measured beliefs about targets’ deservingness of punishment. Participants were assigned one of three voting thresholds: Their group would require at least either 10, 11, or 12 votes for a given option in order to deliver a verdict. As in Study 2, failure to reach a verdict would ostensibly result in the final decision being deferred to another group. As in Study 2, participants were assigned to be either a pivotal voter or a nonpivotal voter. For pivotal voters, the group was always one vote away from crossing the voting threshold (e.g., in the 11-vote threshold condition, the group vote was 10 to 1 in favor of punishment), which meant voting to punish would lead to a punishment verdict and voting not to punish would lead to a decision deferral. For nonpivotal voters, the group was always two votes away from crossing the threshold (e.g., in the 11-vote threshold condition, the group vote was 9 to 2 in favor of punishment), which meant the group would defer the decision no matter how the nonpivotal voter voted. Importantly, we measured the degree to which participants believed the target deserved to be punished after learning how the target allocated the endowment, and we randomized whether participants reported this belief before or after learning how the other group members voted.<sup>††</sup> All participants reported their beliefs before casting their own vote, which prevented their reported beliefs from being influenced by postdecision justification processes. We again find that participants are more likely to vote to punish a target when they are a pivotal voter, and that this effect persists across various voting thresholds. Interestingly, we also find that pivotal voters update their beliefs about targets’ deservingness—this suggests that the social pressure

pivotal voters feel to punish can drive them to deviate from the private attitudes they hold based strictly on the evidence.

Fig. 2A shows that the rate at which participants punish the dictator differs between situations in which they are pivotal (60.15%) and those in which they are nonpivotal (47.27%). However, to conduct formal hypothesis testing, it is important to unpack the differences between pivotal and nonpivotal voters while controlling for the effect of classic conformity. Accordingly, we first conduct a logistic regression of the participant’s choice (voted to punish = 1; voted not to punish = 0) against a dummy variable for whether the participant is a pivotal voter (pivotal = 1; not pivotal = 0) and a variable containing the number of group votes assigned to punish the dictator. The parameter of interest is the coefficient on the pivotal voter dummy variable. We replicate our basic effect, finding that pivotal voters are more likely to punish the dictator than nonpivotal voters ( $\beta_{pivotal} = 0.46$ ,  $SE = 0.12$ ,  $P < 0.001$ ).

Fig. 2B shows participants’ beliefs about targets’ deservingness of punishment before and after seeing other group members’ votes. In Fig. 2B, *Left* we examine the difference in beliefs among participants who provided deservingness ratings before seeing the other members’ votes (but after learning about “the case”; *ex ante* private beliefs). The remaining participants provided their deservingness rating after seeing everyone else’s vote (and after learning about “the case”; *ex post* private beliefs).<sup>‡‡</sup> These *ex post* beliefs capture the potential influence of other votes. By design, *ex ante* beliefs were equivalent between (soon-to-be) pivotal voters (mean [ $M$ ] = 3.43,  $SD = 2.43$ ) and nonpivotal voters ( $M = 3.50$ ,  $SD = 2.37$ ),  $t(813) = 0.40$ ,  $P = 0.693$ ,  $d = -0.03$  and capture the unswayed, private beliefs that participants have about the target. By contrast, the *ex post* beliefs were not equivalent between pivotal voters ( $M = 4.17$ ,  $SD = 2.47$ ) and nonpivotal voters ( $M = 3.70$ ,  $SD = 2.40$ )—being pivotal causes participants to rate targets as more deserving of punishment,  $t(816) = -2.73$ ,  $P = 0.006$ ,  $d = 0.19$ . Moreover, the difference persists even when controlling for current votes ( $\beta_{pivotal} = 0.49$ ,  $SE = 0.20$ ,  $P = 0.016$ ) (Table 2). This result demonstrates

<sup>††</sup>Formally, the process by which real jurors initially learn the votes of others is through an initial ballot held at the beginning of deliberations, which may or may not be anonymous. However, researchers have shown that informal “predeliberations” occur where jurors share their own beliefs, learn the beliefs of others, and potentially update their own beliefs (29). Our experimental design departs from these realities and does not map perfectly onto the potentially public and dynamic nature of jury deliberations but allows us to unpack the psychology that would be present throughout the process.

<sup>‡‡</sup>Here we label *ex ante* and *ex post* relative to learning the social information (i.e., other votes). All beliefs are elicited after the details of “the case” are known.

**Table 2. Regression models showing effects of pivotal voter status and conformity on the probability of voting for punishment and beliefs about deservingness of punishment**

	Dependent variable		
	Model 1: voted to punish (logistic regression)	Model 2: <i>ex ante</i> deservingness beliefs (OLS)	Model 3: <i>ex post</i> deservingness beliefs (OLS)
Pivotal voter	0.465*** (0.118)	-0.065 (0.200)	0.487* (0.201)
Assigned votes (for punishment)	0.055 (0.062)	-0.002 (0.105)	-0.022 (0.103)
Constant	-0.599 (0.556)	3.515*** (0.950)	3.894*** (0.935)
Observations	1,633	815	818
Adjusted R <sup>2</sup>	—	-0.002	0.006

This table depicts three models. Model 1 is a logistic regression with voting to punish the target as the dependent variable. Model 2 is an OLS model with *ex ante* beliefs about the targets' deservingness of punishment as the dependent variable. Model 3 is an OLS model with *ex post* beliefs about the targets' deservingness of punishment as the dependent variable. Each model uses pivotal voter status and other group members' votes (to punish) as independent variables. *Ex post* and *ex ante* are defined relative to learning the social information (i.e., other people's votes). We find that being pivotal increases the likelihood of voting to punish. Pivotal voters also update their beliefs correspondingly—being pivotal increases the degree to which targets seem to deserve punishment. \* $P < 0.05$ , \*\*\* $P < 0.001$ .

that pivotal voters adopt harsher views toward the target. Importantly, the target's behavior is unambiguous (i.e., all participants are given the entire set of facts, that the dictator was endowed with \$1.00 and only shared \$0.20) and the number of current votes is controlled for, so this difference in beliefs cannot be readily explained by access to different factual or social information. Instead, we interpret this result as evidence that pivotal voters' attitudes incorporate the influence of others—they adopt the *ex post* belief that is congruent with their increased propensity to punish but incongruent with their independent conclusions about the facts and the (socially influenced) beliefs they would have had if not pivotal.

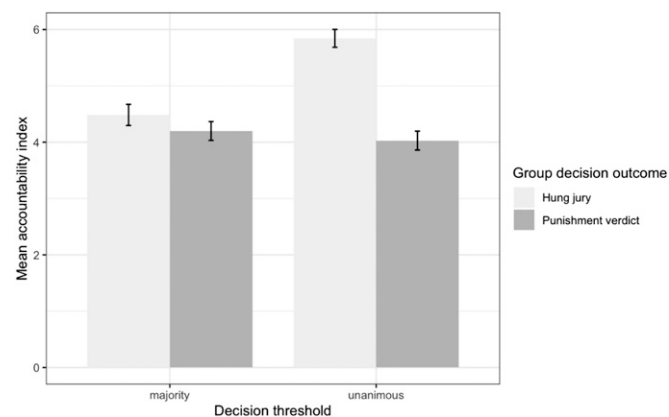
### Study 4 Results

In our final study ( $n = 505$ ), we explore attributions of pivotal voters' causality, accountability, and responsibility for group outcomes as a function of whether or not their vote blocks a group decision (e.g., leads to a hung jury) or enables one (e.g., leads to a verdict). All participants read 10 vignettes that each described a scenario in which a victim was harmed and another party carried some ambiguous amount of responsibility for causing that harm. For each vignette, participants learned that a jury with 12 members was deliberating on whether to punish the other party ("defendant") and that there was a final voter who had to decide whether to vote to punish or acquit. Participants were assigned to one of two voting threshold conditions: Either they learned that the juries had a majority-rules threshold, meaning 7 out of 12 votes were needed to convict, and that each jury's current vote was 6 to 5 to convict, or a unanimous threshold, meaning 12 out of 12 votes were needed to convict and that each jury's current vote was 11 to 0 to convict. In all situations, the final voter was pivotal. For each vignette, for each subject, we randomized the voting decision outcome: The pivotal voter either voted against the majority to acquit—thus leading to a hung jury—or voted with the majority to convict—thus leading to a final verdict to convict. We then asked participants three questions (Likert scale, 1 to 7) capturing the degree of responsibility, accountability, and causation they attributed to the pivotal voter with respect to the group's ultimate outcome. This study allows us to explore the likely subjective experience driving the normative influence and speaks to why voting against the group as a pivotal voter may be so aversive.

We average the three responses together to generate an accountability index ( $\alpha = 0.96$ ). We conduct an ordinary least squares (OLS) regression analysis with the accountability index as the dependent variable and the voting decision outcome (hung jury = 1, punishment verdict = 0) and voting threshold as independent variables (unanimous threshold = 1, majority threshold = 0). We find that with a majority-rules voting threshold, pivotal voters are considered slightly more responsible for the group outcome when they vote against the majority ( $\beta_{\text{hung jury}} = 0.29$ ,  $SE = 0.12$ ,  $P = 0.021$ ). However, when under a unanimous threshold, the effect is dramatically larger ( $\beta_{\text{hung jury} \times \text{unanimous}} = 1.53$ ,  $SE = 0.17$ ,  $P < 0.001$ ). These results, captured in Fig. 3, demonstrate how people view pivotal voters who block or enable group decisions and suggest how pivotal voters themselves may anticipate or internalize additional responsibility. This possibility suggests at least one pathway that leads pivotal voters to avoid indecision.

### Discussion

Groups are responsible for making many of society's most important decisions; despite this reality, past research has shown that group decision-making can suffer from many process failures. We find evidence for yet another process failure for groups with complex decision rules: The mere opportunity to make conclusive group decisions dramatically influences



**Fig. 3.** Participants' responsibility judgments of pivotal voters whose choices led to a hung jury or a punishment verdict. The pivotal voter was either a member of a majority-rules jury or a unanimous-threshold jury. Error bars depict 95% confidence intervals.

pivotal voters and ultimately skews group voting outcomes. Our findings provide insights into this process failure—rather than accept their group’s failure to reach a decision, pivotal group members opt simply to reach a conclusive outcome. This is especially concerning because one could argue that votes ought to align with the beliefs the voters would hold if they were not pivotal.

Jury trials help to illustrate the adverse real-world consequences of these findings. In a recent Supreme Court case, it was argued that the 735 (37%) defendants convicted by nonunanimous juries in Louisiana between 2011 and 2016 would have received hung juries had the threshold merely been set to unanimity. Our studies, by contrast, suggest that moving the threshold would have been less effective than the Supreme Court suggests because jurors would continue to be motivated to reach a conclusive group decision to convict (vs. becoming a hung jury), leading the group voting distribution to adjust to meet the minimum voting threshold for conviction regardless of where that threshold is set. We posit that changing the jury threshold, which occurred as a result of this Supreme Court case, was neither necessary nor sufficient—rather, other remedies must be called for to reduce unconstitutional convictions.

Our research suggests that groups of all kinds may be subject to a fundamental psychological aversion that causes them to prefer mere decisiveness over adhering to their own beliefs about the matter at hand. In the real world, there are institutional and personal influences that compound or exacerbate the tendency to vote against one’s true beliefs. For example, courts frequently levy *dynamite charges*, whereby judges regularly encourage deadlocked jurors to work harder to reach a decision (30). In addition, more basic private preferences to “just be done with it” may lead to false consensus if voters are not adequately motivated to deliberate. In our laboratory studies, we isolate our proposed effect from institutional influences (by omitting them) and personal influences (via randomization) but expect that these elements merely amplify our effect in the real world.

With this in mind, we underscore the need for care in designing choice architectures and avoiding “sludge” (31) that exacerbates psychological biases such as conformity pressures and the effect of being a pivotal voter. An open question is what interventions might effectively mute this effect across the many settings in which groups make impactful decisions. We believe that the strong moderating effect of the asymmetry in responsibility judgments along with that of interpersonal affiliation seem to provide fruitful directions.

Our findings raise a number of other interesting questions for future research. First, does this finding extend to larger groups, such as the US Congress and the United Nations? Groups like these are often tasked with even more consequential decisions, so the heightened stakes may make indecision more aversive. However, larger groups may also be subject to other pressures and types of expertise that crowd out the effect (e.g., party loyalty in political decisions). Second, future research should determine whether the assigned location of the threshold itself may signal different degrees of the decision’s importance to group members. For example, voters may infer that a decision that requires a simple majority is less consequential than one that requires unanimity. Third, what explains the reason we find this effect in contexts as varied as punishment decisions and nonmoral, incentive-compatible trivia games, but not acquittals? One potential answer is that punishing and submitting trivia answers are acts of commission, whereas acquitting—neglecting to punish someone—is an act of omission; previous research has documented asymmetries between the two types of acts (32). Finally, we suspect that individual differences

vary the magnitude of the effect. We encourage future research to explore the extent to which gender, culture, personality traits, and group composition moderate the findings.

The list of barriers to effective collaboration is ever-expanding. Although there are many benefits to group decision-making, the drawbacks should not be ignored. Our research demonstrates the influence of voting thresholds on pivotal voters and group outcomes and provides a warning signal for how to encourage group members to vote for what they truly believe: Design choice environments that commit members more to their beliefs than to crossing thresholds.

## Materials and Methods

This research was approved by the University of Chicago Institutional Review Board (IRB 19-1060). All participants provided informed consent.

**Study 1.** In order to investigate the ramifications of Louisiana’s nonunanimous voting rules, *The Advocate*, Louisiana’s largest daily newspaper, collected data from 75% of all jury trials in the state between 2011 and 2016. This extensive effort was part of a thorough journalistic investigation into the causes and consequences of this unique system. The publication has made this dataset publicly available (34).

*The Advocate* notes, “Of the cases in the data set, it was possible to determine whether verdicts were unanimous on 993 convictions out of the 2,027 cases that ended with at least one guilty verdict from a jury. Those cases cover half of the state’s 64 parishes, though they are heavily weighted toward the large parishes of Orleans, Jefferson, St. Tammany, East Baton Rouge and Caddo. Collectively, those parishes are responsible for about 68 percent of the convictions in the state and roughly 69 percent of the data on jury unanimity in the data set.”

In our analysis, we first limit the sample to those 3,794 charges with 12-person juries (70.3% of the dataset) to exclude charges with unconventional jury sizes. We then further subset the data to only include jury outcomes for which *The Advocate* was able to collect information about individual jurors’ votes. Out of 3,794 outcomes, 1,960 (51.7%) had data on the votes of each juror, yielding 1,960 jury outcomes across 1,044 trials. A wide variety of charges are represented in the resulting data, but the three most common charges demonstrate the gravity of the charges considered: second-degree murder (20%), armed robbery (8%), and firearm possession (7%). Based on discussions with staff from *The Advocate*, we do not believe the jury outcomes are correlated with the probability of appearing in the sample, which would introduce significant sampling bias. However, we are not able to directly observe or test this belief.

**Study 2a.** This study used a two-condition (voting threshold: majority rule vs. unanimity rule) between-subjects design to test whether participants would be more likely to vote to punish a third party if they held the decisive vote.

**Participants and Procedure.** We initially set out to recruit 300 participants from a community population for a preregistered virtual laboratory study in return for \$1.40 ( $M_{\text{age}} = 27.6$ ;  $SD_{\text{age}} = 11.24$ ; 70% female; all data and materials are available on OSF ([https://osf.io/23whv/?view\\_only=da8fe2a904724447be124c432f2f3fb1](https://osf.io/23whv/?view_only=da8fe2a904724447be124c432f2f3fb1))). Due to COVID-19-related complications, we were only able to recruit 261 participants. Participants learned they would be one of four judges who would decide, as a group, whether or not to punish another participant playing the role of the dictator in an economic dictator game (35) with yet another participant. The dictator had been granted an endowment of \$1.00 and made a selfish decision to allocate \$0.80 to themselves.

Participants were randomly assigned to one of two voting threshold treatments: Either three votes (majority) or four votes (unanimity) were necessary to reach a group decision. Participants learned that a failure to reach a group decision meant the final decision would be left to a different group of judges. Participants read that a group decision to punish resulted in a deduction of \$0.19 from the dictator’s bonus and that a decision to not punish would allow the dictator to keep the full \$0.80. Participants completed three comprehension checks and one attention check to ensure they understood the rules of voting and punishment and that they were paying attention.

Participants next observed the ostensible results of the dictator game. They learned that two other judges had voted to punish and one judge had voted not

to punish. Participants then made their ruling: "Do not punish" vs. "Punish by subtracting 19 cents." As they made this decision, participants could see how the other group members voted and what the final group decision would be depending on how they cast their own vote—in the three-vote-threshold condition, voting to punish resulted in punishment while voting not to punish resulted in decision deferral; in the four-vote-threshold condition, voting always led to deferral. The answer choices, presentation of group votes, and indication of what final group decisions would be reached if the participant chose a given answer were yoked and presented in counterbalanced order. After making their decisions, participants reported their subjective experiences of the ease of making their decision, the perceived influence of the other group members, and their own satisfaction with the final group decision. Participants also reported the perceived gender of the dictator. These results are discussed in *SI Appendix*.

**Study 2b.** This study used a two-condition (voting threshold: majority rule vs. unanimity rule) between-subjects design to test whether participants would be more likely to vote to acquit a third party if they held the decisive vote.

**Participants and Procedure.** We requested 300 participants through Prolific Academic for a preregistered online study in return for \$1.15. This process returned 298 participants ( $M_{\text{age}} = 34.01$ ;  $SD_{\text{age}} = 12.69$ ; 60.74% female).

This study was designed to be identical to Study 2a, except that participants learned that two of the other judges had voted not to punish and one judge had voted to punish (unlike Study 2a, where one judge voted not to punish and two judges voted to punish). As in Study 2a, participants could see how the other group members voted and what the final group decision would be depending on how they cast their own vote. However, given this voting distribution, participants in the three-vote-threshold condition saw that voting not to punish resulted in an acquittal outcome while voting to punish resulted in decision deferral, and participants in the four-vote-threshold condition saw that voting always led to deferral. Results of subjective experience measures and perceived gender of the dictator are discussed in *SI Appendix*.

**Study 3.** This study used a 2 (pivotal voter status, between subjects: pivotal vs. not pivotal)  $\times$  3 (voting threshold, between subjects: 10 vs. 11 vs. 12 votes)  $\times$  2 (belief elicitation, between subjects: before vs. after) design to both test whether pivotal voters update their private beliefs as they become more likely to vote for decisive outcomes, and whether the effect persists across different voting thresholds.

**Participants and Procedure.** We requested 1,600 "Cloud Approved" participants through Cloud Research, for a preregistered online study in return for \$1.00. This process returned 1,633 participants ( $M_{\text{age}} = 41.00$ ;  $SD_{\text{age}} = 13.03$ ; 55.36% female).

Participants completed procedures that were similar to Study 2; however, we also increased the size of the group to 12 judges, included additional voting threshold conditions, and measured participants' beliefs about the target's deservingness of punishment. Participants were randomly assigned to one of three voting threshold conditions: At least 10 votes, 11 votes, or 12 votes were required for the group to deliver a verdict. As in Study 2, participants learned that failing to reach a verdict meant the decision would be left to another group. Importantly, participants were assigned to one of two pivotality conditions: Either they were a pivotal or nonpivotal voter. For pivotal voters, their group's current vote (before casting their own individual vote) was always one vote away from crossing their minimum voting threshold for a punishment verdict (i.e., in the 10-vote threshold condition, the group vote was 9 to 2 in favor of punishment, in the 11-vote condition it was 10 to 1, and in the 12-vote condition it was 11 to 0). For nonpivotal voters, their group's current vote was always two votes away from crossing the threshold for a punishment verdict (i.e., in the 10-vote threshold condition, the group vote was 8 to 3 in favor of punishment, in the 11-vote condition it was 9 to 2, and in the 12-vote condition it was 10 to 1). By varying both the number of current votes and the minimum voting threshold, we are able to directly compare pivotal and nonpivotal voters' likelihood of voting to punish while holding the absolute number of group votes constant. To ensure participants understood the rules of the task, they answered an attention check and two comprehension checks—one about the rules of the dictator game and one about which group outcome would occur for each possible voting distribution, given the participant's assigned voting threshold. All participants were required to complete this latter check correctly to proceed.

We measured participants' beliefs about the degree to which the target deserved punishment and randomly assigned whether participants reported these beliefs before or after learning about how their group members voted. Participants were asked, "To what extent do you believe Player 1 deserves to be punished (by subtracting 19 cents from his/her bonus)?" (1 = Player 1 does not deserve to be punished, 7 = Player 1 deserves to be punished). Participants either answered this question immediately after learning how the dictator allocated the endowment and before learning how the rest of their group voted, or they answered it after finding out both how the dictator allocated the endowment and how their group voted. The answer choices, presentation order of group votes, and indication of what final group decisions would be reached if the participant chose a given answer were presented in counterbalanced order.

**Study 4.** This study used a 2 (voting decision outcome, within subjects: punish vs. hung jury)  $\times$  2 (voting threshold, between subjects: majority vs. unanimity)  $\times$  10 (vignette, within subjects: 10 unique scenarios) design to test whether participants judge pivotal voters as differently responsible for conclusive and inconclusive jury outcomes.

**Participants and Procedure.** We requested 570 participants on Amazon's Mechanical Turk, for a preregistered online study in return for \$1.20. We sought a final sample of 400 participants and expected 30% of participants to fail our comprehension and attention checks. This process returned 576 participants, 14.1% of whom failed these checks, thus yielding a final sample of 505 participants ( $M_{\text{age}} = 41.67$ ;  $SD_{\text{age}} = 13.17$ ; 56.24% female).

Participants read 10 scenarios in which harm was done to someone and a jury with 12 members was deciding whether or not to punish a defendant involved in the event (these scenarios were drawn from Multistate Bar Examination preparation materials). For example, one scenario involves a jury deciding whether to send a doctor to jail for 1 y for negligence because, while dining at a restaurant, he did not help a person who was choking and subsequently suffered severe and preventable brain damage. Moreover, they learned that a minimum number of votes would be required for each jury to render a verdict (of whether or not to punish) and that failing to reach this minimum voting threshold would result in a hung jury—meaning that the verdict would be left to an entirely different jury.

We randomly assigned participants to one of two between-subjects voting threshold conditions: majority or unanimity. In the majority condition, all juries in a given participant's scenarios would need at least 7 out of 12 jurors to agree in order to render a verdict. In the unanimity condition, all juries would instead need 12 out of 12 jurors to agree in order to render a verdict.

Participants read about a focal juror in each scenario who held the pivotal vote—meaning this juror held the deciding vote between either punishing the defendant or having the jury hang. The focal juror was always the last of the 12 jurors to vote on a jury that was one vote away from reaching a verdict. In the majority condition, the current vote (prior to the pivotal juror casting their own vote) was always 6 votes to punish vs. 5 votes not to punish; in the unanimity condition, the current vote was always 11 votes to punish vs. 0 votes not to punish.

For each of the 10 scenarios, we randomized (within subjects) the voting decision outcome by having the pivotal juror either vote to punish—resulting in a punishment verdict—or vote not to punish—resulting in a hung jury. To confirm that participants understood the task and were paying attention they completed an attention check and a comprehension check. We also randomized the order in which the scenarios were presented and also randomized the names of the pivotal jurors from a pool of the 50 most common male and female names in the United States over the last 100 y, according to the Social Security Administration.

Our dependent variable of interest was participants' judgment of pivotal jurors' responsibility for the voting decision outcome. For each scenario, we collected three 'responsibility' measures (in randomized order), asking participants about the extent to which participants felt the pivotal juror was responsible for the group outcome (1 = not responsible at all, 7 = completely responsible), accountable for the group outcome (1 = not accountable at all, 7 = completely accountable), and causal for the group outcome (1 = did not cause it at all, 7 = completely caused it). Finally, participants reported demographic information and whether or not they experienced technical issues.



**Data Availability.** Anonymized surveys and datasets have been deposited in OSF ([https://osf.io/23whv/?view\\_only=da8fe2a904724447be124c432f2f3fb1](https://osf.io/23whv/?view_only=da8fe2a904724447be124c432f2f3fb1)) (33). Previously published data were used for this work (34).

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