THE EFFECT OF ORGANIZATIONAL AGGREGATION STRUCTURES ON INDIVIDUALS' VOTING BEHAVIOR: AN EXPERIMENTAL INVESTIGATION

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ABSTRACT

A key question in scholarship on organizational design asks: How do organizations form decisions? More often than not, it is not a unitary actor but a committee composed of multiple decision makers that is making the calls. To aggregate potentially conflicting individual judgments, organizational committees frequently rely on voting, and in doing so, may adopt different thresholds required to greenlight an initiative. Results from two experiments reveal that voting thresholds have a non-intuitive effect on individual voting behavior, with more liberal voting rules resulting in more conservative votes. This effect is further amplified when actors perceive that they possess inferior information for making a decision compared to their peers. We contribute to research on organizational aggregation by highlighting the dual function of voting rules as they combine votes but also shape voting behavior. We demonstrate that these two functions are diametrically opposed to one another: a smaller voting threshold lowers the bar for a project to be greenlit at the organizational level, but it also reduces individual agents' tendency to vote in favor of an investment. The combination of both effects explains why the organizational adoption of a new voting threshold may not yield the intended effect.

INTRODUCTION

When the venture capital firm Draper Fisher Jurvetson (DFJ) made the strategic decision to grow their portfolio and invest in more ventures, they implemented a new rule by which only a single committee member voting in favor of investing in a venture would trigger the go-ahead (Liu et al. 2017). Through this organizational design change, DFJ hoped to resolve the problem that they had previously faced—namely, that they missed out on investing in many eventually successful ventures. DJF believed that the origin of their under-investment problem was that they required too high an internal consensus in order to invest. The adoption of a lower threshold was intended to fix this problem and substantially increase the number of investments.

In this paper, we examine the consequences of alternative thresholds when aggregating votes into an organizational decision. Ceteris paribus, a lower threshold should result in a greater number of investments by the organization, simply because it reduces the number of required yes votes (Christensen and Knudsen 2010; Csaszar 2013; Knudsen and Levinthal 2007; Sah and Stiglitz 1986). However, we suggest that the adoption of a lower threshold may have an overlooked but important side effect: it may lead individual members of the organization[1] to change their voting behavior. Specifically, we suggest that a lower voting threshold will reduce members' willingness to cast a yes vote in favor of an investment, which may ultimately keep the organization's number of investments from rising. In other words, more liberal organizational aggregation rules may be counteracted by more conservative individual voting—with the result that these two countervailing forces may (in part) cancel each other out. We expect this pattern to occur when individuals are aware of the aggregation rule ex ante and when they are incentivized to achieve the best outcomes for their group—scope conditions that resemble much strategic decision-making in organizations.

[1] In this paper, we use the terms "organizational members," "committee members," "decision makers," "actors," and "agents" interchangeably to refer to the individuals participating in the organizational vote.

Understanding the effect of organizational design choices such as voting thresholds is of critical concern to the fields of organization theory and strategy alike. A key challenge that virtually all organizations face concerns how much of their resources to allocate to uncertain investments (Christensen et al. 2017; Criscuolo et al. 2017; Fenger et al. 2019; Hallen 2008; Keum and See 2017). Top managers devote significant time and effort to select those alternatives that will help the organization succeed while staying away from those that are likely to fail, thus avoiding under- and overinvestment (Csaszar 2013). However, because eventual success is typically difficult to predict at the time of selecting investments, managers have to deal with significant uncertainty and often need to go beyond the information given to them in order to infer what is missing and attend to even subtle cues regarding investment quality that may exist in their immediate environment (Phadnis et al. 2015). In this paper, we investigate how organizational design, and specifically the voting threshold employed in committee decisions, affect the degree to which organizational members support investments in uncertain alternatives.

Our study builds on and extends the literature on aggregation structures in organizations. Beginning with the seminal work by Sah and Stiglitz (1986), a rich body of research has examined how different ways of designing thresholds shape organizations' decisions (Christensen and Knudsen 2010; Csaszar 2013; Csaszar and Eggers 2013; Knudsen and Levinthal 2007). The majority of this work has developed formal models in which individual voting behavior is assumed to be exogenous. In our study, we relax this assumption and offer a theory that focuses on how thresholds can substantially affect individual voting behavior. Specifically, we develop and test the argument that information aggregation structures go far beyond their mere calculus (transforming individual votes into an organizational decision) in that they shape the very votes they use as inputs.

To test our theory empirically, we build on and extend an emerging body of research that deploys experiments to study organizational design (Csaszar and Laureiro-Martínez 2018; Keum and See 2017). In our experimental task, participants assume the role of partners in a venture capital firm voting on whether to invest in certain startups. While participants vote autonomously, their votes will then be aggregated into an organizational decision, which allows us to manipulate the voting threshold. Beyond examining the main

effect of this manipulation on voting behavior, we also study how voting thresholds interact with participants' level of information about the startups, which enables us to identify a key mechanism underlying the observed effect.

Theoretically, we contribute to research on organizational aggregation by elaborating the dual function of thresholds as they not only aggregate but also shape voting behavior. We illustrate that these two functions are in direct opposition: a lower threshold reduces the bar for a project to be greenlit at the organizational level, but it also reduces individuals' tendency to vote in favor of an investment. Correspondingly, a higher threshold increases the bar for a project to be greenlit at the organizational level, but it also increases individuals' tendency to vote in favor of an investment. As a result, changing the organizational voting threshold may not yield the intended effect, because individuals adjust their behavior to the voting regime. Our theory emphasizes that neither decision-making structures nor individual voting behavior can be studied in isolation, as they are deeply intertwined. It is thus critical to account for the macro-to-micro implications of organizational structures in order to capture their true effects (Gavetti et al. 2007; Greve 2013; Keum and See 2017; Raveendran 2020).

On a broader level, our study contributes to the microfoundations movement in strategy and organizational theory (Barney and Felin 2013; Haack et al. 2020). In both fields, calls abound for greater attention to the role of individuals in organizational decision making (Felin et al. 2015; Powell et al. 2011). However, although Barney and Felin (2013) insist that studying "aggregation is the *sine qua non* of microfoundations" (p. 145), the dynamics of emergence—that is, the processes involved in transforming individual choices to organizational actions—have so far been largely neglected empirically or treated in an oversimplified fashion (Kozlowski et al. 2013), and "researchers' scaling assumptions can and should be made explicit" (Powell et al. 2011, p. 1374). Doing so can substantially improve scholarly understanding of what it means for "organizations to act" (King et al. 2010). Our study addresses this question by shedding new light on how structures and individuals interact as organizational decisions come into being.

We also make an empirical contribution. While most of the research on organizational aggregation has deployed modeling approaches, formal models can only go so far (Knudsen et al. 2019; Mason and

Watts 2012), and making the move to experimental methods allows us to study the behavioral assumptions underlying such models (Puranam et al. 2015; Raveendran et al. 2016; Reypens and Levine 2018). Gathering experimental evidence on behavioral ramifications is crucial, as voting rules do not alter the mechanics of aggregation in a vacuum but also what is being aggregated. In this way, we endeavor to expand on the emerging body of experimental work in organizational design (e.g., Csaszar and Laureiro-Martínez 2018; Keum and See 2017; Mak et al. 2019; Reitzig and Maciejovsky 2015) in order to elucidate the cross-level effects of organizational structure that are difficult to isolate in archival work (Csaszar 2012; Puranam 2018).

THEORETICAL BACKGROUND

Organizational Aggregation

This study follows a microstructural approach to organizational design, which places aggregation structures linking the individual and the organizational level at center stage (Puranam 2018). This emphasis explicitly acknowledges that organizational decisions are regularly not made by unitary actors but rather emerge from multiple agents whose individual judgments jointly inform organizational action (Dobrajska et al. 2014; Mack and Szulanski 2017). Rich empirical evidence illustrates how organizations rely on multiple agents who make decisions without resorting to authority as the primary coordination mechanism. Such decision making among equals is particularly widespread in top management teams (Eisenhardt 1989), boards (Garg 2013; Garg and Eisenhardt 2017; Stern and Westphal 2010), board of directors (Forbes and Milliken 1999), steering committees (Loch et al. 2017), investment committees (Csaszar 2012), and panels (Criscuolo et al. 2017).

The question of how to organize in the absence of authority while integrating individual agents' choices has endured as one of the most fundamental and pressing issues in organizational design (Arrow 1974; Puranam 2014). Organizational structures based on voting to make a decision at the organizational level represent one key approach to addressing this issue (Csaszar 2012; Sah and Stiglitz 1986). Indeed, it has become increasingly common that decisions involving multiple individuals take place via voting (Csaszar and Enrione 2015; Mack and Szulanski 2017; Whittington et al. 2011). In elections, organizational

members may choose whether or not the organization should accept a particular alternative, in an effort to separate the good from the bad alternatives (Christensen and Knudsen 2009). Voting is often seen as the natural way of aggregating individual choices to the organizational level (Turco 2016), particularly in the case of strategic decisions[2] that tend to be high-stakes, complex, and nonroutine. The types of strategic decisions on which organizational agents regularly vote range from firms narrowing down innovation ideas to pursue (Keum and See 2017; Reitzig and Maciejovsky 2015) to mutual funds choosing stocks in which to invest (Csaszar 2012) to venture capitalists picking ventures to support (Liu et al. 2017).

Voting has several desirable features that may explain its popularity in the context of organizational decision making. Most notably, it is a mechanism that allows for tapping into the knowledge of several individuals. The knowledge held by multiple organizational members tends to be more diverse and more comprehensive than knowledge held by a single individual. As a result, organizations that pool the knowledge of many members have the potential to engage in more effective organizational decision making (Surowiecki 2004). Moreover, aggregating the beliefs of multiple individuals via voting offers the opportunity to cope with biases to which individuals are subject (Liu et al. 2017). The aggregation of multiple opinions means that each individual (and, by extension, each individual's bias) receives less weight and that individual biases may cancel each other out when aggregated.[3]

For these reasons, it is not surprising that many organizations rely on voting; however, there is considerable variety in how organizations aggregate individual votes. Formal modeling research, going back to the seminal study by Sah and Stiglitz (1986), has started to examine the implications of various kinds of aggregation structures (Christensen and Knudsen 2009; Christensen and Knudsen 2010; Csaszar 2013; Csaszar and Eggers 2013; Knudsen and Levinthal 2007). A key concern in this literature is how alternative voting thresholds affect organizational decisions. Specifically, research has focused on the

[2] We follow Phadnis et al. (2015) in defining strategic decisions as those that deal "with the long-term allocation of existing resources and the development of new ones essential to assure the continued health and future growth of the enterprise" (Chandler 1962, p. 383).

[3] This latter argument of course rests on the assumption that beliefs of individuals form independently and are not subject to some systematic bias (Becker et al. 2019).

linkage between the magnitude of the voting threshold and the likelihood that an organization pursues a particular course of action.

These formal models have more recently been complemented by empirical studies investigating the kinds of aggregation structures that organizations deploy and how these structures shape organizational decisions (Keum and See 2017; Reitzig and Maciejovsky 2015; Reitzig and Sorenson 2013). In a large-scale archival study of investment funds, Csaszar (2012) shows that organizations in this field vary considerably in the way they aggregate votes, and these variations translate into substantial differences in these organizations' investment decisions. Moreover, it appears that firms are aware of the importance of voting thresholds and deliberately deploy them as a design lever for strategy implementation. Going back to the case of the venture capital firm DFJ mentioned earlier, an important way in which their organizational design differs from that of other firms is that "DFJ invests in a startup as long as at least one [individual] partner feels very strongly about the idea and avoids unanimity in investment decisions" (Liu et al. 2017, p. 150). DFJ's clearly stated goal in adopting this aggregation structure was to grant each individual more influence, avoid consensus-driven decision-making, and ultimately encourage a greater number of investments. Similarly, Csaszar (2012) identifies several cases in which investment funds purposefully change the way in which they aggregate votes.

A key insight from much of the extant literature is that the lower the voting threshold, the greater the number of investments. However, what has not been considered by this literature is that individual agents may adjust their voting behavior to the threshold being employed. While Sah and Stiglitz (1986) suggest that the deployed structure may influence individuals' voting behavior, this claim has to the best of our knowledge yet to be elaborated theoretically and examined empirically. What is thus needed is a behavioral account of how aggregation structures not only create an analytic framework for calculating joint decisions but also influence individual decision makers anticipating the application of this framework. Because individual behavior is rarely exogeneous to organizational structure (Coleman 1990; Gavetti et al. 2007), cross-level accounts can add both greater precision and much-needed insight into theoretical mechanisms of organizational design choices; however, more often than not, they also require drawing

from literatures outside one's home discipline (Rousseau 1985). In order to develop a theory on the effect of organizational aggregation structures on individuals' voting behavior, we turn to relevant insights from political science and behavioral economics; specifically, we turn to the stream of research employing the Condorcet jury model.

Condorcet Jury Model

In its original formulation, the Condorcet (1785) theorem refers to juries in criminal and civil trials voting over the innocence or guilt of a defendant; however, the framework can be readily generalized to collective decision-making under uncertainty more broadly (Guarnaschelli et al. 2000) and organizational decision-making specifically (Csaszar 2018). The general model features a committee of size $n > 1$ that is deciding on a binary policy. The policy is determined by an election, in which each committee member can cast either a yes or a no vote, after which the individual votes are aggregated into a group decision according to some voting rule (Ali et al. 2008). In this model, one can compare voting behavior under alternative voting rules, consistent with our interest in the effect of different forms of organizational aggregation on strategic decision-making.

Both the Condorcet model and the current investigation assume general objective utility to the group decision and individuals all having the same ultimate preferences (Austen-Smith and Banks 1996; Guarnaschelli et al. 2000). For instance, when a committee of strategic decision makers decides whether or not to invest in an uncertain project, it is assumed that all committee members will seek the decision that will maximize organizational performance (i.e., greenlight the promising projects and avoid the lemons). However, under conditions of uncertainty regarding the true quality of the projects, disagreements among individual committee members' judgments as to which investment will yield high performance lead to differences in their votes. These differences create an information aggregation problem, making it harder for the group to reach a consensus on the "right" conclusion and producing the need for formalized voting regimes (Guarnaschelli et al. 2000). The presence of such disagreements underscores the crucial importance of voting thresholds, as they determine the minimum degree of consensus that is required.

Strategic Voting

Until relatively recently, the literature employing the Condorcet jury model has assumed that actors engage in "naïve voting" (cf. Feddersen and Pesendorfer 2014). Naïve voters simply vote "sincerely" based on their individual judgement of the investment alternative. Naïve voting thus implies that there will be no difference between individuals' private judgment of a project and their vote on it. As a result, organizational design—and more specifically, how votes are aggregated—will have no effect on naïve voters.

Recent work, however, has shown that voters regularly do not behave this way and instead engage in "strategic voting" (Austen-Smith and Banks 1996; Feddersen and Pesendorfer 1996). That is, the way people vote in a multi-person committee is often not the same as the way they would vote on their own. The involvement of other members can drastically affect how individuals vote. We focus on how individuals' voting behavior depends to a significant extent on the type of voting rule that is being employed. This is the central idea that underlies our hypotheses.

HYPOTHESES

Voting Thresholds and Behavior

In this paper, we argue that strategic voting is a function of the aggregation structure's voting thresholds. To develop this argument, let us compare voting considerations under regimes with thresholds of one vs. two yes votes and a committee size of five. If one vote is sufficient for a project to be greenlit, a focal actor's yes vote can by itself cause a go-ahead, even if all four other committee members voted no on the project. In this scenario, the focal actor will be solely responsible for the organizational decision even though it goes directly against everybody else's vote. In contrast, if a threshold of two is employed, the focal actor's yes vote determines the outcome only in the event that another committee member also voted in favor of the project; here, the focal actor's yes vote only makes a difference in case another individual also votes yes.

We argue that strategic voters will put themselves into the particular scenario in which their vote is the pivotal one, since otherwise their vote does not matter and their behavior is inconsequential (Austen-Smith and Banks 1996; Austen-Smith and Feddersen 2009). Going one step further, voters will infer project

quality from the type of votes of other committee members that are necessary for the pivotal scenario to materialize.[4] In other words, people will condition their vote not only on the private information they have about project quality but also on the information that others must possess in the event that their own vote turns out to be the pivotal one. Therefore, a key mechanism determining voting behavior relates to the other actors' private information about project quality that can be inferred from the particular situation of casting the pivotal vote.

Under the two-vote-threshold regime, people will thus make the assumption that one other committee member voted yes. However, if another committee member favored the project, the focal actor will infer that this other member's private information suggested the project is indeed worthwhile. For instance, one might assume that the other actor has special expertise and/or additional information that led him/her to evaluate the project favorably. In contrast, nothing points to others' information supporting the project in the pivotal-vote scenario of the one-vote-threshold regime. In this scenario, an individual's vote is pivotal only in the event that no other members voted in favor of the project. As a result, the focal actor may infer that others base their no-votes on certain pieces of information that he or she lacks and that point to the project being of poor quality. This logic suggests that the lower the voting rule's threshold is, the less likely actors will be to cast a yes vote. With an increasing threshold, however, inferences about the other actors' information may cause actors to support the focal project.

In sum, we expect actors' tendency to cast a yes vote to be lower under lower (rather than higher) thresholds in aggregation rules. In contrast, higher thresholds will encourage actors to support uncertain projects. Our argument may thus be captured by the following ceteris paribus hypothesis:

[4] The rationale underlying the inferred-information mechanism proposed here is consistent with that of the winner's curse in common-value auctions, which suggests that bidders will condition their offer not only on their private information but also on what they infer about the quality of the auctioned item if theirs is the high bid (Feddersen and Pesendorfer 1996).

H1: Actors are more likely to support uncertain projects when the aggregation structure's voting threshold is high (rather than low).

Asymmetric information

Beyond this proposed main effect, our study also aims to establish an important boundary condition with the potential to "turn off" the influence of thresholds on strategic voting.[5] Expanding our above theorizing regarding the role of private information on product quality, we develop the argument that actors' *level of information* will interact with the aggregation structure's threshold. Accounting for differences in the level of information reflects the fact that committee members are usually not equally well-informed about the project on which they are voting. Better-informed actors may have more experience or education pertinent to the project, or they may have invested more time and effort in doing their research and preparing for the committee vote. Other actors may be poorly informed, lacking relevant expertise and/or background information.

Building on theory about asymmetric information in group decisions (Battaglini et al. 2010; Feddersen and Pesendorfer 1996; Piketty 1999), we argue that people will have a particularly strong motivation to avoid casting the pivotal vote when they are poorly informed. Under these circumstances, actors will rather leave the decision to the more informed committee members, so as to avoid contradicting the better-informed actors' choice and possibly pushing the group decision in the wrong direction. Poorly informed actors effectively strive to delegate the decision to the better-informed ones so as not to interfere with the efficient information aggregation performed by actors with higher-quality information. In simplified terms, they are particularly prone to free-ride on the effort to scrutinize. If this is true, the threshold-level effect proposed in our first hypothesis should be especially pronounced for actors with low levels of information, as these actors are particularly attuned to voting strategically so as to avoid being the one to cast the pivotal vote. On the other hand, we expect the proposed threshold-level effect to be

[5] This approach follows a mediation-by-moderation logic, in which inferences about a theoretical process are made by analyzing a condition under which this process is interrupted (Jacoby and Sassenberg 2011; Spencer et al. 2005).

significantly diminished when an actor is well-informed. High levels of information should increase the decision maker's confidence to vote sincerely (i.e., consistent with their personal judgment of project quality) and to deprioritize strategic concerns. Hence:

> *H2: When actors' level of information is high (rather than low), the effect of the aggregation structure's threshold on actors' voting behavior is attenuated. In other words, there will be a negative interaction between actors' level of information and the aggregation structure's threshold in predicting actors' support of uncertain projects.*

METHODS

Study Overview

We conducted two experimental studies to test our hypotheses. In addition to their well-known ability to pinpoint causality and disentangle micro-level mechanisms (e.g., Agarwal et al. 2010; Levine et al. 2017), experiments are particularly useful for research on information aggregation because of the sensitivity of results to exact voting parameters and because of the lack of relevant archival datasets (Ali et al. 2008, pp. 181-182; Csaszar and Laureiro-Martínez 2018, p. 515). In our setting specifically, it would be virtually impossible to obtain the required data (e.g., exact voting parameters, committee member characteristics, their level of information, and vote outcomes) from either archival sources or surveys. And even if that data was available, we could still not be entirely sure that any observed effect is causally due to the voting threshold. In experiments, participants are randomly assigned to conditions such that potentially confounding factors can be held constant, affording exceptionally high internal validity. It is thus not surprising that Cyert et al. (1959, p. 94) insist that "(m)any of the major propositions in organization theory depend on evidence generated by studies in the laboratory" (also see Gavetti et al. 2012). Many researchers are now following this call, and experimental designs are becoming commonplace in organization theory and strategy alike (Li et al. 2018). A possible drawback pertains to external validity, in that generalizing from the laboratory to real-world settings may be seen as more difficult than generalizing from one real-world setting to another (Krause et al. 2014). We believe that we have struck an acceptable

balance between internal and external validity by closely following pertinent recommendations regarding experimental design (e.g., Aguinis and Bradley 2014; Bitektine et al. 2018). For instance, our samples include MBA students (Study 1) and Executive MBA participants (Study 2) rather than undergraduates, the population traditionally used in most experimental research (Falk and Heckman 2009). Perhaps more importantly, we devised an experimental task that resembles key decision-making features found in the real world while also ruling out extraneous factors that would be difficult to isolate in complex field settings.

Specifically, we developed an experimental setting that fits the particular needs of the current investigation. Consistent with the parameters of the general Condorcet model, the experimental task needed to involve a *group* of size $n > 1$ that decides over a *binary* policy with *uncertain* outcomes and that uses a *voting rule* in order to aggregate individual votes. Consistent with our objective to inform organization theory and strategy research, the nature of the decision needed to be one that is *organizational*, of *strategic import*, and commonly made through *managerial committees*. To create such a setting, we built on experimental procedures established in the jury literature (Ali et al. 2008; Guarnaschelli et al. 2000) while adapting the decision context to a venture capital scenario, a setting in which group decision making among partners is particularly common (Bottazzi et al. 2016; Sahlman 1990). Different venture capital firms use different voting rules (Liu et al. 2017), and individual venture capital partners differ in their level of information about specific ventures brought up for consideration (Wu 2016); for these reasons, the venture capital setting is an ideal fit to test our two hypotheses.

In the experimental task, each participant was asked to assume the role of a member of the investment committee of a venture capital firm and cast a series of go/no-go votes on a total of nine early-stage ventures in a set-up very similar to typical real-life scenarios in which investors need to make decisions based on limited information (Csaszar and Laureiro-Martínez 2018; Huang and Pearce 2015; Scott et al. 2020). After learning about the voting rule (which varied across conditions, as explained below), participants were asked to read a brief dossier for each company containing background information about the product, market, and team. While the information provided was relevant for making funding decisions, the complexity of the dossiers was kept at a relatively manageable level, so as to ensure that even study

participants with comparatively limited in-depth knowledge about venture capital funding would be able to comprehend them (Elliott et al. 2007). To make sure the company dossiers were high in psychological realism (Colquitt 2008), we based them on pitch-day profiles of companies that were accepted by the prominent startup accelerator Y Combinator while changing the identifying details. We chose the nine companies so as to cover a wide variety of different industry sectors and—unknown to the participants—eventual success outcomes (i.e., about half the companies failed, while the other half demonstrated steady growth). The order in which the nine profiles were presented was randomly determined but consistent across all participants.[6] Please see our data archive for the full study materials along with the data and log files (https://osf.io/fjadb/?view_only=909ac0a916834d6180ae74d429a57d0e).

We employed this task in both of our experimental studies. Whereas Study 1 focuses on the main effect of thresholds on voting behavior (H1), Study 2 provides convergent evidence for this main effect while also investigating the moderating role of the level of information (H2).

Study 1

Sample. Participants in the first study were full-time students in a first-year MBA entrepreneurship course at a large business school with a Financial Times "Top 10" MBA program. These students identified entrepreneurship as their primary major or area of study, which ensured that all participants possessed some degree of interest in and knowledge related to evaluating entrepreneurial ventures (Lee and Huang 2018). The class consisted of 16 sessions containing a total of 140 students (39 women, 101 men), all of whom volunteered to participate in the study. Three students left some of the sociodemographic information unanswered, but we retained their data for the remaining analyses. A power analysis using G*Power (Faul et al. 2007) found that the sample is sufficiently powered ($1 - \beta = 0.82$) to detect medium effects ($d = 0.50$) at $p < 0.05$ (see Appendix A). Participants were between 25 and 36 years of age ($M = 29.48$ years, $SD = 2.23$), and their working experience ranged from 2.5 to 15 years ($M = 6.32$ years, $SD = 2.31$). A total

[6] Manual inspection of participants' responses across the nine trials failed to reveal any discernable order effects.

of 15.1% of the participants indicated they had some first-hand work experience related to venture investments, such as work in private equity or venture capital.

Procedures. The study was conducted as part of a class activity, and participants expected to be graded as a team according to their venture capital firm's performance. Specifically, they were told that team investments in successful ventures would earn them two points, team investments in failures would result in losing one point, and abstaining from investment would leave their score unchanged.[7] How their score on the task would translate into a class grade was deliberately left unspecified. The teams used for the study ranged in size from three to five participants (M = 4.76 participants, SD = 0.56); these teams had been formed at the beginning of the semester for various group-based class activities, and hence the participants were familiar with their teammates. Participants cast their votes individually and without any prior team discussion. The activity was conducted during class without prior announcement, was self-paced, and took approximately 40 minutes to complete. Once the signal to begin was given, all instructions were provided through the written study materials, which participants completed individually in a paper-and-pencil format.

Teams and their participants were randomly assigned to one of the two experimental conditions in this two-factor between-subjects design: (1) a threshold of one yes vote vs. (2) a threshold of two yes votes (n = 70 and n = 70, respectively). That is, study materials were identical across conditions except for the information on how individual votes were aggregated at the team level. In both conditions, participants were told that although they and their teammates would vote on each investment opportunity individually, their votes would subsequently be aggregated at the team level via a pre-defined voting rule, and their performance on the task would be assessed at this aggregated level. In the one-vote-threshold condition, participants were told that the following voting rule would be applied to form a team decision: "If just one team member votes yes, your team will invest in the specific venture." In contrast, in the two-vote-threshold

[7] This scoring scheme was meant to reflect the fact that "good" investments in successful ventures tend to overcompensate venture capitalists for their "bad" investments in flops (e.g., Gompers and Lerner 2004).

condition, participants were shown the following voting rule: "If two or more of the team members vote yes, your team will invest in the specific venture." Participants then saw a table showing illustrative examples of how team members' individual votes would be aggregated into a team decision and reminding them of the names of their teammates. They were then asked to respond to a comprehension question,[8] to read the nine company profiles, and to indicate their yes/no investment vote for each of these nine companies. Finally, participants were asked to provide some basic personal information (including sex, age, work experience, experience with venture investments, number of siblings, and an abbreviated version of Snyder's (1974) self-monitoring scale) and were debriefed. We confirm that we report all administered measures, conditions, data exclusions, and determination of our sample sizes, in accordance with the Center for Open Science recommendations (Nosek et al. 2013). Instruments, data, and log files are available at https://osf.io/fjadb/?view_only=909ac0a916834d6180ae74d429a57d0e.

Results. Random assignment to treatment conditions allowed us to assume that all other relevant factors were controlled for by design. Because including unnecessary control variables can decrease statistical power and heighten the chances of Type I and Type II errors (Becker 2005), our paper presents the results using only the hypothesized independent variable as predictor. As a robustness check, we included controls for sex, age, work experience, team size, number of siblings, and self-monitoring in our analyses, and results remained virtually unchanged.

Because participants voted on nine different companies, we computed the total number of yes votes for each participant to capture the count-dependent variable of "support of uncertain projects." A Poisson regression was run to predict this count based on the study condition.[9] Results revealed a statistically

[8] The comprehension question was: "Imagine you turn out to be the only one in your team who votes in favor of investing in a specific venture, but all other members of your team voted 'No'. Will your team then invest in that venture?" The correct response differed between conditions. We also ran the analyses excluding those seven participants who either answered this question incorrectly or left it unanswered (i.e., with $n = 133$); the results were substantively similar.

[9] To demonstrate robustness, we also (1) ran a Wilcoxon-Mann-Whitney test and (2) transformed the data from wide to long to estimate a random intercept logistic regression with participant as clustering variable (Rabe-Hesketh and Skrondal 2012). The results of these analyses are consistent with those of the Poisson regression (please see the log file in the data archive).

significant difference across conditions ($p = 0.001$): individuals in the two-vote-threshold condition green-lighted 1.36 (95% *CI*, 1.13 to 1.63) times as many investments ($M = 3.89$; $SD = 1.31$) compared to participants in the one-vote-threshold condition ($M = 2.86$; $SD = 1.21$). The obtained effect size is large ($d = 0.82$; 95% bootstrapped *CI*, 0.51 to 1.11), strongly supporting Hypothesis 1.

Discussion. The results of Study 1 were consistent with Hypothesis 1. As predicted, we found a significant main effect of the aggregation structure's threshold on participants' support of investment projects, with greater support in the high than in the low consensus-level condition. Study 2 was designed to extend our investigation by testing the moderating effect of the decision maker's level of information proposed in Hypothesis 2.

Study 2

Sample. Participants in Study 2 were enrolled in an Executive MBA program and attended an entrepreneurship class on the creation of new business ventures. In total, 99 people took part in the study, of whom 73 (73.7% percent) were male. Two participants left individual investment decisions unanswered; we retained these participants under the assumption that they did not want to invest in the respective ventures (but results are essentially unchanged when assuming positive investment or dropping these participants). A power analysis using G*Power (Faul et al. 2007) found that the sample is sufficiently powered ($1 - \beta = 0.97$) to detect large effects ($d = 0.80$) at $p < 0.05$ (see Appendix A). Participants were an average of 37.85 years of age ($SD = 3.95$) and had an average of 15.14 years of full-time work experience ($SD = 4.08$), and 18.2% indicated they had some first-hand work experience related to venture investments.

Procedures. Study procedures resembled those of Study 1, with the key difference being that Study 2 used a 2 (threshold: one versus two yes votes) × 2 (level of information: low versus high) between- by within-subjects design.[10] As in Study 1, the voting threshold was manipulated by assigning participants to a threshold of either one yes vote ($n = 50$) or two yes votes ($n = 49$). Except for how individual votes were

[10] The measures collected from participants were also identical across studies, with the only exception being that we also included a risk attitude measure in Study 2 (as explained further below) and that we obtained sex and age from student records (rather than through the post-task questionnaire).

aggregated at the team level, study materials were identical across the two threshold-level conditions. In addition, we also manipulated level of information as a within-subjects factor. Specifically, four randomly selected company profiles in each participant's handout contained 5-6 lines of blurred-out, unreadable text (low level of information), whereas five company profiles in each participant's handout contained 5-6 lines of bold and underlined text (high level of information). Additional instructions provided with each low-level-of-information company profile informed participants: "Some of your team members have done additional research and therefore have more information on this company than you do. The information that is blurred is information that some of your teammates have, but you do not have." In contrast, each high-level-of-information company profile was preceded by the instructions: "You have done additional research on this company and therefore have more information on the company than your team members. Specifically, the information that is highlighted in the text (bold and underlined) is information that you have exclusively and that your teammates lack."[11] Except for one four-person team, all teams had five members (M = 4.96 participants, SD = 0.20) in Study 2, and all but four participants gave a correct response to the study comprehension question.[12]

Results. Because individual company profiles differed in terms of information levels (the within-subjects variable), we moved to a trial-level analysis as our default analytic method and coded the dependent variable of investment as a dummy variable for each company. To account for the fact that individual trials were nested within participants, we used random-intercept logistic regression with participant as clustering variable (Rabe-Hesketh and Skrondal 2012). The model included voting threshold, level of information, and their interaction as predictors.

[11] Please see the full study materials for details on the blurred/highlighted text and the additional variables we collected from study participants, including the comprehension question, perceived pivotality, self-reported motivation, work experience, experience with venture investments, number of siblings, self-monitoring, and risk propensity. Information on sex and age were obtained from student records in Study 2.

[12] The comprehension question was the same as in Study 1, and results remained virtually unchanged when dropping the four respondents who provided an incorrect response to this question.

Results provided additional support for the proposed main effect (Hypothesis 1): the voting threshold had a significant positive impact on the propensity to invest ($b = 1.51$; $SE = 0.33$; $z = 4.51$; $p = 0.00$).[13] Further, we found that the level of information positively affected the dependent variable ($b = 2.74$; $SE = 0.31$; $z = 8.98$; $p = 0.00$). Most importantly, the negative coefficient of the interaction term was consistent with the moderation effect proposed in Hypothesis 2 ($b = -1.37$; $SE = 0.37$; $z = -3.71$; $p = 0.00$). Figure 1 graphically illustrates the percentages of positive investment decisions averaged by condition. Subsample regression analyses revealed that the effect of the voting threshold was no longer significant when focusing on the five trials with high levels of information alone ($b = 0.13$; $SE = 0.18$; $z = 0.70$; $p > 0.25$), whereas this effect was positive and significant when focusing on the four low-level-of-information trials ($b = 1.79$; $SE = 0.47$; $z = 3.79$; $p = 0.00$). Consequently, the level of information constitutes a critical boundary condition to the threshold-level effect.[14]

---Insert Figure 1 about here---

Finally, in order to explore the alternative explanation that the observed voting-threshold effect might be driven by changes in risk attitude, Study 2 also captured participants' risk attitude using Holt and Laury's (2002) hypothetical lottery-choice instrument. A Poisson regression revealed that the count of risky lottery choices is unaffected by the threshold condition ($b = 0.08$; $SE = 0.08$; $z = 1.02$; $p > 0.25$), thus ruling out this alternative explanation.

Discussion. The results of Study 2 both replicate and extend the findings from Study 1. Using a sample of Executive MBA participants, we again find a significant positive main effect of the voting threshold on investment, illustrating the robustness of this effect and generalizing our findings across different populations (Bettis et al. 2016). In addition, Study 2 provides novel evidence on the role of level

[13] Results of a complementary Poisson regression also revealed a significant difference in the total number of investment decisions between threshold-level conditions ($p = 0.02$): individuals in the two-yes-votes condition again green-lighted 1.30 (95% *CI*, 1.05 to 1.62) times as many investments ($M = 3.86$; $SD = 1.80$) compared to participants in the one-yes-vote condition ($M = 2.96$; $SD = 1.28$), yielding a medium effect size ($d = 0.58$; 95% bootstrapped *CI*, 0.19 to 0.96).

[14] Similar to Study 1, we also considered exploring organizational-level decisions in the data of Study 2, but we concluded that such an analysis with only 20 teams in total would be under-powered to estimate interaction effects.

of information as a moderator of the voting threshold–investment effect. In situations of low levels of information, the effect of the voting threshold on investment likelihood is significantly more pronounced than in situations of high levels of information.

Post-hoc Analyses

Although the paper's hypotheses pertain to effects on individuals' voting behavior, we were curious whether the voting-threshold manipulation might also have downstream effects on decisions at the level of the organization. We thus pooled our data from Study 1 and 2, applied the respective voting rule to compute team-level decisions, and compared them across conditions.[15] Interestingly, results of a Poisson regression revealed that the number of team-level investment decisions was not statistically different across conditions at the conventional 5% level (b = -0.20; SE = 0.11; z = -1.68; p = 0.092). This implies that redesigning an organization's aggregation structure in an effort to influence organizational decisions may not create the anticipated downstream effect, as the mechanics of the aggregation rule appear to be substantially countervailed by changes in individual voting behavior. We return to this insight in our Discussion section.

To dig a bit deeper, we also computed "statistical counterfactuals" (e.g., Csaszar and Laureiro-Martínez 2018), applying the two-vote aggregation mechanism to the decisions of teams exposed to the one-vote-threshold (and vice versa) and thus allowing for a comparison between actual voting behavior and voting behavior unaffected by the threshold condition. This approach allows us to make more detailed inferences how individuals endogenously change their voting behaviors. The ensuing analyses show that the threshold effect appears to play out asymmetrically at the team level. As we uniformly apply the two-vote-threshold aggregation mechanism to all teams, we see a significant difference in the resulting team decisions across experimental conditions, with significantly more invests among teams in the two- than in the one-vote-threshold condition (b = 0.35; SE = 0.13; z = 2.63; p = 0.009). That is, even when holding constant the aggregation mechanism itself, individual voting differences produce differences in outcomes,

[15] One participant was mistakenly provided with materials for the other study condition than his/her teammates. While this did not affect the individual-level analyses reported above, it precluded us from team-level aggregation, so we omitted this particular team from the post-hoc analyses.

such that teams exposed to the higher threshold will engage in more investments. However, when we uniformly apply the one-vote-threshold aggregation mechanism to all teams, the difference between conditions is not statistically significant ($b = 0.14$; $SE = 0.11$; $z = 1.34$; $p = 0.179$). These results suggest that the endogenous changes in individual behaviors are particularly consequential at the team level when voters anticipate a low threshold. And more broadly, they underline our position that it is not tenable to treat aggregation rules and voting behaviors as independent phenomena.

GENERAL DISCUSSION

In order to examine the effect of organizational voting thresholds on individual voting behavior, we conducted two experiments. Results reveal that voting thresholds indeed have a substantial effect on individual votes. Specifically, a lower threshold renders people more conservative in their voting, whereas a higher threshold causes them to cast more liberal votes. We also show that this voting-threshold effect is contingent on individuals' level of information about the underlying decision. Increasing levels of information can "turn off" this effect, suggesting that inferred information on project quality is a key mechanism through which voting thresholds alter individual voting. Our study builds on and helps to advance multiple streams of research.

Organizational Aggregation

First and foremost, our investigation addresses repeated calls for advancing "a theory of aggregation that explains how individuals combine their behaviors to produce collective outcomes" (Freeman 1999, p. 175; also see Powell et al. 2011) by elucidating the important effect of voting thresholds. Specifically, our findings bring out the dual role of voting thresholds, as they (1) combine and (2) shape individual votes. Our study makes an important contribution by highlighting and providing empirical evidence for the second—and so far largely neglected—function of aggregation rules: their shaping of individual votes. Prior work on organizational aggregation, often deploying formal modeling, tended to treat individual voting behavior as exogenous. By contrast, we focus on how aggregation rules influence individuals' voting behavior; thus, we treat their votes as endogenous. Although Sah and Stiglitz (1986, p.

721) briefly alluded to the possibility that organizational structures may affect individuals' considerations, this idea has received little elaboration or empirical evidence.

The effect that aggregation rules have in shaping voting behavior is particularly remarkable given that it *counteracts* their effect in combining votes into an organizational decision. While a smaller threshold lowers the bar for a project to be greenlit at the organizational level, it also reduces organizational members' tendency to support that project. The two functions of combining and shaping are thus in direct opposition. As a result, organizations that adopt a particular voting threshold may not achieve the desired effect, as the change in individual voting behavior may undermine the structural change.

This insight—that is, that aggregation rules have two countervailing functions—has high relevance for research on organizational aggregation. Studying the effect of aggregation rules on organizational decision-making without taking into account how aggregation rules shape individuals' voting behavior may result in a systemic overestimation of the effect of aggregation rules on organizational decision-making. This is particularly notable given that a major stream in that literature deploys formal models in which individual behavior is often treated as exogenous (for notable exceptions, see Keum and See 2017; Reitzig and Sorenson 2013).

Our paper therefore emphasizes that neither decision-making structures nor individual voting behavior can be studied in isolation, as they are deeply intertwined. It is critical to account for the macro-to-micro implications of organizational structures to capture their true effects (Gavetti et al. 2007; Greve 2013; Keum and See 2017; Raveendran 2020). Consider a study examining strategic decision making while only studying individual choices and ignoring aggregation structures. Such a study would be unable to account for the fact that actors in organizations commonly make decisions in committees and, in doing so, engage in strategic behavior that tends to differ markedly from how they would behave in isolation. Conversely, studies focusing on aggregation structures while disregarding individual behaviors may overestimate how these structures will inform organizational decisions. As such, our findings directly support the microfoundations perspective, to which we turn next.

Microfoundations

The study of microfoundations has recently witnessed unprecented interest and continued growth in organizational theory and strategy alike, to the extent that we can speak of a microfoundations movement that is fundamentally changing the landscape of these formerly purely macro-level fields (Felin et al. 2015; Haack et al. 2020). Microfoundational research seeks to explain how relations between macro variables (such as organizations' structures and decisions) are mediated by micro actions (such as agents' voting behaviors) (Abell et al. 2008).

At the core of the microfoundational approach is the question of what it means for organizations to act, given that organizations are rarely represented by only one individual (King et al. 2010). That is, how does collective organizational action emerge and take on forms that cannot be explained by taking the simple average among the organization's members? Our study attempts to provide one answer to this question. We show how aggregation structures transform how organizational members act, in a way that deviates from how they would act either in isolation or under different aggregation structures. As such, on the one hand, our study offers support for the notion that there is something fundamentally supraindividual and uniquely organizational that drives the decision making of organizations (i.e., voting thresholds), demonstrating that organizations are indeed much more than the sum of their parts. On the other hand, our findings qualify the extreme view that individuals do not matter, as we show that their behavior may in fact go against and counteract tendencies inherent in the organizational structure. Overall, then, we contribute to elaborating a more balanced middle-ground perspective (e.g., Heugens and Lander 2009; Schilke 2018) that transcends the conventional dichotomy of structure vs. agency and unpacks the mechanisms through which the two interact. Our approach highlights the importance of organizations' voting rules as unique properties that structure the decision process while at the same time doing justice to the important role of individual behavior in organizational decision making. While earlier research on organizational actorhood primarily traced an organization's character back to its identity and goals (e.g., King et al. 2010; Schilke 2018), we suggest that organizational structures—and in particular aggregation structures—should be

added to the list of uniquely organizational features that explain the nature of the actions taken by the organization.

In addition to speaking to the issue of organizational actorhood, we believe our research may also contribute specifically to elucidating the microfoundations of dynamic capabilities—that is, firms' capacity to purposefully create, extend, or modify their resource base (Helfat et al. 2007). Organizational design has been recognized as a critical enabler of dynamic capabilities (Felin and Powell 2016), and, more specifically, the decision rules that organizations employ have been linked to the degree to which firms are able to seize opportunities (Teece 2007). Nevertheless, more fine-grained theorizing about specific types of decision rules and empirical research directly linking such rules to concrete organizational investment decisions have been largely absent in this literature (also see Felin et al. 2015, p. 616; Schilke et al. 2018, p. 415). As such, dynamic capabilities scholars may find it insightful that voting thresholds significantly impact investment decisions and, by implication, the extent to which firms routinely change their resource base. Put differently, voting rules may qualify as a central (albeit underappreciated) microfoundation of firms' dynamic capabilities (Teece 2007), a notion that contributes to a more refined picture of how specifically the complex concept of dynamic capabilities (which has been criticized as being vague and elusive; Arend and Bromiley 2009) manifests inside firms.

Beyond Organization Theory and Strategy Research

While our study primarily speaks to organization theory and strategy scholarship, researchers from other disciplines may also consider our findings interesting. For instance, while political science scholars have made much progress in studying different voting rules, they have paid relatively little attention to the cognitive mechanisms that explain their effects. As such, we hope they see value in our empirical test, which contributes to the understanding of how inferred information quality serves as a key process explaining divergent outcomes across voting regimes.

Further, given the empirical context of our experimental task, our findings also speak to scholars of entrepreneurship and, more specifically, venture capital. In this literature, there has long been a debate about how macro-structural features, such as diversification (Buchner et al. 2017), VC status (Petkova et

al. 2014), or intraorganizational politics (Guler 2007), affect the types of investments a venture capital firm makes. However, much less attention has so far been dedicated to the role of organizational microstructure, such as voting rules, despite the fact that venture capital firms constitute a prime example of organizations in which group decision making among partners is widespread (Bottazzi et al. 2016; Sahlman 1990; Wu 2016).

And finally, in economics, the issue of reactance to structure has been virtually entirely ignored in the adaptive rationality tradition, while it has been emphasized but at times trivialized in game theory by assuming an equilibrium in expectation. Our findings suggest that both approaches may to the very least be incomplete, and the possibility of endogenous individual choices should take on a more prominent role in economic theorizing.

Managerial Implications

While drawing managerial implications from experimental research should be treated with caution (Bitektine et al. 2018), the results reported here provide support for the notion that aggregation structures can serve as powerful organizational design tools that are relatively easy for firms to change; yet we also highlight that they may have unexpected effects. For instance, changing the voting threshold may not have much effect at the organizational level unless committee members possess relatively high levels of information about the underlying investments. However, especially in settings where managers face significant information asymmetries and are thus uncertain about the prospects of an investment, they may vote strategically, in the hope that their colleagues might be better informed. As such, one implication of our findings is that firms trying to make strategic changes by adjusting voting thresholds may be well-advised to also implement deliberation routines through which each voting member's level of information is made transparent to the group and the better-informed individuals share their insights before votes are collected.

Limitations, Boundary Conditions, and Future Research

Our study is subject to several limitations that result from our methodological and theoretical choices. Methodologically, we relied on experiments, because they allow for strong causal inference while

also enabling the study of micro-level mechanisms (e.g., Agarwal et al. 2010; Levine et al. 2017). However, these important benefits come with the caveat that empirical findings from experimental research, like those reported here, are generalizable only via theory rather than being directly transferable to the real world (Lucas 2003; Martin and Sell 1979; Zelditch 1980). Several simplifying assumptions are necessary to bring organizational decision-making to the laboratory, and it is important to be transparent about the resulting boundary conditions. Most crucially, for our findings to hold, decision makers must be aware of the aggregation structure (which we accomplished in our experiments by prominently highlighting the voting threshold before the participants made their decisions). However, it is possible that members of an organization may not be fully aware of the voting regime and thus may not take it into account when voting. Organizations may even gather their members' votes without having established a voting regime at all. In such cases, the effects observed here may be absent or attenuated. Moreover, it is worth highlighting that our experiments randomly assign voting thresholds, and results might differ if teams self-select into different structures (Gibbons et al. 2019) or if participants were given specific reasons for why the organization uses the structure. Also, the individuals in our setting were incentivized to be concerned about the overall organizational outcome. The degree to which managers care about the organizational implications of their actions may vary across managers and organizations (Eisenhardt 1989; Garg 2013). Further, we assumed equal decision rights among voting committee members; however, committees may also weigh individual members' votes differently and/or give certain members veto rights (Phadnis et al. 2015), and the role of hierarchy in information aggregation warrants further investigation (Lee and Csaszar 2019). Motivated by the real-world case of the venture capital firm DFJ, we contrasted regimes with thresholds of one vs. two yes votes, but organizations may use higher thresholds than that, including majority or unanimous voting rules (Miller 1985). It is clear that we need further investigations to generalize our findings to other voting thresholds and different voting rules. For instance, it would be worth studying whether framing a vote as a "yes" or a "no" might elicit different reference points and distinct effects. Another interesting extension to our findings would be an investigation into how committee size may affect voting behavior. Although our robustness check did not show a significant effect of team size, this might

be due to limited variation in our sample (all teams were between three and five participants in size). In this paper, we made the simplifying assumption of individuals voting autonomously without prior deliberation; however, many votes are preceded by a group discussion (Austen-Smith and Feddersen 2009). Finally, although we move beyond the common practice of using either undergraduates or crowdsourced participants for our experiments, MBA and Executive MBA students may not be a representative sample of the population of managers, potentially limiting the generalizability of our research.

For all of these reasons, we hope that experimental studies such as ours will spark further research that expands on our findings by relaxing or systematically varying some of our boundary conditions. While we see significant opportunity for further experimental research, there is also a clear need for studies using complementary methods (Levine 2003) in order to shed more light on the complex and dynamic process through which voting unfolds in real-life organizations. Most notably, we see much promise in accessing new *archival* data sources that enable investigations of aggregation structures' cross-level effects. For example, to coordinate their voting, organizations rely on professional service firms such as Qualtrics, Slack, or BigPulse. Gaining access to these firms' data would allow for studying cross-level effects in a wide population of organizations. Other research may be able to leverage variance in voting thresholds across decisions within the same organization.

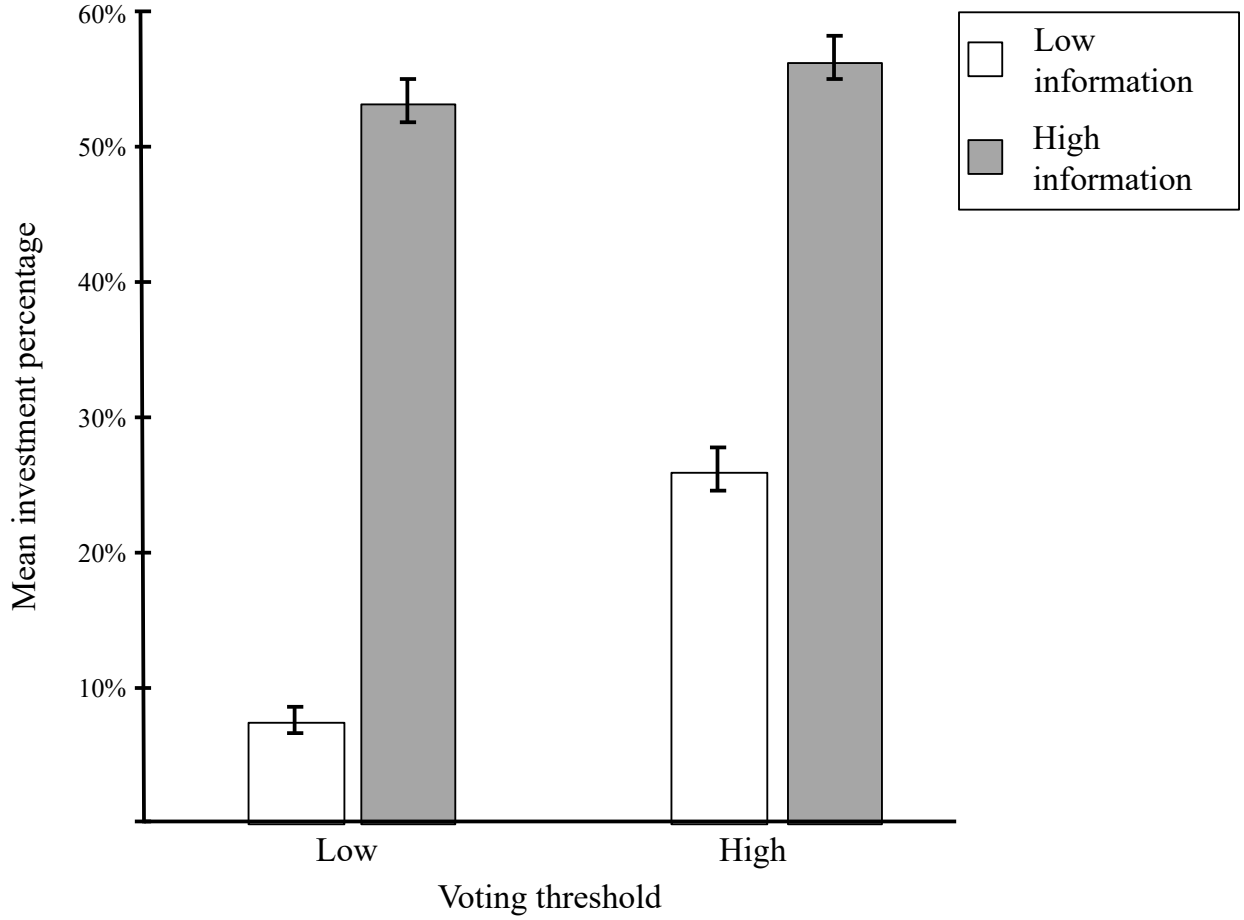
In addition to complementary methodological approaches, we also urge future research to tease out additional theoretical contingencies that condition the link between voting thresholds and voting behavior. For example, future research may explore how characteristics of the *group* of organizational members (e.g., diversity of the group, faultlines between organizational members, interaction routines) may affect the linkage between thresholds and voting behavior.

CONCLUSIONS

In conclusion, this paper offers valuable new insights into how aggregation structures shape decision making in organizations. Most prior research on aggregation structures focused on the bottom-up process of transforming the votes of individual agents into an organizational decision while taking individual voting behavior as a given. By contrast, we point to the top-down process through which

aggregation structures go far beyond merely combining the votes of individual agents and instead play an active role in molding them. Individual agents assume center stage in this line of inquiry that the current investigation aims to bolster, thus laying further groundwork for a microfoundational agenda of organizational design research that considers structural and individual dynamics simultaneously in order to account for their interactions.

Figure 1: Mean Investment Percentage by Condition, Study 2



Note: Error bars represent standard errors.

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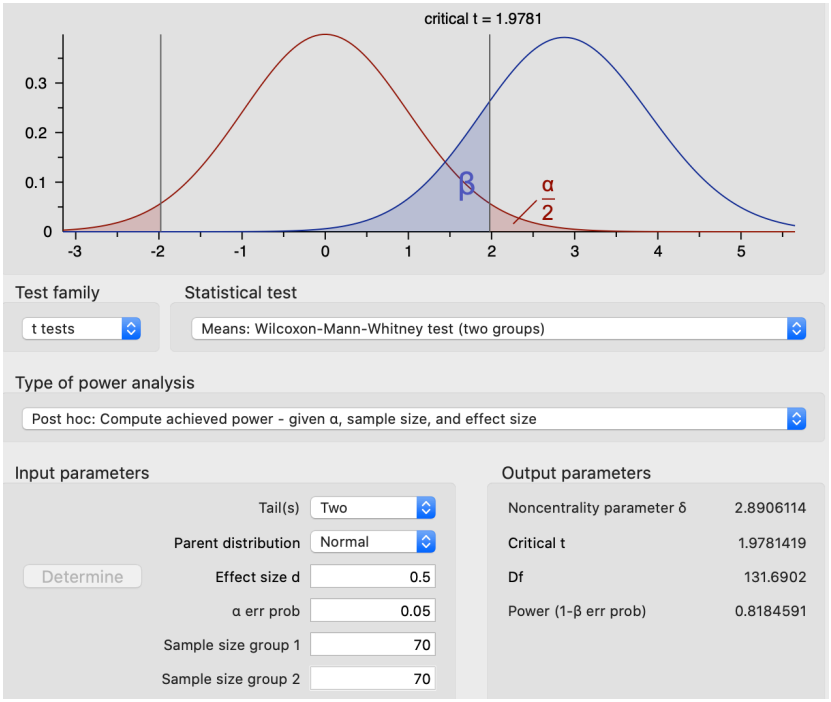
Appendix A: Power analyses using G*Power

Study 1



Study 2