Inside the board: Decision readiness, meeting dynamics, and decision outcomes

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Abstract

We investigated the interplay among four constructs related to meeting dynamics and their relationships with decision outcomes on boards of directors, which includes perceived overall board performance, creativity/innovativeness and ethicality of board decisions. We obtained responses from 358 board members using an original survey instrument distributed internationally, although most respondents in the final sample are based in South America. We employed recently developed analytical tools, including the pioneering application of confirmatory composite analysis in the survey-based board literature. Our results indicate that the four explanatory composite variables, named board-level decision readiness, debate and cognitive divergence, safety and trust climate, and information and opinion sharing are positively interrelated and are positively associated with the composite representing decision outcomes, even after controlling for myriad respondent-, organization-, and board-level characteristics, including board demographics, functioning and structure. We also found evidence of complementary mediating channels; in particular, our results are compatible with the conjecture that board-level decision readiness benefits decision outcomes directly and indirectly through its positive influence on the other constructs related to meeting dynamics. In contrast, we found no evidence of nonlinearity in the relationships between decision outcomes and the aforementioned constructs. Additional disaggregated analyses reveal that decision outcomes may be most enhanced in boardrooms in which members are well prepared, have adequate time to make decisions, feel comfortable disagreeing with others, and trust the executives. This research, which relies on the perceptions of board members themselves, complements previous studies mainly by focusing on decision readiness as a group-level phenomenon and providing evidence regarding its potential role in board dynamics and decision-making.

Keywords: Board of directors, decision readiness, board processes, board dynamics, decision-making, confirmatory composite analysis.

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1 INTRODUCTION

An expanding body of research investigates how constructs related to group dynamics and behavior might influence decision outcomes such as the advisory and control task performance of boards of directors (BoDs) or the financial risk-taking of firms (e.g., Kanadlı et al., 2020; McNulty et al., 2013; Minichilli et al., 2009, 2012) from an input-process-output perspective (Pettigrew, 1992). While some qualitative studies observe board meetings and the unfolding of boardroom dynamics directly (e.g., Pugliese et al., 2015; Veltrop et al., 2021), several empirical investigations of this topic rely on survey responses from CEOs, board chairs or other board members. For example, Heemskerk (2019) offers a meta-analytical assessment of the survey-based studies which draw inspiration from the seminal work of Forbes & Milliken (1999). We aim to contribute to this stream of research by introducing an original survey instrument and offering a fresh perspective, in both conceptual and methodological terms, on the relationships among variables related to meeting dynamics and decision outcomes on boards.

Our survey instrument was originally developed with the aid of experienced board members from different countries who represented various types of for-profit and nonprofit organizations; this instrument aimed to capture relevant features of board functioning and performance. In addition, one of the coauthors of this paper is an active board member and has pursued a career as an expert in corporate and board governance with an emphasis on the application of behavioral theory. This practitioner-led approach allowed us to incorporate perspectives that remain underexplored in the extant academic survey-based board literature while also drawing inspiration from previous research. This approach was also instrumental in facilitating access to actual board members, a

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notoriously difficult-to-reach population (Leblanc & Schwartz, 2007). In contrast, many previous survey-based board studies have relied solely on responses from CEOs (e.g., Kanadlı et al., 2020; Minichilli et al., 2012; Zona & Zattoni, 2007). After careful pretesting and pilot testing, our web-based instrument was distributed (in English, Portuguese, and Spanish) with the support of the Brazilian Institute of Corporate Governance (IBGC) and the International Finance Corporation (World Bank Group); a total of 358 valid responses were obtained exclusively from board members. Although we received responses in connection with boards based in 40 different countries, our final sample is highly focused on Latin America. To the best of our knowledge, this study is the first academic research of its kind to include emerging countries and one of the few studies to survey only board members.

We complement previous research in several ways. In particular, we investigate how the physiological unpreparedness (fatigue/tiredness) and time constraints faced by boards relate to perceived decision outcomes and to other variables related to meeting dynamics. These phenomena are connected with the broader concept of *decision readiness*, which has been advanced by recent behavioral research with a focus on debiasing interventions (Soll et al., 2015). Another of our survey items that is related to the same concept gauges board members' degree of cognitive preparedness during meetings. Although previous survey-based studies have addressed cognitive preparedness in boards (e.g., Minichilli et al., 2009; van Ees et al., 2008; Van Puyvelde et al., 2018), to the best of our knowledge, our research is the first to use decision readiness explicitly as a conceptual framework in the board literature.

Our measure of decision outcomes also complements previous research by including items related to the perception of board members regarding the extent of ethical soundness and creativity/innovativeness of the decisions made by their boards. While most of the extant research employs measures of task performance, few papers include creativity or innovativeness in their criterion (i.e., dependent) variables (e.g., Åberg & Shen, 2020;

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Derdowski et al., 2018; Jaskyte, 2018), and we know of no previous survey-based research that seeks to explain the perceived overall ethicality of board decisions.

This research also adopts a fresh methodological perspective by modeling our target constructs as emergent variables and by estimating structural equation models (SEM) based on the recently developed confirmatory composite analysis (CCA) framework (Schuberth et al., 2018). In contrast, previous SEM-based board research has relied on the well-known confirmatory factor analysis (CFA) framework and has thus modeled constructs such as board processes or task performance as latent variables (e.g., Derdowski et al., 2018; Ranasinghe et al., 2020; Zhang, 2013; Zhu et al., 2016). As demonstrated by recent methodological papers (e.g., Rhemtulla et al., 2020; Sarstedt et al., 2016), the latent variable approach based on reflective indicators is often inadequate and it may lead to severe distortions in inference when the unique variance in the observed survey items (i.e., the variance that is not shared among the individual components of each proxy) is relevant and should not be treated as measurement error. This feature is applicable to our research because the individual survey items were selected to capture diverse facets of the target constructs, and these facets may have unique predictive power with regard to the variables included in our model (Rhemtulla et al., 2020).

In practice, since we used composite scores as proxies (stand-ins) for the target constructs, our empirical strategy is more similar to that used by previous papers that have employed regression analysis using summed or averaged item scores to represent board processes, behavior, and performance (e.g., Åberg & Shen, 2020; Jansen, 2021; Kanadlı et al., 2020; Machold et al., 2011; McNulty et al., 2013; Minichilli et al., 2009). However, unlike these papers, our SEM-based approach allows for the assessment of overall model fit (i.e., testing the hypothesis that the model-implied covariance matrix matches the population covariance matrix of the survey items used as indicators), as

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recommended by recent methodological studies (Schuberth et al., 2022). While CCA has previously been employed in several fields (for an account of previous applications, see Henseler & Schuberth, 2020), to the best of our knowledge, this research provides the first application of CCA in the board literature. In addition, we introduce newly developed machine-learning procedures to the survey-based board research; these procedures are adapted to confirmatory research designs that aim to improve the selection of available control variables related to respondent-, organization-, and board-level characteristics, including board demographics, functioning and structure. These procedures allow us to consider a much greater array of potentially relevant controls (including interactions and quadratic terms) while avoiding estimation problems due to redundancy and excessive collinearity (Blackwell & Olson, 2021).

We constructed four composite variables combining 12 survey items related to board processes and behaviors that should reflect or directly influence boardroom dynamics, i.e., the patterns of interactions among board members: board-level decision readiness (BDR), debate and cognitive divergence (DCD), safety and trust climate (STC), and information and opinion sharing (IOS). We empirically investigated the ability of these variables to predict each other as well as a composite measure of decision outcomes (DO) that is composed of survey items related to perceived overall board performance and to the perceived creativity/innovativeness and ethicality of board decisions.

Our results indicate positive associations between each of the aforementioned process/behavioral variables and DO. The estimates are broadly consistent with hypotheses connecting more desirable decision outcomes with boards with higher scores on BDR, DCD, STC, and IOS. These inferences hold even after controlling for a host of variables comprising respondent-, organization-, and board-level characteristics. In contrast, we found no evidence to support hypotheses related to nonlinear relationships between either DCD or STC and DO, i.e., our results are not compatible with the

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conjectures that the relationship between DCD and DO is quadratic or that it is moderated by STC.

The first-order constructs represented by BDR, DCD, STC, and IOS were also modeled as components of a second-order construct named board meeting dynamics (BMD). The positive association between the BMD proxy and DO is stronger than the associations between DO and any of the proxies for the first-order constructs. Further analysis suggests that each of the components of BMD adds relevant predictive power, with BDR being the most important predictor in this context. With regard to the individual survey items, we show that the single most important predictor of desirable decision outcomes in our sample is the perceived degree board member preparation during meetings. Other items that are among the most relevant include the perception that the amount of time that the board has to make decisions is less than the amount of time it needs to do so; the degree of free debate, including the expression of contrasting views; perceived trust between the board and the executives; and board members' level of comfort disagreeing with those who have the most power within the organization. Importantly, BMD and its four constituent composites are identified as relevant predictors of each of the components of DO, including the perceived degree of creativity/innovativeness and of the ethicality of board decisions.

We also shed light on the interplay among the four components of BMD. Specifically, the SEM estimates are highly compatible with the hypothesized positive relationships among these constructs. These estimates show that BDR and STC are strong predictors of both DCD and IOS. Interestingly, BDR also strongly predicts STC, suggesting that decision readiness at the board level might be an important antecedent of positive group dynamics connected with openness, trust, and psychological safety.

Overall, the evidence presented by this research concurs with and complements previous efforts to shed light on the black box of board decision-making. Within the input-process-

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output (IPO) framework, our results, similar to previous papers, show that board 'process variables' connected with meeting dynamics and behavior are relevant predictors of decision outcomes (i.e., 'output variables' within the IPO framework). Indeed, in line with previous studies (e.g., Minichilli et al., 2009, 2012; Zona & Zattoni, 2007), such variables are substantially more relevant with regard to explaining decision outcomes than the commonly used indicators of board demography or structure (i.e., 'input variables' within the IPO framework). Our analysis contributes to this stream of research, especially by suggesting that more attention should be given to the task of fostering decision readiness during board meetings by ensuring that board members are well informed and physically capable and that the group has sufficient time to deliberate, since it appears to be a driving force underlying both positive group processes/behaviors and positive decision outcomes, including the perceived degree of creativity/innovativeness of boards and the perceived ethicality of board decisions.

2 TARGET CONSTRUCTS AND PROXIES

2.1 BOARD-LEVEL DECISION READINESS

Decision readiness "…refers to whether an individual is in a position to make a good decision in a particular situation" (Soll et al., 2015, p. 927). This concept is inspired by the heuristics and biases literature and, more specifically, the two-system model of individual cognitive function (Stanovich & West, 2000), according to which System 1 subsumes cognitive processes that are fast, associative, automatic, emotionally charged, and effortless; these processes are often associated with intuition and habit formation and are typically difficult to change or control. In contrast, System 2 processes are much slower, serial, subject to deliberate control, and effortful; they are often rule-based, relatively flexible and associated with rational decision-making (Kahneman, 2003).

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While System 1 is highly adaptive and efficient, it might lead to myriad systematic errors in judgment that can impair both individual and group decisions unless System 2 is able to step in and filter out inappropriate intuitions. Importantly, the intervention of System 2 typically involves energy-intensive attention and reflection as well as sufficient knowledge of and the will to apply the appropriate normative rules (Soll et al., 2015). In this context, decision readiness is decreased when System 2 is unable or less likely to perform its key monitoring and adjustment functions.

Several factors may determine the degree of decision readiness. For example, extant behavioral research shows that fatigue, distraction, and time constraints can all temporarily impair the ability of individuals to exercise self-control, monitor decisions, engage in analytical processing, and spot errors in reasoning (e.g., Baumeister et al., 2007; Gilbert & Hixon, 1991; Ordóñez et al., 2015). Similarly, decision readiness is decreased when individuals are insufficiently trained or inadequately informed with regard to the context of their decision-making (Soll et al., 2015).

Although decision readiness is an individual-level concept, we claim that it might and often does impact boardroom dynamics because of systematic variation in the degree of time constraints, cognitive and emotional demands, and premeeting preparation of board members across different boards of directors. Such systematic variation might arise, for instance, from enduring differences in boardroom decision-making culture across organizations (Huse, 2005). Indeed, the items included in our survey that pertain to this concept seek to capture the degree of decision readiness as it emerges during board meetings, i.e., as a group-level phenomenon. Specifically, we ask questions that assess how the degrees of fatigue/tiredness and preparation/information among board members become manifest within the collegiate decision-making process. In addition, we gauge the perceived degree of time constraints during board meetings, comparing the amount of

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time the board needs to produce decisions with the amount of time it actually has to do so (see Table 1).

Previous survey-based board research has addressed the preparation of board members, for example, by identifying the extent to which relevant information was made available and actually discussed by directors (Zhu et al., 2016) and exploring whether directors actively collected additional information ranging beyond that supplied by managers (Minichilli et al., 2009), although none of these studies conceptually frames this issue as an element of decision readiness. Moreover, most studies ignore the role of perceived time constraints on the decision-making process of boards, and to the best of our knowledge, no previous study has addressed how fatigue/tiredness among board members might influence decision outcomes.

2.2 DEBATE AND COGNITIVE DIVERGENCE

Debate and cognitive divergence refers to the degree of cognitive heterogeneity and the expression of contrasting views within boardrooms (see Table 1). This notion is closely related to the concept of cognitive or task conflict, which refers to task-oriented differences in judgment or issue-related disagreement among board members (Forbes & Milliken, 1999; Zona & Zattoni, 2007). Cognitive/task conflict is prominently identified by extant board research (Heemskerk, 2019) as an antidote to apathy or excessive group conformity, which might lead to poor board performance. Indeed, a large body of research in management and social psychology suggests that this type of conflict may contribute to decision quality by encouraging a deeper evaluation of the assumptions underlying decision alternatives, promoting team member commitment, and enlarging the space of alternative decisions (e.g., Amason, 1996; Eisenhardt et al., 1997). On the other hand, it has been suggested that while moderate levels of task conflict are desirable, high doses

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of task conflict might lead to inferior information processing and a reduced focus on goal attainment in small teams (e.g., De Dreu, 2006).

2.3 SAFETY AND TRUST CLIMATE

The construct safety and trust climate (STC) comprises survey items related to perceived tensions during board meetings, trust between the board and the executives, comfort disagreeing with powerful members of the organization, and resistance to challenging ideas proposed by outsiders or less experienced board members (see Table 1). STC is closely related to the concepts of interpersonal trust, openness, and psychological safety, which have been featured in the academic literature on the dynamics underlying small groups, including top management teams and boards of directors (e.g., Edmondson & Lei, 2014; Kanadlı et al., 2020; Morrissette & Kisamore, 2020; van Ees et al., 2008).

2.4 INFORMATION AND OPINION SHARING

Arguably, one of the most critical features of the board, as a decision-making unit, is its ability to collect and integrate the unique perspectives and pieces of information possessed by its members. More broadly, this ability is viewed as a key feature that allows groups in general to outperform individuals (for a review of the broader group-decision literature, see Tindale & Kluwe, 2015). However, the sharing of unique information may be hindered in many group settings. In particular, research on decision-making in small groups has focused extensively on the 'hidden profile' problem, demonstrating that unique, previously unshared information tends to be underrepresented in the final decisions relative to previously shared information, which is more readily accessible, thus leading to inferior decision outcomes (Stasser & Abele, 2020; Stasser & Titus, 1985). The survey items comprising this construct are shown in

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Table 1. They assess the perceived extent to which board members share their unique information or opinions when making decisions.

Previous board studies have discussed concepts pertaining to information sharing. However, they have generally overlooked the hidden profile problem and the related group-decision literature and have not specifically measured the degree of (unique) information and opinion sharing among board members. For example, as a component of their 'use of knowledge' construct, van Ees et al. (2008, p. 91) capture the extent to which "…directors also use information, which is not provided by the top management team", while Zona & Zattoni (2007, p. 857) assess whether "[i]nformation flows quickly among board members" as part of the construct 'use of knowledge and skills'. In this regard, the study by Kanadlı et al. (2020) is an exception because it explicitly addresses research on the hidden profile and gauges whether "…board members willingly offer advice based on private knowledge, ideas and views" (p. 7) as part of the construct 'board atmosphere of openness'.

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Table 1 – Variables related to boardroom dynamics

Variable/construct	Survey item	Response scale
Board-level decision readiness (BDR)	Does fatigue/tiredness among the board members during meetings contribute to the body making hasty decisions?	(1) Always (5) Never
	Do you consider that the board members are well prepared/informed when they make decisions at board meetings?	(1) I totally disagree (5) I totally agree
	Do you get the feeling that the amount of time that the board has to produce decisions is less than the amount of time it needs?	(1) Always (5) Never
Debate and cognitive divergence (DCD)	The level of dissention at board meetings – free debate with the expression of contrasting views – is:	(1) Nonexistent (5) Very high
	With regard to the discussion of ideas and positions, how would you rate your board?	(1) Very homogeneous - everyone thinks alike (5) Very heterogeneous - the great majority have very different perspectives

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Table 1 (continued)

Variable/construct	Survey item	Response scale
Safety and trust climate (STC)	Do board meetings take place under a tense atmosphere?	(1) Always (5) Never
	Do you feel that there is a high level of trust between the board and the executives?	(1) I totally disagree (5) I totally agree
	The level of comfort for board members to disagree with those who have the most power in the organization is:	(1) Nonexistent (5) Very good
	How do you assess the degree of resistance to ideas that come from outside and that challenge the board members' thinking?	(1) Very pronounced (5) Nonexistent
	When a new board member or one who has no expertise in the industry puts forward a totally new and different approach or direction to what the industry/company has been doing for years, what is the likelihood that he/she will hear an answer like "you do not know this industry/company. It does not work like that"?	(1) Very high (5) Nonexistent
Information and opinion sharing (IOS)	When making important decisions, did the board members share information that only they had, even if it seemed obvious and already known to everyone?	(1) Individual information sharing was selective and very limited (5) Individual information sharing was very pronounced
	In the case of your board, how often did a board member refrain from expressing his/her opinion because he/she believed it did not coincide with those of his/her colleagues?	(1) Very often in the case of my board (5) It has never occurred in the case of my board

2.5 DECISION OUTCOMES

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For the purposes of this research, decision outcomes (DO) is defined as the combination of 4 questionnaire items capturing the perceived degree of creativity/innovativeness of, ethical concerns regarding, overall quality of, and satisfaction with the decisions actually made by the board (see Table 2 for the full description). In contrast with previous research, we did not focus on the performance of the board with regard to specific tasks (e.g., Minichilli et al., 2009; Zona & Zattoni, 2007) to minimize response time and increase the response rate. On the other hand, we included questions regarding the degree of creativity/innovativeness and ethicality of decisions, which have not been included in most previous papers. In fact, we are not aware of any survey-based research addressing the perception of board members regarding the ethicality of the decisions made by their boards. By construction, a greater DO score denotes decision outcomes that are more desirable.

Table 2 – Decision outcomes

Variable/construct	Survey item	Response scale
Decision outcomes (DO)	When it addresses complex issues, the board usually comes up with creative and innovative solutions	(1) I totally disagree (5) I totally agree
	Do you think the board makes decisions that, from your point of view, are ethically questionable?	(1) Often (5) Never
	On average, do you feel satisfied or frustrated with the decisions made by your board?	(1) Frustrated (5) Satisfied
	How do you assess the overall quality of the board's performance?	(1) Very poor (5) Very good

3 HYPOTHESES

3.1 BOARD MEETING DYNAMICS AND DECISION OUTCOMES

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Behavioral research shows that attention and concentration are energy-intensive resources that are necessary to activate deliberate, effortful thinking, thereby allowing decision-makers to monitor and correct potentially misleading intuitive or automatic judgments. Moreover, it has been shown that nonintuitive judgment may be significantly impaired by fatigue, lack of sufficient information related to the decision, and excessive time constraints (Kahneman, 2003; Ordóñez et al., 2015; Soll et al., 2015). For example, although moderate time restrictions may be compatible with satisfactory decisions in small groups (Kelly & Loving, 2004), significant time constraints/pressures have consistently been associated with inferior decision outcomes, including lower creativity and innovativeness, since time-constrained decision-makers tend to consider fewer options, engage in less analytical thinking, and give more weight to negative information (e.g., Amabile et al., 2002; Ordóñez et al., 2015). Interestingly, theoretical arguments and empirical evidence suggest that time constraints may increase the likelihood of ethically questionable decisions (Ordóñez et al., 2015), although they do not necessarily lead to outright dishonesty (Van der Cruyssen et al., 2020). For example, Moberg (2000) proposes the concept of 'moral readiness', claiming that moral reasoning could be severely impaired under conditions of time pressure, while experimental studies suggest that time constraints might lead to more self-interested decisions or to a greater tendency toward duty-oriented reasoning (duty, obligations, rights) rather than consequence-oriented reasoning (effects on others) (Andiappan & Dufour, 2018; Bjorklund, 2003).

Therefore, we expect less desirable decision-making outcomes on boards whose members are frequently fatigued or insufficiently prepared during meetings or where the amount of time available to make decisions is frequently perceived as insufficient. The following hypothesis formalizes these conjectures:

H1: Board-level decision readiness (BDR) is positively associated with decision outcomes (DO).

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Previous research conducted in both laboratory and real-life organizational settings, including boards of directors, has suggested that task-related heterogeneity in judgment or issue-related divergence among team members might positively impact decision-making and lead, for example, to improved team performance or enhanced creativity and innovativeness (e.g., Derdowski et al., 2018; Nemeth et al., 2004; Zona & Zattoni, 2007). Several reasons have been proposed to justify such a positive impact. For example, task/cognitive conflict might lead to greater scrutiny of task-related issues and enhanced task focus, motivation and learning, ultimately resulting in more and better ideas and insights. However, several small-group studies have found that cognitive conflict might be irrelevant to or even undermine decision-making quality (see the meta-analysis conducted by de Wit et al., 2012). It has been argued, for example, that extreme cognitive heterogeneity and task-related divergence might degenerate into widespread affective/relationship conflict within the group, which is consistently associated with worse decision outcomes. In addition, as discussed by De Dreu (2006), high levels of task conflict might lead to information overload, distraction, and a lower capacity to perceive and process information regardless of affective/relationship conflicts. For this reason, several researchers have proposed that there might be a nonlinear (inverted U-shaped) relationship between task conflict and team performance or team creativity such that the best outcomes are produced at moderate levels of task conflict (e.g., De Dreu, 2006; Farh et al., 2010). Based on this body of research, we test the following competing hypotheses:

H2a: Debate and cognitive divergence (DCD) is positively associated with decision outcomes (DO)

H2b: The relationship between debate and cognitive divergence (DCD) and decision outcomes (DO) is nonlinear (i.e., inverted U-shaped) and becomes less positive (or more negative) as DCD increases.

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H2a is in line with most previous survey-based board studies. We also consider H2b to account for evidence drawn from the wider small-group literature and because, according to the meta-analysis conducted by Heemskerk (2019), the evidence regarding the aforementioned relationship that is available in the survey-based board literature remains inconclusive.

The extant research, both qualitative and quantitative, indicates that a climate of openness and psychological safety is key to group functioning and is associated with improved group-level task performance, satisfaction, and creativity, among other factors (see the review conducted by Edmondson & Lei, 2014; Frazier et al., 2017, provide a comprehensive meta-analytical account of the psychological safety literature). Measures of the related concept of team trust have also proven to be relevant predictors of team performance. For instance, the meta-analysis conducted by Morrissette & Kisamore (2020), which includes 55 independent studies, reveals positive relationships between team trust and team performance across business team types and sizes. Indeed, they find the largest positive associations in studies of "decision-making teams", which, like boards of directors, are characterized by significant informational interdependence and information processing.

Previous studies have also suggested that one key benefit of psychological safety, openness, and trust lies in the fact that they promote "constructive confrontation" within decision-making teams, avoiding the degeneration of task-related divergence into affective conflicts (Edmondson & Lei, 2014; Kanadlı et al., 2020). For example, in an in-depth qualitative analysis of real-life boardroom interactions, Veltrop et al. (2021) report that when board chairs typically appreciated and asked for contributions from colleagues, thus facilitating a psychologically safe climate, task-related disagreements with the CEO developed in a more productive and open way. In contrast, when boards exhibited lower psychological safety, the exchanges were often tense and heated, resulting in quarreling among directors. Similarly, the survey study conducted by Kanadlı et al. (2020) suggests

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that the relationship between task conflict and board task performance is positive and stronger on boards that score higher on their measure of board openness.

We therefore propose that a stronger safety and trust climate (STC) predicts both desirable decision outcomes (DO) and a positive and larger relationship between debate and cognitive divergence (DCD) and DO. We formalize these conjectures in the following complementary hypotheses:

H3: Safety and trust climate (STC) is positively associated with decision outcomes (DO)

H4: The relationship between debate and cognitive divergence (DCD) and decision outcomes (DO) is positively moderated by safety and trust climate (STC).

The sharing of private or unique information and points of view among members has long been recognized as a key element of group decision-making. However, as extensive research based on the "hidden profile" paradigm demonstrates, ensuring effective information sharing is challenging in most small-group settings (Tindale & Kluwe, 2015). Several meta-analytical assessments including dozens of studies with varying methodological and sampling approaches report consistently positive correlations between the degree of unique information sharing and team performance (Stasser & Abele, 2020), thus justifying the following hypothesis:

H5: Information and opinion sharing (IOS) is positively associated with decision outcomes (DO).

Finally, we define a second-order construct named board meeting dynamics (BMD), whose ingredients are the 4 first-order constructs described in Table 1, i.e., BDR, DCD, STC, and IOS. Consistent with the previous hypotheses, we conjecture that this aggregate proxy positively predicts DO:

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H6: Board meeting dynamics (BMD), which combines BDR, DCD, STC, and IOS, is positively associated with decision outcomes (DO).

3.2 THE INTERPLAY AMONG THE COMPONENTS OF MEETING DYNAMICS

We expect that the constructs described in Table 1 are positively associated with one another. Indeed, several channels of mutual reinforcement might be proposed. For example, if board members are usually well prepared/informed and physically capable during meetings and time constraints are not excessively severe, it is plausible that the dynamics of internal debate (e.g., free expression of contrasting views, comfort explicitly disagreeing with managers) and information sharing (e.g., disclosure of potentially relevant unique information) may benefit. Moreover, if well-prepared board members are offered adequate time to express their thoughts and arrive at decisions, this situation might help diffuse tensions and build trust and rapport over time, thus contributing to an improved board climate. Such conjectures motivate the following hypotheses:

H7: Board-level decision readiness (BDR) is positively associated with debate and cognitive divergence (DCD)

H8: Board-level decision readiness (BDR) is positively associated with safety and trust climate (STC)

H9: Board-level decision readiness (BDR) is positively associated with information and opinion sharing (IOS).

A theoretically motivated conjecture supported by a growing body of empirical evidence is that an atmosphere featuring openness, low tension and high trust between the board and the executives should encourage free debate and the sharing of unique information and divergent points of view (e.g., Collins & Smith, 2006; Edmondson & Lei, 2014). Therefore, we hypothesize the following:

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H10: Safety and trust climate (STC) is positively associated with debate and cognitive divergence (DCD)

H11: Safety and trust climate (STC) is positively associated with information and opinion sharing (IOS).

Finally, all else being equal, the amount of unique (initially unshared) information possessed by members of cognitively heterogeneous boards should be greater than the amount of unique information available in cognitively homogenous boards. Thus, the combination of cognitive heterogeneity with the prevalence of free debate, which facilitates the expression of contrasting views (as represented by a greater DCD score), should lead to more sharing of unique information among board members. This conjecture is in line with previous studies in the field of social psychology showing that task conflict triggers greater information exchange (e.g., Farh et al., 2010). Indeed, De Dreu (2006) argues that high levels of task conflict might even lead to excessive information exchange and information overload. This reasoning motivates the following hypothesis:

H12: Debate and cognitive divergence (DCD) is positively associated with information and opinion sharing (IOS).

However theoretically plausible the above hypotheses may be, we refrain from making any strong claims regarding causal paths. One reason for our hesitance in this regard is the possibility of reverse causality and feedback. For example, a high level of trust between the board and the executives could certainly stimulate the free expression of contrasting views during board meetings. However, it is also plausible that consistently allowing for free debate can help increase trust within the boardroom over time. Both arguments are compatible with a positive association between trust and free debate, but the underlying causal direction remains unclear. In addition, both trust and free debate could be caused by unobserved confounders. Unfortunately, we lack exogenous variation

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in our dataset to identify causal parameters reliably. Therefore, although we estimate path coefficients to test the hypotheses and use several control variables and other strategies to mitigate endogeneity, we avoid drawing any strong causal conclusions.

The conceptual models shown in Figure 1, panels A, B, and C, graphically represent theoretically motivated paths corresponding to the hypotheses proposed above. The relationships depicted in panels A and B were actually estimated jointly, i.e., within a single structural equation model. They are shown separately to facilitate visualization. The relationships depicted in panel C were estimated using a separate structural equation model.

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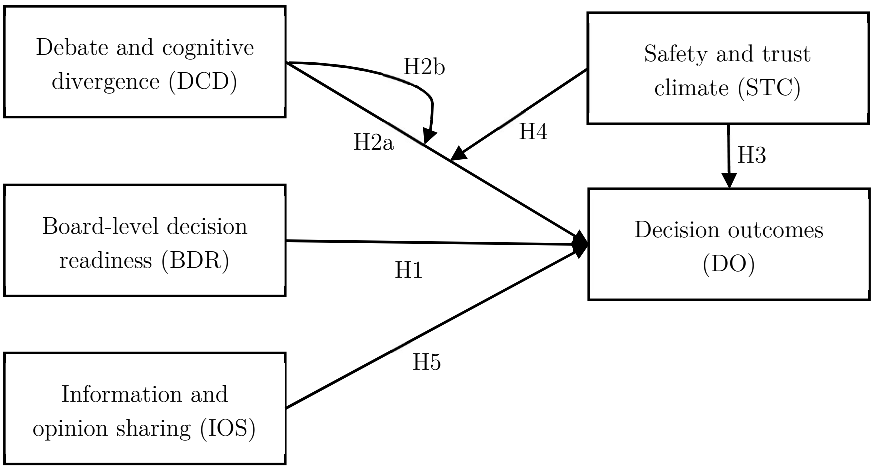
Figure 1 – Conceptual models

Panel A: Meeting dynamics and decision outcomes – First-order constructs



Panel B: The interplay among the components of meeting dynamics

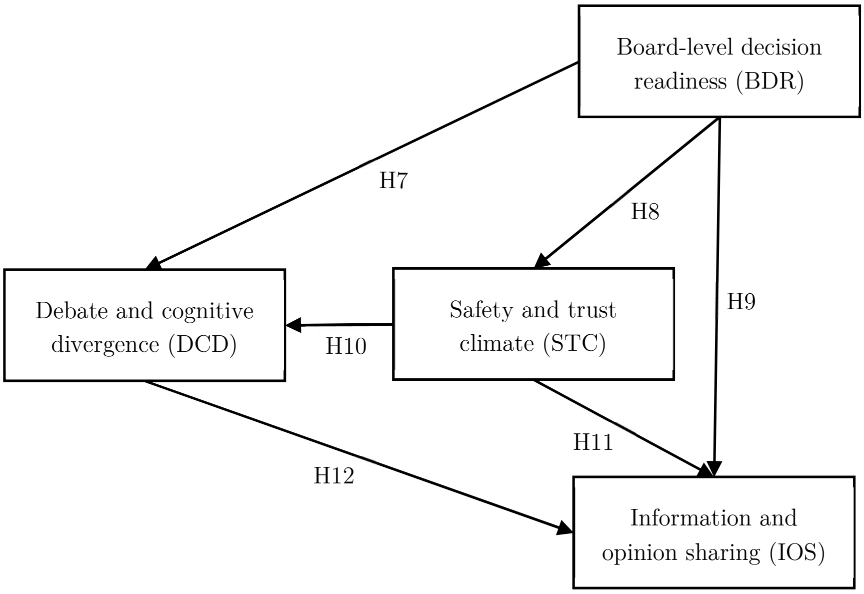


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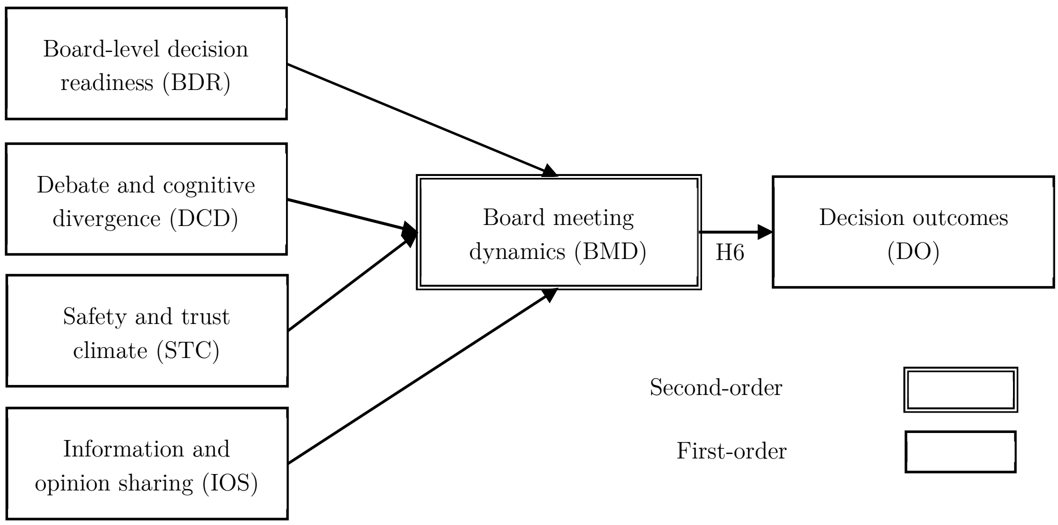
Figure 1 (continued)

Panel C: Meeting dynamics and decision outcomes – Second-order construct



4 METHOD

4.1 INSTRUMENT AND SAMPLE

We developed the web-based survey instrument used in this paper as part of a broader, ongoing research project with the aim of investigating several aspects of board decision-making. This instrument includes items pertaining to board behavior, perceived decision outcomes, board structure and demographics, and organization-level as well as respondent-level characteristics. The complete 52-item questionnaire is available from the authors upon request.

One key challenge of board research is the task of obtaining access to directors, who are frequently very senior and very busy individuals (Leblanc & Schwartz, 2007). Accordingly, we used several strategies to elicit participation and ensure a sufficient number of responses. First, we resorted to our own professional networks. In fact, one of the coauthors is a founding member of the Brazilian Institute of Corporate Governance

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(IBGC) and has more than 27 years of experience working with boards of directors in several countries and engaging with internationally recognized organizations dedicated to advancing the corporate governance debate. Second, we obtained support from the International Finance Corporation (World Bank Group) and the IBGC. These organizations contributed by bringing the survey to the attention of potential respondents on their websites and via newsletters. In addition, we were supported by well-connected directors and governance experts, who offered us access to their international professional networks. Third, we distributed the questionnaire in three versions, i.e., English, Portuguese, and Spanish. In fact, the instrument was originally developed in English and Portuguese and subsequently translated into Spanish. External native speakers revised the survey text in each of the three languages. We also used the back-translation procedure to ensure consistency. We chose Portuguese and Spanish because potential respondents from Latin countries (especially those from South America) were more easily accessible to the authors.

Additional strategies used to increase the number and quality of responses included careful pretesting and pilot testing to refine the wording of the items and reduce the chance of nonresponse due to respondent fatigue; strict assurance of respondent anonymity in the presentation letter; the establishment of clear deadlines for receiving responses alongside reminders sent via email and newsletters; and stimulation of potential respondents' interest in the topic by explaining in the presentation letter the importance of further research on board behavior. Finally, we administered the questionnaire in several rounds during the second half of 2018 (setting a new deadline in each round), thus offering potential respondents a degree of flexibility with regard to the timing of their participation in the survey.

The development of the survey items relied not only on the professional and academic experience of the coauthors but also on extensive feedback collected from actual board

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members and governance experts, which enhanced the instrument's content validity. Specifically, we pretested the questionnaire in English and Portuguese and conducted a pilot study that yielded 30 responses, which were used to refine the choice of items as well as their wording and ordering. Overall, we tried to reduce ambiguity and enhance clarity and readability, thus ensuring that respondents could answer all the questions appropriately while constraining the number of items to reduce respondent fatigue.

The set of procedures described above might not only have enhanced content validity and increased the number of respondents but also mitigated response biases. For example, the assurance of anonymity in our survey should reduce the social desirability bias. In addition, we positioned some of the items related to the same construct separately in the survey, presented items related to the dependent and independent variables in different sections of the questionnaire, and employed various response formats. In summary, we employed most of the procedural remedies recommended in the methodological literature to address response biases (e.g., Podsakoff et al., 2012). In particular, the combination of such procedures gives us confidence that our analysis was not harmed by common method bias (for an updated discussion of this type of bias, see Speklé & Widener, 2018).

We examined the potential for nonresponse bias by comparing early responses (i.e., responses obtained during the first round of data collection, which started in June 2018) with late responses (i.e., responses received during subsequent rounds of data collection) to several of our survey items. Nonparametric and parametric tests of difference in means revealed no systematic differences between early and late responses, thus mitigating concerns regarding nonresponse bias.

We obtained 358 valid responses from board members from 40 different countries, all of whom provided informed consent prior to opening the survey. Unsurprisingly, the sample was highly focused on Latin America, where most of the coauthors' professional network is located. In particular, we obtained a very good sample of directors from Brazil (211

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responses). In contrast, fewer than 15% of responses came from board members based in Africa and Asia combined. More than 45% of the sample represent publicly held companies (more than 70% of which are listed in a stock exchange). More than 38% of the sample represent privately held firms, while nonprofit and cooperative organizations account for approximately 15%. The sample is highly heterogeneous in terms of industry representation. In fact, the organizations to which the respondents referred span all 20 categories of the 2-digit North American Industry Classification System (NAICS). More than half of the organizations included belong to one of the following industries, in descending order: manufacturing; finance and insurance; utilities; transportation and warehousing; retail trade; and educational services. The ownership structures of the sample organizations are also very heterogeneous, with no dominant category. The sample includes, for example, corporations with dispersed ownership, family-controlled firms, and state-owned enterprises.

The survey was sent by the coauthors directly to an international mailing list containing 1,166 board members. If all potential respondents and actual responses were drawn from this pool, the response rate would be 31%. However, the actual response rate is certainly lower because an unknown number of potential respondents were reached via the websites and newsletters managed by our institutional supporters. To comply with the nondisclosure rules followed by our supporters and ensure the anonymity of the respondents, we had no access to their identities. Therefore, we are unable to compute the precise response rate, a cost which we exchanged for the benefit of reaching a broader international pool of board members.

It would be utterly unwarranted to claim that our sample is representative of the population of board members worldwide or of any particular geographical region. First, similar to previous survey-based board studies, we do not have access to a random sample drawn from the entire population of board members. Rather, our sample was drawn from

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the professional networks reached by the coauthors either directly or via the practitioners and institutions that supported this research. Such professional networks are likely to be disproportionately populated by individuals with some level of interest in and knowledge of the corporate governance debate. Therefore, we must refrain from generalizing these results to any population whose characteristics might deviate substantially from those of our sample. To provide some evidence in this respect, we compared the largest subgroup in our sample, which included 73 companies that are reportedly based in Brazil and listed on the local stock exchange (B3), with the population of B3-listed companies in 2018. We note that the median number of board members in our subsample is greater than the median number of board members in the B3 population (9 and 7, respectively; this difference is statistically significant at the conventional levels). Importantly, the distributions of board size, industry affiliation, and ownership structure in our subsample appear to be closer to the distributions of these characteristics in the subpopulation of 136 companies listed (in 2018) on B3's highest corporate governance segment (*Novo Mercado*), thus suggesting that companies with higher governance standards might be overrepresented in our sample. For example, 11% of the companies in our Brazilian subsample are reported to be "dispersedly owned", which is compatible with the proportion of *Novo Mercado* companies whose largest shareholder owned less than 10% of common shares (8%) but less compatible with the corresponding proportion of B3-listed companies in general (4%).

Bearing this limitation in mind, we nevertheless claim that our study scores high in the two main criteria for nonrandom sampling validity discussed in the methodological literature (e.g., Speklé & Widener, 2018), namely, sample prototypicality and sample relevance. Our respondents are plausibly prototypical for our (theory testing) purposes because all of them were (or had been no more than 2 years prior to completing the questionnaire) members of boards of directors and/or advisory boards, as formally required and noted on the cover page of the survey. We explicitly stated that the

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"…questionnaire does not apply to executive/management boards". Therefore, we may be confident that our responses were provided by individuals connected to the groups that are the focus of our theoretical considerations. In addition, our respondents span all of the categories of board participation considered in the survey (i.e., we obtained responses from board chairs; independent members of the board – including lead independent directors; and nonindependent members of the board – either connected with the controlling shareholder or members of the management team, including the CEO). This diversity contrasts with the majority of survey-based board research, which relies exclusively on responses from CEOs (e.g., Kanadlı et al., 2020; Zhang, 2013; Zona & Zattoni, 2007) or, less frequently, board chairs (e.g., Jansen, 2021; McNulty et al., 2013) or a mix of CEOs and board chairs (e.g., van Ees et al., 2008; Van Puyvelde et al., 2018). Finally, as described above, the organizations to which the respondents referred span all of the 20 (2-digit NAICS) industry categories, and all of the categories included in our survey related to either ownership structure or organizational type, including nonprofit organizations and privately held firms. Likewise, our sample is relevant because "…membership in the sample is defined in the same way as membership in the targeted population" (Speklé & Widener, 2018, p. 4), i.e., all responses were provided by actual board members with diverse organizational affiliations and demographic characteristics that correspond to the targeted population. As noted by Blair & Zinkhan (2006, p. 6), this diversity in the sample is crucial to "…enhance the robustness of relational findings".

4.2 ADDITIONAL MEASURES

The variables of interest are depicted in Figure 1, and the items related to the corresponding constructs are described in Table 1 and Table 2. In addition, we selected a host of control variables pertaining to organization- and board-level characteristics, including board demographics, functioning and structure. These control variables include

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industry affiliation; ownership structure (e.g., dispersed ownership, family control, state control, foreign control); type of organization (e.g., privately or publicly held, not-for-profit, stock exchange-listed); country in which the board is located; number of advisory committees of the board; number of yearly board meetings; average duration of meetings; board size; board members' tenure distribution; board member compensation; frequency and type of board evaluation; percentages of women, independent directors, foreign members and members under 40 years old; ethnic and background diversity; CEO duality; independence of chairperson from controlling shareholders and gender of the chairperson. The use of such controls allows us to compare boards with similar characteristics and should mitigate concerns regarding biases stemming from omitted variables that are correlated with decision outcomes and with the variables related to boardroom dynamics. As explained by Speklé & Widener (2018), the inclusion of additional variables also mitigates concerns regarding any remaining common method bias.

In addition to the organization- and board-level characteristics, we used several controls related to respondent-level characteristics, namely, nationality; gender; age; experience as board member; number of directorships, board committee or advisory board participation; existence of professional engagements other than board participation; and position on the board (independent member; nonindependent member – executive director or connected to the controlling shareholders; chairperson; and lead independent director). Such controls allow us to account for potential systematic heterogeneity in perceptions of board behavior and of decision outcomes across respondents' characteristics (see Heemskerk, 2019, for a discussion of this issue). For instance, it is plausible that a respondent who is the chairperson of the board may make a more optimistic assessment of board performance or meeting dynamics than a respondent who is an independent board member. Likewise, perceptions may systematically vary with the age, gender or professional experience of the respondent.

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4.3 CONFIRMATORY COMPOSITE ANALYSIS (CCA)

Our main empirical analysis employed a variance-based structural equation modeling (SEM) approach using the partial least squares (PLS) estimation algorithm and a composite measurement model. The choice of the SEM approach was based on its ability to assess the conceptual models depicted in Figure 1 in a confirmatory way, including tests of construct validity and overall model fit (e.g., Bollen, 1989).

In the context of SEM, three main modeling approaches are designed to connect individual survey items (often called indicators) with a given theoretical construct – understood as "[…]a conceptual term used to describe a phenomenon of theoretical interest" (Edwards and Bagozzi, 2000, p. 156–57). These are the composite, reflective, and causal-formative measurement models. We employed a composite measurement model and thus operationalized the concepts described in Table 1 and Table 2 as emergent variables (for a detailed comparison of the alternative measurement modeling approaches, see Henseler, 2017).

Emergent variables, also referred to as 'composite', 'aggregate' or 'formative' constructs (Henseler & Schuberth, 2020), are computed as linear combinations of individual items; thus, the construct is thought to 'emerge' from them (Benitez et al., 2020). In other words, the composite measurement model functions as a recipe that indicates the way in which ingredients (the individual survey items) should be combined to develop the construct. Therefore, the relationship between indicators and emergent variables is definitional. Importantly, the individual components of the emergent variables may or may not be highly correlated with each other, and dropping one component may change the meaning of the variable, in contrast with latent variables, whose components are all supposed to be highly correlated and interchangeable (Henseler, 2017). A composite measurement model is especially useful for operationalizing a 'design concept' or

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‘artifact’, understood as “[…]a human- or firm-made object composed of its ingredients” (Benitez et al., 2020, p. 3). This type of construct is not assumed to exist in nature but rather originates from “[…]theoretical thinking and/or theoretically justified constructions usually made to fulfill a certain purpose” (Benitez et al., 2020, p. 3). We believe that the variables of interest in this research may be adequately construed as emergent variables. For example, the decision outcomes (DO) composite aggregates items that are related to board decisions but are not necessarily highly correlated, such as the degree of creativity and ethicality in the decision-making process. Rather, a desirable configuration of DO may emerge from the combination of creative and ethically sound decisions made by the board.

A well-developed framework that enables the estimation and assessment of structural equation models featuring emergent variables, which is named confirmatory composite analysis (CCA), has been recently established (Schuberth et al., 2018). CCA is analogous to well-known confirmatory factor analysis (CFA). The only difference between CCA and CFA is that the former is designed to assess emergent variable structures, whereas the latter is designed to assess latent variable structures (Benitez et al., 2020). CCA has spread rapidly through many areas of business research in recent years, including knowledge management, family firms, marketing, service management, information systems research, and project management (e.g., Benítez-Ávila et al., 2018; Pittino et al., 2018; Ruiz-Palomo et al., 2019; a longer list of recent applications is found in Schuberth, 2020, and Henseler, 2021).

5 EMPIRICAL ANALYSIS

5.1 MAIN RESULTS

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Our first baseline structural equation model (SEM1) includes all relationships corresponding to the hypotheses presented in section 3 and depicted in Figure 1, Panel A and Panel B. Therefore, these relationships were estimated simultaneously. Additionally, SEM1 does not include control variables. As shown in Table 3, columns (1)-(4), the estimates obtained from SEM1 are mostly compatible with our research hypotheses. In particular, these estimates indicate strong support for the hypotheses connecting board-level decision readiness (BDR) to decision outcomes (DO) and to the remaining variables related to board meeting dynamics (H1, H7, H8, and H9). Safety and trust climate (STC) is also strongly associated with DO, debate and cognitive divergence (DCD), and information and opinion sharing (IOS), in accordance with H3, H10, and H11. In addition, the results indicate a positive relationship between DCD and information and opinion sharing (IOS), as postulated by H12. In contrast, the estimated path coefficients of the nonlinear terms (squared DCD and DCD $\times$ STC) are small and not statistically significant at the conventional levels. Therefore, the findings indicate little evidence in support of H2b and H4. Since these redundant nonlinear terms introduce substantial multicollinearity in SEM1, we proceeded to estimate an alternative structural equation model (SEM2) that is identical to SEM1 except for the exclusion of nonlinear terms. The results of the partial least squares regression featuring DO as the dependent variable are shown in column (5) (the remaining path coefficient estimates in SEM2, featuring STC, DCD, and IOS as dependent variables, are identical to SEM1). The estimates in SEM2 confirm the inferences obtained from SEM1 but lend considerably more support to H2a and H5 regarding the associations between DO and both DCD and IOS, since their path coefficients become statistically significant at the 10% and 5% levels, respectively. The path coefficient estimate for IOS also increases in magnitude by approximately 22%.

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Table 3 – Baseline PLS-SEM estimates – first-order constructs

Variables	(1) DO	(2) STC	(3) DCD	(4) IOS	(5) DO
Board-level decision readiness (BDR)	0.376***	0.725***	0.165**	0.241***	0.369***
	(0.064)	(0.038)	(0.071)	(0.066)	(0.062)
Debate and cognitive divergence (DCD)	0.090			0.205***	0.090*
	(0.056)			(0.058)	(0.048)
DCD × DCD (quadratic term)	-0.004				
	(0.042)				
Safety and trust climate (STC)	0.317***		0.461***	0.380***	0.325***
	(0.071)		(0.076)	(0.070)	(0.067)
DCD × STC (interaction term)	-0.071				
	(0.045)				
Information and opinion sharing (IOS)	0.087				0.106**
	(0.054)				(0.053)
No. of observations	309	309	309	309	309
R-squared	0.614	0.525	0.351	0.517	0.608
Adjusted R-squared	0.607	0.523	0.346	0.512	0.602

Note: This table shows the coefficient estimates and standard errors (in parentheses) from two variance-based structural equation models (SEM) using the partial least squares path modeling (PLS-PM) as the weight estimator. The estimates from the first structural equation model (SEM1) are shown in columns (1) through (4). The second model (SEM2) is identical to the first, except that it excludes the two nonlinear (quadratic and interaction) terms from the regression explaining the dependent variable decision outcomes (DO). The table shows, in column (5), the estimates from SEM2 corresponding to the regression explaining DO. The estimates for the remaining path coefficients from SEM2 are identical to SEM1. All constructs are modeled as composites using the Mode B algorithm (regression weights) and all variables are standardized. Standard errors for the path coefficients are bootstrapped using 399 resamples. In addition to DO, the dependent variables are safety and trust climate (STC); debate and cognitive divergence (DCD); and information and opinion sharing (IOS). The survey items defining these composites are described in Table 1 and Table 2. *, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

Our next set of estimates are based on SEM2 augmented with control variables, allowing us to account for potential confounders among the organization-, board-, and respondent-level characteristics collected by our survey and described in section 4.2. Our criteria for selecting controls adheres to the latest methodological recommendations and avoided the inclusion of control variables that could be framed as mediators or colliders (e.g., Cinelli et al., 2020; Whited et al., 2022). Specifically, we considered as potentially relevant controls all characteristics addressed in the survey that could plausibly influence the

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dependent variables and the explanatory variables of interest simultaneously. In the absence of reliable theoretical guidance regarding which of the potential confounders available in our dataset should be viewed as relevant, we were faced with a potentially high-dimensional selection problem. In fact, we could include dozens of characteristics related, for example, to board and respondent demographics (e.g., the proportion of board members under 40 years old or the position of the respondent on the board, such as chairperson or lead independent director) or to organizational features (e.g., sets of dummy variables related to ownership structure or the country in which the board is located) plus polynomial or interaction terms (e.g., board size and its squared values, the interaction of the number of board meetings and the average duration of meetings). To avoid the inclusion of redundant and irrelevant controls and unstable estimates due to excessive collinearity and overfitting, we employed an advanced machine learning procedure named postdouble-selection (PDS) (e.g., Belloni et al., 2012; Belloni et al., 2014), which uses the Lasso – Least Absolute Shrinkage and Selection Operator (Tibshirani, 1996), a method of choice for estimating sparse high-dimensional models. The PDS procedure is solidly grounded in statistical theory and has performed remarkably well in simulation studies (e.g., Blackwell & Olson, 2021).

To illustrate this procedure, consider a hypothetical original regression model featuring, on the left-hand side, a dependent variable and, on the right-hand side, a small set of predetermined explanatory ('independent') variables of interest. Using the PDS algorithm to select a sparse set of relevant controls from a large, potentially high-dimensional set of (mostly irrelevant) variables entails three steps: (i) estimate a Lasso regression in which the large set of control variables are used to explain the original dependent variable (excluding the predetermined explanatory variables of interest); (ii) estimate Lasso regressions in which the large set of control variables are used to explain each of the explanatory variables of interest; and (iii) select the final set of control variables from the union of the smaller sets of right-hand-side variables selected in steps

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(i) and (ii) and re-estimate the original model while including the final set of control variables. In other words, the postdouble-selection procedure favors only control variables that are relevant predictors of both the original dependent variable and of each of the explanatory variables of interest, thus discarding all irrelevant and redundant controls.

In our first application, the dependent and independent variables of interest were the composites resulting from SEM2 (alternatively, we constructed these composites using equal weights; in both cases, the same set of controls was selected by the PDS algorithm). The initial set of controls comprised 93 variables, including 21 industry dummy variables, 6 dummy variables related to ownership structure, 5 dummy variables related to the type of organization, 4 dummy variables related to the region of the world where the board is located, several variables related to board- and respondent-level characteristics as well as polynomial terms (e.g., squared values of board size, meeting duration, percentage of independent board members) intended to capture conceptually plausible nonlinear relationships. The PDS procedure was then applied to the regressions corresponding to columns (2)-(5) shown in Table 3, resulting in the selection of 10 or 9 controls depending on the regression model used. Only one polynomial term was selected, i.e., the squared background diversity indicator. The complete set of selected variables is shown in Table 4. Interestingly, none of the organization-level characteristics included in the initial set were identified as relevant controls. Therefore, our inferences are not driven by unaccounted heterogeneity related, for instance, to ownership structure, industry or type of organization.

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Table 4 – Control variables selected using the postdouble-selection (PDS) procedure

Variable	Survey item or computation procedure	Scale
Background diversity	"… taking into account other aspects of diversity such as education, knowledge, positions held, operating in different sectors of activity, different experiences and outlooks, what is the level of diversity of your board?"	(1) Very diverse (5) Not at all diverse
Board compensation	"Do the board members receive enough compensation to ensure the required level of dedication?"	(1) I totally disagree (5) I totally agree
Board evaluation frequency	"The board carries out a regular evaluation of its performance:"	(1) Never (5) Annually
Percentage of independent board members	Reported number of independent board members divided by board size	0-1
Percentage of foreign board members	Reported number of foreign board members divided by board size	0-1
Respondent's age	"How old are you? (in years)"	(1) 30 or less (8) 80 or over
Respondent's experience as board member	"How many years of experience do you have as a board member considering your entire career?"	Number of years
Respondent's committee participation	"How many board committees are you on at the present time considering all your board seats?"	Number of committees
Respondent is the chairperson	Binary variable equal to 1 if the respondent is the chairperson of the board and zero otherwise	Dummy variable

Note: The initial set of control variables comprised 93 variables, including organization-, board-, and respondent-level characteristics, and polynomial terms. The post-double-selection (PDS) procedure (Belloni et al., 2012) is implemented in the Stata package 'pdslasso' (Ahrens et al., 2018). The table describes the corresponding survey item or the procedure used to construct the variable.

After the selection of the relevant control variables using PDS, we estimated the augmented structural equation model SEM3, as shown in Table 5. Unsurprisingly, the path coefficient estimates for the variables of interest are, in most cases, slightly smaller

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in SEM3 than in SEM2. Nevertheless, the new estimates retain their practical as well as statistical significance (all estimates are significant at least at the 10% level), suggesting that our inferences are robust to the inclusion of the potential confounders available in our dataset. It is worth noting that SEM3 estimates suggest that board chairs tend to be more optimistic than other board members regarding all dependent variables. For example, decision outcomes scores are higher, on average, when the respondent is the chairperson. Similarly, Jansen (2021, p. 1347) states that, in his sample of chair-only respondents, "…chairs rate their boards rather high in terms of board effectiveness". Thus, our estimates suggest that collecting responses from a diverse pool of board members serving in different capacities might be important to obtain a more accurate and less biased picture of board behaviors and performance.

Table 5 – PLS-SEM estimates including control variables – first-order constructs

Variables	(1) DO	(2) STC	(3) DCD	(4) IOS
Board-level decision readiness (BDR)	0.298***	0.638***	0.174**	0.221***
	(0.055)	(0.046)	(0.071)	(0.070)
Debate and cognitive divergence (DCD)	0.090*			0.205***
	(0.050)			(0.061)
Safety and trust climate (STC)	0.309***		0.409***	0.360***
	(0.065)		(0.075)	(0.073)
Information and opinion sharing (IOS)	0.083*			
	(0.048)			
Control variables	Yes	Yes	Yes	Yes
No. of observations	309	309	309	309
R-squared	0.648	0.568	0.401	0.538
Adjusted R-squared	0.632	0.554	0.379	0.518

Note: This table shows the coefficient estimates and standard errors (in parentheses) from a variance-based structural equation model (SEM3) using the partial least squares path modeling (PLS-PM) as the weight estimator. The dependent variables are: Decision outcomes (DO); safety and trust climate (STC); debate and cognitive divergence (DCD); and information and opinion sharing (IOS). They are further described in Table 1 and Table 2. The constructs shown in this table are modeled as composites using the Mode B algorithm (regression weights) and all variables are standardized, including controls. The control variables, selected using the post-double-selection (PDS) machine learning procedure (Belloni et al., 2012), are: background diversity and squared background diversity; board compensation; board evaluation frequency; percentage of independent board members; percentage of foreign board members; respondent's age; respondent's experience as board member; respondent's committee participations; respondent is the

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chairperson. These variables are further described in Table 4. All selected controls are included in the regressions shown in columns (1) and (4). The regressions shown in columns (2) and (3) include the same controls except for respondent's committee participations. Standard errors for the path coefficients are bootstrapped using 399 resamples. *, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

We proceeded to test H6 by estimating structural equation models corresponding to the conceptual model depicted in Figure 1, Panel C, which features the second-order construct board meeting dynamics (BMD). Table 6 shows the main regression estimates both without control variables in column (1) and including the controls selected using the PDS algorithm in column (2). In both cases, the estimates are compatible with H6, indicating that BMD strongly predicts decision outcomes (DO). Indeed, the R-squared from the regression featuring BMD alone is greater than 0.6. Even after the inclusion of all relevant controls, as shown in column (2), the path coefficient point estimate reveals that a 1 standard deviation (SD) increase in BMD is associated with an increase in DO of approximately 0.7 [0.59; 0.78] SD (95% confidence interval in brackets).

The remaining columns in Table 6 show regressions featuring each of the four composites used to construct BMD. These regressions include controls specifically selected for each regression using the same PDS procedure. These models allow us to determine which of the four components of BMD is the strongest or weakest predictor of DO. Consistent with the results shown in Table 3 and Table 5, it becomes apparent from Table 6 that board-level decision readiness (BDR) and safety and trust climate (STC) are the strongest predictors of DO, exhibiting coefficient estimates with similar magnitudes. Conversely, debate and cognitive divergence (DCD) and information and opinion sharing (IOS) are less relevant as predictors of DO (although they remain substantially associated with it) and also exhibit coefficient estimates with similar magnitudes. Unsurprisingly, the estimates shown in Table 6, columns (3)-(6), are much greater in magnitude than the estimates shown in Table 5, column (1), in which context all four composites are included in a single regression. The reason underlying these differences is that BDR,

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STC, DCD, and IOS are all positively and significantly correlated (all correlations exceed 0.5), which also explains why the estimates shown in Table 6 are associated with much larger t-statistics. Notably, comparing column (2) with columns (3)-(6) in Table 6 demonstrates that the R-squared is greatest when the main regressor is BMD, thus suggesting that each of its four components adds substantial explanatory power.

Table 6 – PLS-SEM estimates – second-order construct and its components

Variables	(1) DO	(2) DO	(3) DO	(4) DO	(5) DO	(6) DO
Board meeting dynamics (BMD)	0.781*** (0.035)	0.683*** (0.048)				
Board-level decision readiness (BDR)			0.590*** (0.045)			
Debate and cognitive divergence (DCD)				0.395*** (0.059)		
Safety and trust climate (STC)					0.613*** (0.053)	
Information and opinion sharing (IOS)						0.451*** (0.054)
Control variables	No	Yes	Yes	Yes	Yes	Yes
No. of observations	309	309	309	309	309	309
R-squared	0.610	0.647	0.581	0.449	0.599	0.487
Adjusted R-squared	0.609	0.635	0.570	0.434	0.587	0.472

Note: This table shows the coefficient estimates and standard errors (in parentheses) from variance-based structural equation models using the partial least squares path modeling (PLS-PM) as the weight estimator. The dependent variable is decision outcomes (DO). The constructs shown in this table are modeled as composites using the Mode B algorithm (regression weights) and all variables are standardized, including controls. The dependent variable and the explanatory variables – Board-level decision readiness (BDR), debate and cognitive divergence (DCD), safety and trust climate (STC), and information and opinion sharing (IOS) are further described in Table 1 and Table 2. The explanatory variable board meeting dynamics (BMD) is modeled as a second-order construct composed of BDR, DCD, STC, and IOS. Different sets of control variables, selected using the post-double-selection (PDS) machine learning procedure (Belloni et al., 2012), were used in the regressions. Controls included in equations (2)-(6): background diversity and squared background diversity; board compensation; board evaluation frequency; respondent's age; and respondent's experience as board member. In addition: equations (2) and (6) include respondent's committee participations; equations (2), (5), and (6) include respondent is the chairperson; equation (3) includes percentage of foreign board members; equations (4) and (5) include percentage of independent board members; and equation (2) includes squared respondent's experience as board member. These variables are further described in Table 4. Standard errors for the path coefficients are bootstrapped using 399 resamples. *, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

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We used a battery of diagnostic procedures to assess validity, admissibility, and overall model fit in the context of our confirmatory composite analysis, following the recommendations in the recent CCA literature (Benitez et al., 2020; Henseler, 2021; Henseler & Schuberth, 2020; Schuberth et al., 2018). In terms of admissibility, we checked the convergence of the algorithm used to compute weights alongside other technical conditions, including the admissibility of all bootstrap replications. Next, we checked the signs, magnitude and statistical significance of all the estimated composite weights, ensuring that they reflect the contribution of the individual survey items to their corresponding composite in accordance with our theoretical expectations. Indeed, in all cases, the weight estimates were positive and, with very few exceptions, significantly different from zero in a statistical sense. Whenever we found weights that failed to pass the conventional significance thresholds, we checked the magnitudes and statistical significance of their estimated loadings. For example, although two of the estimated weights from SEM2 were not statistically significant at the conventional levels, their loadings were positive and statistically significant at the 1% level, indicating that these indicators substantially correlate with their corresponding composites, thus justifying their presence in the empirical analysis. In addition, we conducted the empirical analysis once again after removing all survey items associated with nonsignificant weights. In all cases, these exercises yielded identical conclusions. Finally, we checked the variance inflation factor (VIF) computed for each weight. Since all of the VIFs are below 5, multicollinearity among the estimated weights is not a major concern in our context (Benitez et al., 2020). The same conclusion applies to the VIFs computed to assess multicollinearity among the composites in SEM2, thus suggesting that multicollinearity does not harm our main inferences.

Importantly, we conducted formal tests of overall model fit. The null hypothesis of these tests is that the model-implied covariance matrix of the indicators (the survey items used to construct the composites) equals the population covariance matrix of the same

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indicators. The results from the application of the test of overall model fit to the structural equation model SEM2 are shown in Table 7. We failed to reject the null hypothesis at the 1% and 5% significance levels because all of the test statistics fell below the 99% and 95% critical values of their bootstrapped reference distributions. These inferences lend considerable support to our modeling choices, indicating that the restrictions imposed by the proposed structural equation model are broadly compatible with the data. Similarly, the computed standardized root mean square residual (SRMR) is much lower than 0.8, which indicates an acceptable model fit according to preliminary methodological recommendations (e.g., Benitez et al., 2020).

Similar conclusions were reached when the test of overall model fit was applied to the structural equation model featuring the second-order construct board meeting dynamics (BMD), thus suggesting that this modeling proposition is also broadly compatible with the data.

Table 7 – Confirmatory composite analysis: Test of overall model fit for SEM2

		Critical value	
Distance measure	Test statistic	95%	99%
Geodesic distance (dG)	0.0720	0.0820	0.0979
Standardized root mean square residual (SRMR)	0.0342	0.0344	0.0371
Squared Euclidean distance (dL)	0.1586	0.1606	0.1871
Distance based on the maximum likelihood fit function (dML)	0.3714	0.4179	0.4852

Note: The distance measures shown in the table measure the discrepancy between the sample indicator correlation matrix and the estimated model-implied indicator correlation matrix. The indicators correspond to the survey items assigned to the composites used in the estimation of the structural equation model SEM2 (see Table 3). The reference distribution for the test statistic corresponding to each distance measure is obtained using the bootstrap with 399 replications. The null hypothesis that the model-implied indicator covariance matrix equals the population indicator covariance matrix is rejected at the 5% (1%) significance level when the test statistic is greater than the 95% (99%) critical value from its bootstrapped reference distribution (for more details, see Henseler, 2021). The tests were computed using the R package 'cSEM' (Rademaker & Schuberth, 2020).

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We extended the empirical analysis to assess the explanatory and predictive ability of the individual survey items used as components of the composites described in Table 1. These exercises show, for example, that the survey item related to the perceived degree of preparation of board members during meetings is the single most important predictor of decision outcomes (DO). Additionally, the most relevant predictors of DO include the board members' level of comfort disagreeing with those who have the most power in the organization; the perception of trust between the board and the executives; the perception that the amount of time that the board has to make decisions is less than the amount of time it needs to do so; and the level of dissention at board meetings (free debate, including the expression of contrasting views). Notably, the ability of these items to predict DO exceeds that of any other survey item or variable available in our dataset. In contrast, some of the survey items described in Table 1 are much less relevant predictors of DO (although their path coefficients are significantly different from zero), in particular, the perceived degree of heterogeneity among board members in terms of perspectives and thinking styles, the perceived degree of information sharing among board members, and the perceived degree of resistance to new ideas or approaches proposed by new board members. In addition, we assessed the ability of the composites and items described in Table 1 to predict each of the survey items used as components of DO, as described in Table 2. Notably, board meeting dynamics (BMD) and each of its components strongly predict each of the components of DO.

5.2 ADDITIONAL ANALYSES

We conducted several unreported additional analyses to complement our inferences or to assess their robustness. For example, we reran the postdouble-selection (PDS) algorithm after including hundreds of interaction terms involving board- and respondent-level variables (e.g., respondent's age multiplied by board size) in the initial set of controls.

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Under this specification, the initial set increased from 93 to 828 controls. Compared with the applications described in section 3.4, the PDS algorithm selected a slightly greater number of controls, including interaction terms. Nevertheless, adding these controls to the structural equation models did not materially affect the estimates. Alternatively, we ignored the PDS procedure altogether and directly included all available organization-level variables as controls, including industry and ownership structure dummy variables. Again, this empirical strategy did not change our inferences, despite the fact that it introduced greater multicollinearity.

Previous research has shown that treating ordinal 5-point Likert-type items as continuous indicators in the estimation of structural equation models is acceptable (e.g., Henseler, 2021; Rhemtulla et al., 2012) because it does not introduce substantial bias. However, in some of our analyses, we used individual 5-point survey items not as observed indicators of emergent variables but as either standalone dependent or independent variables, which might give rise to the suspicion of inference errors stemming from inappropriately treating ordinal variables as continuous variables. To address this concern, we transformed all Likert-type items used as standalone variables into binary variables. For example, instead of using the original survey item capturing perceived background diversity within the board on a scale ranging from '1' ("very diverse") to '5' ("not at all diverse"), as described in Table 4, we used a dummy variable that was equal to 1 if the assigned score was either '1' or '2' and 0 otherwise. We then estimated regression models using these dummy variables in place of the original 5-point items whenever they were used as individual explanatory or control variables or as the dependent variable (employing the probit estimator in the latter case). These exercises yielded qualitatively similar results, suggesting that our inferences are robust to this type of misspecification.

5.3 SUMMARY AND DISCUSSION OF EMPIRICAL FINDINGS

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The empirical analysis reveals a strong positive association between our proxy for board meeting dynamics (BMD) and the decision outcomes (DO) composite even after accounting for the organization-, board-, and respondent-level characteristics used as control variables. One way to determine the practical significance of this result is to compute Cohen's f^2 measure, which compares the coefficient of determination (R-squared) of regressions including and excluding the explanatory variable of interest. As a rule of thumb, Cohen (2013) suggests that values of f^2 greater than 0.35 are indicative of a "strong effect". Considering the model with selected controls shown in Table 6, column (2), the f^2 measure for BMD is approximately 0.91. Moreover, BMD is positively associated with each component of DO. For example, a one SD increase in BMD predicts an approximately 0.6 SD [0.52; 0.68] (95% confidence interval in brackets) improvement in the perceived creativity of board decisions, a 0.47 SD [0.38; 0.57] improvement in perceived ethicality (i.e., the absence of ethically questionable decisions), a 0.73 SD [0.67; 0.80] improvement in overall satisfaction with board decisions, and a 0.72 SD [0.66; 0.78] improvement in perceived board decision-making performance. In other words, increasing BMD predicts a greater likelihood of observing responses that indicate greater satisfaction with the decisions made by the board on the part of board members as well as an enhanced perception that decisions tend to be creative/innovative and ethically sound.

Each of the four composites that form BMD contribute significantly to its explanatory power. However, the composites board-level decision readiness (BDR) and safety and trust climate (STC) clearly stand out in this context. Moreover, in addition to exhibiting lower explanatory power, the composites debate and cognitive divergence (DCD) and information and opinion sharing (IOS) have greater average and median values in our sample than either BDR or STC, suggesting that the latter have more room for improvement and should thus be prioritized. In addition, further analysis focusing on the components of BDR and STC suggests that DO may be particularly enhanced in

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boardrooms in which members are well prepared, have adequate time to make decisions, feel comfortable disagreeing with others, and trust the executives.

We also provide evidence regarding the interplay among the components of meeting dynamics based on the hypothesized relationships depicted in Figure 1, Panel B. The estimates based on our structural equation models show that BDR, STC, DCD, and IOS are positively associated with each other and that all path coefficients remain statistically and practically significant after accounting for a host of potential confounders. Moreover, the test of overall model fit shows that the restrictions imposed by our modeling choices, including the proposed unidirectional paths connecting these constructs, are broadly compatible with the data.

These models also allow us to estimate the so-called 'indirect effect' and 'total effect', thereby assessing potential mediation channels that are compatible with the conceptual model (despite this terminology, we note that attaching a causal interpretation to these estimates is questionable, as discussed above). For example, the estimates associated with model SEM3 are compatible with the conjecture that BDR positively influences all other components of BMD. Therefore, BDR is related to DO both directly via its estimated path coefficient – as shown in Table 5, column (1) – and indirectly via the interactions of the path coefficients connecting BDR to STC, DCD, and IOS and those connecting STC, DCD, and IOS to DO. This 'indirect effect' of BDR is almost as large as its 'direct effect'. In addition, the estimated 'indirect effect' is statistically significant at the 1% level. Consequently, the estimated 'total effect' from BDR to DO (0.58 [0.49; 0.68]) is much larger than the path coefficient estimate shown in Table 5. A smaller 'indirect effect' was found for STC via the path coefficients connecting it to DCD and IOS, yielding a 'total effect' estimate for STC of 0.38 [0.25; 0.52]. We found qualitatively similar results in all alternative specifications. These findings are compatible with the conjecture that the influence of BDR on DO is partially mediated by the influence of BDR on STC, DCD, and IOS. Such a mediation channel is also termed 'complementary'

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because both the direct and indirect effects are positive (Henseler, 2021; Zhao et al., 2010). An analogous interpretation applies to STC. In addition, this analysis reveals that, accounting for all possible mediation channels in our models, BDR stands out as a particularly relevant predictor of DO, despite the fact that the 95% bootstrapped confidence intervals of the 'total effects' of BDR and STC overlap, indicating that their difference is not statistically significant at the 5% level.

6 CONCLUDING REMARKS

This research contributes to the literature on board behavior and performance by showing that enhancing board-level decision readiness (BDR) may be a critical step toward the improvement of board behavior and dynamics and, ultimately, board decisions, a point which is in line with the current debate on debiasing and decision-making. Therefore, to foster healthy board dynamics and satisfactory decision-making, it might be particularly relevant to ensure that board members are well prepared/informed and physically capable during meetings and to reduce the gap between the time available to make important decisions and the time deemed necessary to conduct appropriate discussions. Likewise, our results suggest that improving psychological safety and promoting a climate of trust between board members and executives might contribute substantially to the attainment of more desirable decision outcomes.

Our results also complement and broadly align with previous survey-based board research. For example, Heemskerk (2019) offered a comprehensive meta-analytical assessment of 17 published articles featuring surveys of CEOs or board members inspired by the seminal work of Forbes & Milliken (1999), concluding that all three constructs

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pertaining to board processes and behavior, namely, effort norms, cognitive conflict, and use of knowledge and skills, are positively associated with perceived board performance. In addition, this author shows that the coefficient estimates for cognitive conflict are much lower and less precisely estimated than the estimates pertaining to the other constructs, which is compatible with the weaker results associated with our debate and cognitive divergence (DCD) variable. In addition, most previous papers have shown that the operationalized constructs related to board behavior and dynamics have greater explanatory power than the demographic and structural characteristics of boards. Our evidence supports this pattern, suggesting that measures related to meeting dynamics do a better job of explaining decision outcomes than many organization- or board-level characteristics that are more commonly examined in the broader corporate governance literature.

Interestingly, our results show that a greater board meeting dynamics (BMD) score predicts a lower frequency of decisions that are perceived to be ethically questionable. Such evidence, which is consistent across the four constructs that constitute BMD, is novel in the aforementioned literature, which focuses mostly on board task performance. This evidence expands this literature by showing that improving board dynamics might facilitate the satisfactory resolution of ethically charged debates and reduce the susceptibility of the board to ethical blind spots. It is also consistent with individual-level behavioral research showing that ill-prepared and time-constrained people are more likely to make unethical decisions (Ordóñez et al., 2015).

This research also pioneers the combined application of confirmatory composite analysis (CCA) with machine learning procedures in the board literature and might be fruitful for advancing the methodological debate in the field. In particular, CCA facilitates the estimation and rigorous assessment of structural equation models featuring constructs that are modeled either as latent variables (the dominant approach in the board research literature) or as emergent variables. The constructs of interest for this research were

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modeled as emergent variables in line with recent methodological developments that put the traditional latent variable modeling approach into question in empirical settings that are analogous to ours (e.g., Rhemtulla et al., 2020). Finally, we contribute to the literature by providing evidence based on information provided by actual board members regarding the relationships between elements of board dynamics and decision outcomes in previously understudied jurisdictions. In particular, we provide novel evidence for boards based in Brazil and South America, from which most of our responses are drawn.

Despite the growth of this research agenda, advancing our knowledge of the inner workings of boards and its consequences still poses significant challenges. For instance, as noted elsewhere (e.g., Heemskerk, 2019), quantitative studies of board behavior usually fail to address endogeneity concerns to move beyond associations and support causal claims more credibly. On this front, future research could combine survey data with plausibly exogenous shocks to board dynamics. These shocks could include, for example, regulatory changes affecting board composition (e.g., mandates regarding gender balance or the proportion of independent directors) or unexpected technological shifts (e.g., remote meetings held during the COVID-19 pandemic) that lead to predictable changes in the patterns of interactions among board members. Longitudinal data regarding the evolution of such patterns within boards could also help disentangle associations from causal effects. Other challenges for future research include improving construct measurement as well as the size and representativeness of samples drawn from the notoriously difficult-to-access population of board members. Overcoming such challenges is not trivial but it seems to be worth the effort in light of the accumulating evidence suggesting that boardroom dynamics represents a key driver of board performance.

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