

Master Thesis Strategic Management

Peeking inside the ‘black box’: influence of director contribution on board effectiveness and the moderating effects of facial expressions in general board meetings



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Introduction

The board of directors represents the highest legal authority in an organization and is a crucial strategic-decision making group (Boivie, Bednar, Aguilera, & Andrus, 2016; Forbes & Milliken, 1999). Therefore, boards have to engage and intervene in their monitoring and resource provision roles. These roles are the board's influence on organization outcomes (Boivie et al., 2016; Forbes & Milliken, 1999; Kumar & Zattoni, 2017). A vast amount of literature in corporate governance has been devoted to identify factors how boards can effectively execute their roles (Guerrero, Lapalme, Herrbach, & Séguin 2017). Among these factors, composition characteristics, such as size, age, gender, and role independency, have been often linked to firm performance (Khanna, Jones, & Boivie, 2014). However, their effects have received mixed support and resulted in questioning the exclusive relevance of these characteristics (Boivie, et al., 2016; Dalton, Hitt, Certo, & Dalton, 2007).

In many studies on boards, claims were made based on board composition input variables to output variables like organization performance, but without direct evidence on interfering processes and mechanisms (Forbes & Milliken, 1999; Guerrero et al., 2017; Pettigrew, 1992). These studies have 'black box' problems and provide little evidence on how it affects organization outcomes because underlying mechanisms were disregarded (Hoobler, Masterson, Nkomo, & Michel, 2016; Lawrence, 1997). In the literature, it is often presumed that demographic characteristics can influence cognition, behavior, and the decision-making process of directors and thus can have an effect on board effectiveness (Boivie et al., 2016; Forbes & Milliken, 1999).

Information elaboration and behavioral processes have often been considered to be emergent processes of diversity in groups (Van Knippenberg, De Dreu, & Homan, 2004; Williams & O'Reilly, 1998). These team-level processes include behavioral processes such as communication/information exchange, task-related debate, and emergent cognitive/affective states (Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Roh, Chun, Ryou, & Son, 2018). A closer look at what is actually happening in boardrooms is necessary to understand how boards can be more effective in their tasks (Forbes & Milliken, 1999; Guerrero et al., 2017; Hambrick, 2007; Hambrick, Werder, & Zajac, 2008). However, this setting has rarely been studied directly due to limited access. This study aims to make a contribution in opening the 'black box' by observing behavioral processes of board directors within the boardroom.

This study will take on social-psychology and group-dynamic theories, the reason being that board effectiveness most likely relies on processes concerning participation, involvement, information sharing, and discussions (Forbes & Milliken, 1999; Milliken & Vollrath, 1991; Zattoni, Gnan, & Huse, 2015). Multiple researchers have acknowledged that boards function as groups and have many characteristics in common with decision-making teams and are exposed to similar dynamics (Forbes & Milliken, 1999; Payne, Benson, & Finegold, 2009). Therefore, this research will elaborate on the process of information elaboration, involving frequency of communication, the exchange of task-related information, and integration of different opinions of directors (Van Knippenberg et al., 2004; Williams & O'Reilly, 1998). For both the control and service tasks of boards, substantial communication and deliberation is required because of the notion of bounded rationality, implying that directors do not have complete information on possible solutions for the problems that occur due to limited cognitive capacity (Gavetti, Greve, Levinthal, & Ocasio, 2012; Khanna et al., 2014). Therefore, the focus will be on director participation and involvement, hereafter referred to as the concept of director contribution

Moreover, interpersonal dynamics tend to affect the information-processing capability of boards (Boivie et al., 2016). The aim of this study is to investigate if affect display through facial expressions can affect an effect between director contribution and board effectiveness. Affect display is a critical component in social interaction and not yet elaborated on in board research. Therefore, it will contribute to a new perspective on boards. Affect displays are movements of the body that can express internal emotion states and has the ability to reveal information about a person's intentions (Barsade & Knight, 2015). Moreover, it can influence other group members, improving cooperation, cohesion and enhanced decision-making (Barsade, 2002; Knight & Eisenkraft, 2015). Conversely, it was found that it can also have the downside of leading to inertia and result in delays in the decision-making process (Liu & Maitlis, 2013; Maitlis & Ozcelik, 2004). Hence, it is of interest to illuminate this unexplored area in the context of boards.

Therefore, the central research question in this study is:

“What is the influence of director contribution on board effectiveness and how is this affected by facial expressions in general board meetings?”

In conducting this study, director contribution will be analyzed by examining the turn-taking process of board directors during general board meetings as it provides an overall measure of involvement and participation in the information elaboration process (Pugliese, Bezemer, & Nicholson, 2014; Sacks, Schegloff, & Jefferson, 1974). In addition, this study engages positive and negative affect, expressed through facial expressions to examine if this enhances or diminishes an association between director contribution and board effectiveness. This analysis will be conducted with the help of a facial emotion recognition method to code facial expressions by taking static images of the speaking directors during board meetings as input (Choudhury, Wang, Carlson, & Khanna, 2019).

The research setting in this study is the boardroom of the Dutch Water Authorities. In the Netherlands, 21 regional water authorities are responsible for working on water safety, quality, and quantity. The general boards consist of representatives of different stakeholders such as residents, owners of open land, owners of nature areas and businesses. These governing bodies have the authority to regulate and manage entrusted tasks and are elected every four years. Water authorities are public organizations, however, their governance is very comparable to that of business organizations. They do not receive funding from the government, instead, activities are financed on an individual basis and therefore rely on the revenue raised through own taxes. The water authorities are obligated to be transparent and publish their figures and notes of general board meetings. Multiple regional water authorities have made video footage of their general board meetings publicly available, creating the opportunity to observe these meetings.

This thesis is structured as follows: chapter two is dedicated to reviewing relevant literature and the development of a conceptual model. Chapter three will outline the methodology of this thesis, including the context, sample, data sources, measurements, data analysis, and research ethics. In chapter four, the results of the analysis are presented and in chapter five these results will be interpreted and will finish with the conclusion.

Theoretical background

2.1 Board of Directors

Boards have different roles and responsibilities. A division can be made between monitoring, resource provision, and participation in punctuated events (Boivie et al., 2016). Engaging and intervening in these roles, are considered to be the board's influence on firm outcomes, for instance, organization strategy, management selection, and financial performance (Boivie et al., 2016).

Furthermore, boards can be perceived as a multi-level information processing structure. The reason is that to be effective in tasks, board directors have to gather information themselves about measures initiated by the top management team (Dalton & Dalton, 2011). Subsequently, this information has to be processed to determine if these measures are in the best interest of the organization (Boivie et al., 2016). For the directors it is of importance to effectively acquire correct information, process it with their individual and collective skills and knowledge, and share it with the top management team and other involved groups (Boivie et al., 2016). This is of importance because they have to decide what is in the best interest of the organization as a group and how the results of these decisions should be implemented.

The first role of directors of the board is that they are legally responsible for monitoring both the actions of top executives and the organization's performance (Forbes & Milliken, 1999; Hambrick, Misangyi, & Park, 2014). This entails approving strategic actions, assessing managerial effort and performance, and participation (Boivie et al., 2016). It is the responsibility of the directors to monitor on behalf of the shareholders, as this is an unobservable process (Hambrick et al., 2014; Hillman, Nicholson, & Shropshire, 2008).

The second role of the board is to accommodate in resources such as advice, guidance, influencing external stakeholders, create awareness about external issues (Boivie et al., 2016; Hambrick et al., 2014). They facilitate in communication between the organization and stakeholders and other external relations (Hambrick et al., 2014). Resource provision activities involve linking the firm to important stakeholders, providing access to resources like capital, and strategy formulation (Hillman et al., 2008). Therefore, interaction between directors and top managers is of importance in this role as it allows managers to utilize information and knowledge to consider in the decision-making process (Boivie et al., 2016; Johnson, Daily, & Ellstrand, 1996).

The third and last role requires the board to participate in punctuated events (Boivie et al., 2016). These events occur not frequently. This implies acquisitions, appointing a new CEO after dismissal or retirement (Boivie et al., 2016). Besides, the board also has to deal with endogenous and exogenous influences creating uncertainty for organization operations. These punctuated events are results of actions initiated within the organization that cause uncertainty for a short period of time (Boivie et al., 2016). Earlier developed theory on corporate governance states that these types of events really allow boards to exercise control, for example, by replacing the CEO (Mizruchi, 1983). This could be seen as more of a monitoring role, but as this happens infrequently, it matches better with the punctuated event's role. Although all three of the roles are described, the largest responsibility of the general board of the water authorities is the control task. Therefore, this will be the main focus of this study.

Conclusively, for boards it is important to effectively engage and intervene in their monitoring and advice roles and responsibilities, considering that this allows them to influence organization outcomes, leading to board effectiveness (Boivie et al., 2016). According to Boivie et al. (2016) and Desender, Aguilera, Crespi, and Garcia-cestona (2013), a more accurate evaluation of board effectiveness can be obtained by looking at board decisions as intermediate outcomes as these decisions can highlight a potential conflict of interest. This should emphasize their engagement and contribution in influencing strategic decisions and therefore organization outcomes.

2.2 Board effectiveness

Research on board effectiveness often draws on research on group dynamics and group-decision making (Boivie et al., 2016; Forbes & Milliken, 1999). Boards have a lot of characteristics in common with decision-making teams and are social structures, exposed to similar political, cognitive, power, and personal dynamics applicable to workgroups (Forbes & Milliken, 1999; Payne, Benson, & Finegold, 2009). Payne et al. (2009) argue that based on both corporate board and group research, identical conditions allowing workgroups to achieve their goals are related to corporate board effectiveness. Moreover, multiple researchers argue that the effectiveness of boards highly relies on social psychological processes, explicitly those related to group participation and interaction, but also exchange of information and critical discussions (Forbes & Milliken, 1999; Milliken & Vollrath, 1991).

Although boards have a lot of similarities with other workgroups, they have a couple of differences. For instance, some of the directors may possess limited knowledge of the

organization or have limited time and thus a different amount of commitment as they serve multiple boards at the same time (Hambrick et al., 2014; Pugliese, Nicholson, & Bezemer, 2015). Moreover, boards meet less frequently than other task-oriented groups and have to make decisions within a relatively short time frame (Pugliese et al., 2014).

To address these issues, boards have to make informed judgments, which requires them to have a high level of understanding of the organization and its environment (Makri, Lane, & Gomez-Mejia, 2006). It is not exclusively about multiple views from different individuals that can lead to better results but that board members communicate these views and exchange ideas prior to making decisions in their monitoring activities (Milliken & Vollrath, 1991; Pugliese et al., 2014). This is of importance because of the notion of bounded rationality, which means that individuals do not have complete information on possible solutions for the problems that occur due to limited cognitive capacity (Gavetti, et al., 2012; Khanna et al., 2014). Hence, directors must be involved and communicate their views. A reason for that is the concern for pluralistic ignorance (Zhu & Westphal, 2011). This entails that directors are hesitant or fail to express their concerns about decisions being made. Hence, they rely on the abilities of other directors in the pursue of the best choice (Zhu & Westphal, 2011).

2.3 Director contribution

In making the best choices, communication and participation in the boardroom are essential decision-making dynamics, because it establishes the underlying mechanism of information sharing and processing as this is the basis for board monitoring and therewith board effectiveness (Brodbeck, Kerschreiter, Mojzisch, & Schulz-Hardt, 2007). Board directors bring in their functional expertise on organization strategy otherwise residing in blind spots, providing assessments and judgments of practices (Heyden, Oehmichen, Nichting, & Volberda, 2015). These iterative processes have the ability to enhance the control task of the board, because disagreements and criticism requires justifications and evaluations of strategic decisions from top-level management (Forbes & Milliken, 1999).

Past conducted studies pointed out that the roles and responsibilities of the boards are undertaken with a wide variety of participation (Forbes & Milliken, 1999). Herman (1981), for example, found that several boards simply sit through motions, attend meetings, and votings without mentally engaging the issues faced by the board.

Pugliese et al. (2014) also found in their research that directors sometimes experienced board meetings as information sessions, rather than discussions or decision frames. Although time can be considered an indication of effort, boards spending similar amounts of time together can still exhibit different levels of effort (Forbes & Milliken, 1999). Moreover, effective groups are characterized by allocating time to let members contribute and promoting members' interactions and exchange of information (Gnisci & Bakeman, 2007; Pugliese et al., 2014). These interactions are often measured by turn-taking behavior. It captures how turns are exchanged, the amount of interruptions, ideas, and interactions (Pugliese et al., 2014). Besides, it provides insight into the information elaboration process and can reveal the overall engagement level of the group members (Sacks, Schegloff, & Jefferson, 1974).

Based on the aforementioned, the expectation is that when directors participate more (take more turns overall), sharing their tacit knowledge and criticism and therewith increase their contribution, boards become more effective in executing their tasks and increasing board effectiveness. Hence the following hypothesis is formulated:

H1: An increase in director contribution during general board meetings leads to increased board effectiveness.

Another communication system that is conceptualized by scholars is the expression of emotion (Keltner, Oatley, & Jenkins, 2014). It is defined as a system that helps people navigate and coordinate social interactions by providing information about another individual's motives and dispositions. During interactions, expressions of emotions are continually displayed and the ability to understand and use these signals help expressing feelings, managing impressions, and influencing others (Kidwell & Hasford, 2014). Consequently, these signs can influence group attitudes, processes, and outcomes (Sy & Choi 2013; Sy, Côté, & Saavedra, 2005). More importantly, it can influence the depth of information processing in decision-making processes (Lerner, Li, Valdesolo, & Kassam, 2015). This leads to the introduction of affect display.

2.4 Affect display

Affect displays are observable movements of the body that can express internal emotion states (Tenhouten, 2012). Within the literature, emotion and affect are often used interchangeably (Davidson, 2003). For clarity purposes, this study will mainly refer to affect display or expression of emotion, instead of just emotion, for the reason that there might be a difference between experiencing emotion and expressions displayed by the expresser (Van Kleef & Côté,

2018). Ekman and Friesen (1969) noted that affect display can have a regulative function in conversations. Moreover, affect has been recognized as an important facet in social interactions (Knapp, Hall, & Horgan, 2014). These affect displays can accompany speech and have the ability to replicate, say the opposite, qualify or even supersede verbal communication and reveals information about the speaker's personality and emotion (Ambady, Bernieri, & Richeson, 2000; Bonaccio, Reilly, Sullivan, & Chiocchio, 2016; Ekman & Friesen, 1969).

In reference to what was mentioned earlier, group processes and outcomes can be influenced by expressions of emotion during interactions. Moreover, it can influence the depth of information processing in decision making (Lerner et al., 2015). The regulative function of affect display and influence on information processing is thus especially of importance for boards, since they meet less frequently than other groups and have a limited amount of time to make decisions and often have to deal with highly complex issues (Hambrick et al., 2014).

2.4.1 Group affect

Affect displayed by an individual within the groups might affect behaviors of other individuals through processes such as emotional contagion (Van Kleef, 2009; Van Kleef et al., 2010). This leads to the introduction of the concept of group affect. This process can be distinguished in two processes. The first process is groups acting upon the emotions of individuals in it, emotional contagion (convergence). Barsade and Knight (2015) argue that groups have a natural propensity to converge, however, a range of influences can act upon them, leading to group members diverging from other members. This refers to the second process, affective diversity (Barsade & Knight, 2015). However, this process is still at the early stage of being explored.

The process of emotional contagion is often found to occur within cooperative settings (Anderson, Keltner, & John, 2003; Van Kleef et al., 2008). In contrast, affective diversity is often more expected in competitive settings (Van Kleef, 2009; Van Kleef et al., 2010). The process of emotional contagion involves people catching emotions of others, without being aware of it, resulting in the convergence of own emotions (Menges & Kilduff, 2015). This convergence tends to influence social decision making (Van Kleef et al., 2010). Based on the roles and responsibility of the board, board meetings can be considered as a cooperative setting as it is their responsibility to come to the right decisions for both the firm and its stakeholders. Therefore, the expectation is that emotional contagion is more likely to occur in the boardroom.

2.4.2 Positive and negative affect

Furthermore, a distinction is made in positive and negative affect. Positive affect is characterized by expressing feelings of joy, content and happiness. In contrast, negative affect is associated with experiencing feelings such as anger or sadness (Oreg, Bartunek, Lee, & Do, 2018).

Barsade (2002) found that positive affect promotes cooperation in groups. It can serve as a bonding function and promote social integration (Knight & Eisenkraft, 2015). Forbes and Milliken (1999) state that a minimum level of interpersonal attraction is required for board directors to engage in substantial communication and deliberation. Therefore, positive affect can affect these processes. It was found that group members with positive affect tend to share more unique information, apply more specific knowledge to solve group problems and disagree when appropriate (Emich, 2012). Moreover, multiple researchers argue that positive affect improves problem solving because it can increase an individual's flexibility, carefulness in thinking and it can broaden group cognitive processing (Amabile, Barsade, Mueller, & Staw, 2005; Emich, 2012). Therefore, positive group affect can lead to enhanced decision-making (Van Knippenberg, Kooij-de Bode, & Van Ginkel, 2010). For boards this is especially of importance because effective strategic decisions are crucial in preventing corporate failure (Daily & Dalton, 1994; Porter, 1991). It is expected that positive affect will enhance the information elaboration process and constructive discussions as more information is shared and combined as a result of broadened group cognitive processing.

In contrast, Barsade and Knight (2015) argue that negative affect can enhance group-performance only in a limited number of situations. Fischer and Manstead (2008) found that positive affect can foster positive social interactions, however, the evidence on negative affect is less explicit. Overall, negative group affect is found to hinder group task performance (Barsade & Knight, 2015). It can lead to a decrease in confidence and undermining the sharing of information, which is critical for boards to be able to decide what is in the best interest of the organization (Forgas, Laham, & Vargas, 1995). Moreover, Maitlis and Ozcelik (2004) found in their study on emotion and decision-making that display of negative affect can lead to inertia, as a result of organization members avoiding to tackle an issue directly and refrain themselves from contributing. In contrast to positive affect, for boards it is expected that negative affect will diminish the information elaboration process as directors are more reserved in their contribution.

2.4.3 Facial expressions

From all the distinctive features that can display affect, the face is considered the most commanding and complicated (Harrigan, Rosenthal, & Scherer, 2008). It is the location of sense, smell, taste, hearing, sight, and also the output of speech (Harrigan et al., 2008). The face can provide a rich source of information and extracts immediate social judgment and therefore considered a powerful tool (Jack & Schyns, 2017). In addition, it also has the ability to expose verbal deception (Vrij, Fisher, Mann, & Leal, 2006).

Moreover, numerous researchers have discussed the existence of six universal expressions, namely anger, disgust, fear, happiness, sadness, and surprise as universally agreed on what emotion was portrayed in the faces (Ekman & Friesen, 1969; Manusov & Patterson, 2006). A distinction is made between positive and negative affect in facial expressions or also referred to as valence (Lerner et al., 2015). For example, whereas angry faces are perceived as more dominant (Montepare & Dobish, 2003), smiling faces are perceived as more trustworthy (Krumhuber et al., 2007). Positive facial expressions can radiate signals of being in a safe environment and can lead to an increase in cognitive processing (Lerner et al., 2015).

Multiple studies have been conducted on the effects of positive and negative affect on cooperation and decision making. However, this has not yet been studied within a boardroom setting. Given the board's tasks and similarities with decision-making groups, board meetings can be considered a cooperative setting. Therefore, the expectation is that the process of emotional contagion will occur. After discussing the effects of individual affect display through facial expressions, the assumption is that the display of positive affect through facial expressions enhances cooperative behavior, as these expressions signal trustworthiness, and a safe working environment. Moreover, it increases the ability of cognitive processing, interpersonal attraction and sharing of (unique) information, and the ability to connect and combine information. Next to that, constructive criticism occurs more often as directors express disagreements more often. This leads to a strengthened association between director contribution and board effectiveness. Hence the following hypothesis is formulated:

H2: The relationship between director contribution and board effectiveness becomes stronger as board members display more positive facial expressions.

The theory about negative affect has shown varying results. In a limited number of situations, negative group affect can enhance group performance (Barsade & Knight, 2015). In a cooperative setting, such as boards, the expectation is that negative affect by expressions of dominance has a negative effect on group performance, resulting in group members refraining from contributing. This leads back to the concept of pluralistic ignorance, where directors are hesitant or fail to express their concern about decisions being made and thus rely on the abilities of other directors. Therefore, the expectation is that the display of more negative facial expressions refrains directors from sharing and assessing information and criticism, therefore, diminishing the relation between director contribution and board effectiveness. Hence the following hypothesis is formulated:

H3: The relationship between director contribution and board effectiveness becomes weaker as board members display more negative facial expressions.

2.5 Conceptual model

Based on the theories explained in the previous paragraphs, the following conceptual model is created.

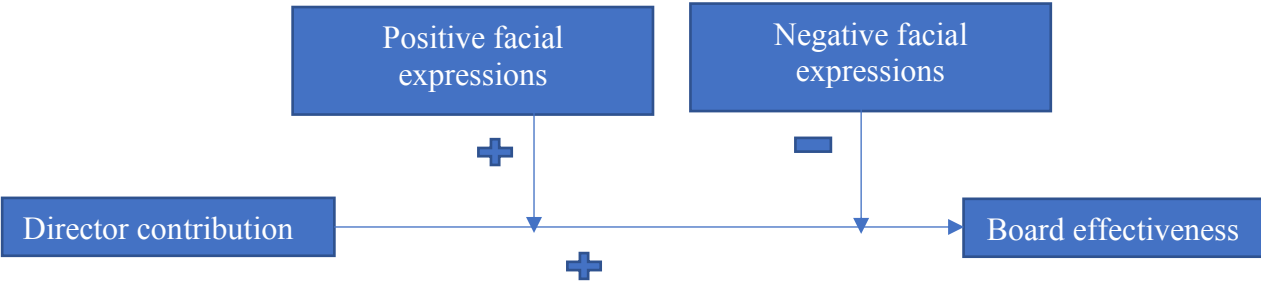


Figure 1 conceptual model

Methodology

3.1 Context

In the Netherlands 21 regional water authorities are responsible for working on water safety, quality, and quantity. Dutch boards have a two-tier structure, with an executive board with the responsibilities for the daily operations and a separate supervisory board (Bezemer, Peij, De Kruis, & Maassen, 2014). The water authorities also consist of two boards, the general board and top management team (daily board). The general board consists of representatives of different stakeholders such as residents, owners of open land, owners of nature areas and businesses and has between 18 and 30 members (Dutch Water Authorities, 2017). The top management team commonly consists of five members, who are also members of the general board. This study focuses on the general board and mainly on their control task, being their largest responsibility, which includes monitoring of the top management team. Water authorities are public organizations. However, their governance is very similar to business firms. Their activities are financed on an individual basis and therefore rely on the revenue raised through their own taxes. A couple of regional water authorities provide public access to video footage of their general board meetings and thus creates the opportunity to observe board processes in the boardroom.

3.2 Sample and data resources

The data for this study is collected by observing the video footage of the general board meetings of four Dutch water authorities. Only a few of the 21 water authorities have video recorded their board meetings and published them on their websites for the last few years. The original sample consists of 108 board meetings. However, after assessing the quality, the sample size is reduced to 102 meeting observations. Six observations were left out of the analysis because the video footage was not suitable for the Microsoft Azure Face application programming interface (API) to generate data for the moderator variables. The reason for that is that the cameras were poorly adjusted and could not provide the required output as they were not pointed at the speaking directors. Furthermore, the recordings provided data on the independent variable director contribution as it registered how many turns were taken. The process of gathering information on the moderator variables will be elaborated on later in this chapter as this was an extensive process. Furthermore, data on the dependent variable group effectiveness is gathered from annual reports and finalized decision lists. Furthermore, data for the control variables are gathered from the websites of the water authorities and the annual reports. The data on control

variables board size, gender diversity, and political diversity are retrieved from the websites of the water authorities. The control variable meeting frequency is determined based on the meeting calendar and data for the control variables age diversity, positive and negative emotion of the top management team was retrieved using the Microsoft Azure Face API. This tool can also determine age based on facial features. For each member, three images were selected to determine the age based on the average of the three images.

3.3 Dependent variable

The dependent variable in this study is board effectiveness. Board effectiveness is about boards effectively engaging and intervening in their monitoring and advice roles and responsibilities, to influence organization outcomes (Boivie et al., 2016). In previously conducted researches it was often measured by making a direct connection to firm performance (Khanna et al., 2014). Desender et al. (2013) argue that this relationship is too complex and indirect to find consistent outcomes. Boivie et al. (2016) add that there might be a need for new and better measures to capture what directors actually do. A more accurate evaluation of board effectiveness can be obtained by analyzing board decisions as intermediate outcomes, because it highlights potential conflicts of interest, indicating the influence of the board (Boivie et al., 2016; Desender et al., 2013). Therefore, this variable is measured by counting the motions and amendments submitted by the general board during every board meeting. The number of motions and amendments were retrieved from finalized decision lists and overviews of every board meetings (an example overview is included in appendix A). The amount of motions and amendments is an indication of the board's ability to judge strategic issues and make changes to have an influence on organizational outcomes (Forbes & Milliken, 1999; Hoppmann, Naegele, & Girod, 2019).

3.4 Independent variable

The independent variable director contribution is measured in turn-taking. Pugliese et al. (2014) indicate that turns taken by directors accounts for participation and involvement. Besides, it highlights the frequency of communication, concerning exchange of task-related information, or integration of the perspectives of board directors (Roh, Chun, Ryou, & Son, 2018; Van Knippenberg et al., 2004; Williams & O'Reilly, 1998). Turn-taking is registered in the video footage and archives of previous board meetings. This was done by summing up the turns taken by directors of the general board. Interactions of the top management team were left out to exclusively measure the contribution of the board directors. The focus is whether directors are actively participating and involving themselves in substantive discussions, sharing unique

knowledge before deliberations are made in the decision-making process (Tuggle, Schnatterly, & Johnson, 2010).

3.5 Moderating variables

Two variables serve as moderators of the main effect to add additional explanation on the proposed direct relationship between director contribution and board effectiveness. The moderators included in this research are positive and negative facial expressions. The videos of the board meetings have been observed to study facial expressions during general board meetings. This process took several weeks of preparing the data with the support of three other researchers who have also conducted research on facial expressions or emotions. The initial step was to download all the videos of the board meetings of four water authorities, ranging from the years 2013 to 2019. The following step involved converting the meeting videos to static image frames using VLC player (Choudhury et al., 2019). This program created a static image for every second of film. However, depending on the speed and power of the computer, a few images were lost in the process. However, this loss remained limited.

The duration of these meetings ranged from five minutes to six and a half hours. Hereafter, the images were sorted per speaker. Depending on the angle of the camera, multiple directors were visible in these images. Therefore, a large amount of the images had to be cropped to ensure that the output data could be traced back to the speaker. This was an important step because the algorithm that is being used by the Face API can also detect faces in objects or parts of faces. After these preparations, the cropped static images were used as input in the tool Microsoft Azure Face API, an AI service that can analyze faces in images. To use this program, an account has to be created. This grants the user a key that allows one to process around 30.000 images with a rate of 20 images per minute. In addition, it grants a budget of 170 euros to experiment with this service. To process all the images of the 102 meetings, multiple accounts had to be created.

With this service, it was possible to generate output in scores of eight facial expressions, namely, anger, contempt, disgust, fear, happiness, neutral state, sadness, and lastly surprise. The neutral state is used for the absence of emotion in facial expressions. The measurements are based on a couple of parameters such as openness of the mouth, curving of the lips, brow movement. For this study, the tool analyzed the facial expressions of one individual at a time. The static images are transformed into weighted pixels so that it can code facial expressions of Anger, Contempt, Disgust, Fear, Happiness, Neutral, Sadness, and Surprise.

The following step was to create a script in Python to run the face API for a large batch of images so that it was able to generate scores for all the images of a complete meeting (see appendix B for the used scripts). The face API delivered output on emotion for each speaker during each meeting (see appendix C for an output example). The output provided by the face API shows values between 0 and 1 and calculates a score for the presence of emotions in facial expressions. Every image receives a score on each of the eight emotions and together add up to a value of 1.

In some cases, more errors were generated due to the API not being able to identify a face. This was the case for recordings that had a lower recording quality or when speakers were looking downwards. Therefore, some meetings have a better representation of facial expressions than other meetings. For this reason, a sample with stricter measurement criteria was created and served as a robustness check for the analysis. This sample consisted of 87 meetings with the criteria that at least 50% of the footage had to be assessed correctly by the tool, resulting in no errors.

The output per image generated by the Face API is delivered in JSON files. Another python script was created to convert a batch of JSON files into CSV output. First, the scores per static image were ordered per speaker and aggregated to the group level by calculating the mean per individual and then calculate the mean based on the mean scores of all individuals. Second, the scores of each image were then categorized per individual. the scores of expressions anger, contempt, disgust, fear, and sadness were summed to create the category negative affect. Facial expression happy formed the category positive affect. Facial expressions neutral and surprise were excluded, because neutral state indicates the absence of expression and surprise can be both positive and negative (Noordewier & Van Dijk, 2018).

Furthermore, a division in data was made between board directors and top management team, because they both perform different roles. The scores of the top management team are used as control variables. Moreover, a separate dataset was created to serve as a robustness check by taking the mean of all individual scores for both board and top management team.

Due to a large amount of observations, the above described method was chosen for this study. Choudhury et al. (2019) found a strong correlation between the coding process done by human coders and the neural network algorithm used in the Face API. Although the results of both approaches did not align perfectly, it indicated that coding done by Face API can be regarded with reasonable validity and is therefore a suitable method.

3.6 Control variables

In order to control for an array of potential alternative explanations, multiple variables are added in the model because they potentially correlate with board effectiveness. It is commonly presumed within the literature that demographic characteristics can influence cognition, behavior, and the decision-making process of directors and thus an effect on board effectiveness (Boivie et al., 2016; Forbes & Milliken, 1999). Therefore, the following control variables are included in the analysis to assess their effects: meeting frequency, board size, age diversity, political diversity, and meeting duration. The control variables representing diversity, have the ability to provoke social processes in groups (Milliken & Martins, 1996). This is especially the case for diversity traits visible to other board members. Therefore, these moderator variables are included because they can have an impact on organizational outcomes (Lawrence, 1997).

Age diversity

Milliken and Martins (1996) have studied the possible influence of age diversity related to firm performance. This variable is included in the analysis as a control variable. A division in director age is created and resulted in five categories: ≤ 30 , $30 \leq 40$, $40 \leq 50$, $50 \leq 60$, $60 >$. Within the field of diversity, Blau's heterogeneity index is the most commonly used to assess diversity (Harrison & Klein, 2007). The Blau Index is known by a number of different names depending on the particular field, Blau Index = 1 - the Herfindahl–Hirschman index. Blau's index (1977) can be used to achieve a relative measure of diversity and is calculated as follows:

$$\text{Heterogeneity} = (1 - \sum p_i^2)$$

P_i is the proportion of category i in the board. The outcome can range from 0 to 1. A value of 0 indicates that there is no diversity at all. Conducting the Blau's index results in a continuous variable instead of a categorical variable. The Blau's index is also used for the control variables gender and political diversity.

Gender diversity

Gender diversity in the literature is often associated with firm performance. It is suggested that gender diversity could lead to more group discussion and benefit decision-making and in turn firm-level outcomes (Johnson, Schnatterly, & Hill, 2012). Therefore, this control variable is also included in this study. This variable is measured with the Blau's index with the category's male and female.

Political diversity

Political diversity variable is included as a control variable, because the extent to which board members have a different functional background, have the tendency to experience differences in perception of processes and responses to issues they are confronted with (Forbes & Milliken, 1999; Milliken & Martins, 1996). Payne et al. (2009) state that sufficient diversity can promote the discussion of more options and board knowledge, which can aid in making good strategic decisions. This variable is also measured with the Blau's index with the different political factions.

Board size

Board size is found to have an impact on how the board functions as a group (Ancona & Caldwell, 1992; Boivie et al., 2016; Khanna et al., 2014). Therefore, this control variable is included in the analysis. The board size is measured in the number of directors on the board.

Meeting frequency

Meeting frequency is another characteristic that has the tendency to affect relationships among directors (Boivie et al., 2016). Individuals or groups that interact more frequently may inhibit an ability to progress into a cohesive decision-making body. This variable is measured in the number of meetings per year.

Meeting duration

Meeting duration is included in the model because it is assumed that meetings with a longer duration create more opportunities to make decisions. This variable is measured in the total amount of minutes.

Year dummies

In order to control for time-specific events, year dummies were created to include in the model. Time dummies have the ability to reduce overconfidence of the estimators and can improve the accuracy of fixed effects and random-effects regression (Certo & Semadeni, 2006). Therefore, dummies were created for the years 2013-2019. Year 2019 is left out of the analysis and serves as the reference category.

Organization dummies

Organization dummies are also included in the model to account for unobservable organization characteristics and organization-fixed effects (Palia & Lichtenberg, 1999). Organization dummies were created for the general water authorities Wetterskip Fryslan, Zuiderzee, Hoogheemraadschap De Stichtse Rijnlanden (HDSR), and Amstel Gooi en Vecht (AVG). Organization dummy AVG is left out of the analysis to serve as the reference category.

Positive and negative emotions top management team

Although this study focusses on the contribution of the board directors, the values for the top-management team were also calculated and included in the model, as it expected that it can also influence the interactions during board meetings.

3.7 Data analysis

The analysis of this study was conducted in the statistical program SPSS. Prior to the analysis, all the variables are examined for statistical violations of linearity, normality, homoscedasticity and independence of error terms for the multiple regression analysis (Hair, Black, Babin, & Anderson, 2014). The Q-Q plots and descriptives indicate that the dependent variable board effectiveness, independent variable director contribution and moderator positive facial expressions are not normally distributed (see appendix D for the assumptions). The Q-Q plot of moderator negative facial expressions indicates that this variable is relatively normal distributed. The partial regression plot shows that there is a linear relationship between director contribution and board effectiveness. There is no clear pattern visible, indicating there is no violation of the homogeneity assumption. The partial regression plots for facial expressions positive and negative show that there is a linear relationship with board effectiveness and no violation of homogeneity. Another assumption of multiple regression analysis is the constant variance of error terms. To test for independent errors, the Durbin-Watson test was performed, generating a value of 2.348 which indicates that the residuals are uncorrelated and this assumption is met.

Furthermore, one outlier in the dependent variable is identified by examining the box-plot (see appendix E). A check was conducted by removing the identified outlier. This led to a reduction of kurtosis by one third and a reduction in skewness by one fourth of the original value. Instead of choosing to remove the observation, winsorizing will be applied (Aguinis, Gottfredson, & Joo, 2013). The value of this outlier is replaced by the value of the second highest value. The original variable will be used in the analysis and the adjusted variable will be used in a robustness check.

Transforming the variables to meet the assumptions can have multiple disadvantages. Therefore, the original variables are included in the analysis. Careful consideration should be given to nonlinear transformations. Becker, Robertson, and Vandenberg (2018) state that transformations can affect construct validity, decrease estimates of true moderator effects, increase type II errors and in some instances cause a lack of external validity. An alternative for transforming data is a negative binomial regression or poisson regression, because the dependent variable is considered a count variable (Blevins, Tsang, & Spain, 2014). Poisson regression has the assumption that the variance of the dependent variable is equal to the mean. The variance of the dependent variable in this study is almost three times the mean. Therefore,

negative binomial regression is preferred over poisson regression, because it includes a parameter that accounts for overdispersion and therefore seems more appropriate (Becker et al., 2018; Denham, 2016). Researchers in previous studies have treated count variables as continuous measures to perform linear regression (Allison, 2009). Therefore, negative binomial regression will be conducted to serve as a robustness check.

3.8 Research ethics

During all stages of this study, research ethics are treated with care.

Plagiarism will be prevented by correct referencing according to the APA rules to properly acknowledge the author's work. Furthermore, an honest representation of report and analysis will be maintained.

Results

4.1 Descriptives

The descriptive statistics of the independent, dependent, and control variables are shown in table 1. Within this study, control variables are included to control for time-specific effects and organization-activity events. However, these control variables are not displayed in the tables to save space and keep the tables clear and organized. A check for multicollinearity was conducted for the independent variables. Multicollinearity did not seem to be a problem because the VIF scores were lower than 10. As illustrated in table 1, the average board effectiveness is 1.657 meaning that this amount of motions or amendments are submitted on average by the board during general board meetings. This variable is not normally distributed, therefore the median is assessed (see appendix F). The median is 1 and 73.5% of the observations have a value of 2 on board effectiveness. The variable director contribution indicates that the contribution of directors during board meeting ranges from 1 to 197 and the average contributions per board meeting is 52.480. The descriptive statistics also show that based on the mean of positive and negative facial expressions, more positive facial expressions ($M = 0.073$) are displayed than negative facial expressions ($M = 0.042$).

Table 1 Descriptive statistics ($n = 102$)

<i>Variables</i>	Minimum	Maximum	Mean	Std. Deviation
Board effectiveness	0	13	1.657	2.232
Director contribution	1	197	52.480	39.309
Positive facial expressions	.001	.233	.073	.047
Negative facial expressions	.005	.085	.042	.018
Board size	27	33	31.620	1.203
Meeting frequency	4	14	10.490	3.168
Meeting duration	5	369	103.800	74.724
Gender diversity	.257	.430	.342	.047
Political diversity	.877	.901	.888	.006
Age diversity	.584	.776	.673	.052
Positive facial expressions (TMT)	.001	.345	.073	.057
Negative facial expressions (TMT)	.005	.092	.029	.020

Note. TMT is top management team

The correlations are reported in table 2. This table reveals a couple of significant correlations between the included variables. Independent variable director contribution is positively correlated with board effectiveness ($b = 0.493$, $p < 0.05$, <0.01). Control variables meeting frequency, meeting duration, age diversity, and negative facial expressions top management

team (TMT) have a significant correlation with dependent variable board effectiveness. Further analysis will examine the support for the hypotheses.

Table 2 Correlation matrix ($n = 102$)

Variables	1	2	3	4	5	6	7	8	9	10	11
1 Board effectiveness											
2 Director contribution	.493**										
3 Positive facial expressions	.043	.027									
4 Negative facial expressions	.327**	.550**	-.014								
5 Board size	-.119	-.367**	.103	-.390**							
6 Meeting frequency	-.259**	-.479**	-.100	-.429**	.237*						
7 Meeting duration	.675**	.817**	.050	.474**	-.379**	-.338**					
8 Gender diversity	.043	-.027	-.206*	-.014	-.492**	.165	.053				
9 Political diversity	-.160	-.351**	-.008	-.419**	.376**	.126	-.320**	-.246*			
10 Age diversity	.244*	.285**	.161	.281**	-.038	-.459**	.182	.363**	-.455**		
11 Positive facial expressions (TMT)	.008	.163	-.061	.123	-.229*	-.069	.011	.008	.000	-.108	
12 Negative facial expressions (TMT)	.239*	.098	.054	.052	.107	-.114	.074	-.097	.027	.159	.119

** $p < 0.01$; * $p < 0.05$ (2-tailed)

Note. TMT is top management team

4.2 Hypotheses

In table 3, the results are shown of the regression of director contribution on board effectiveness and moderations of positive and negative facial expressions. In the first model of the analysis, the dependent variable board effectiveness was regressed on the control variables. The control variables are included in all models. In the second model, the dependent variable board effectiveness was regressed on the independent variable director contribution. The third model includes the moderation of positive emotion and director contribution on board effectiveness, the fourth model tests the moderation of negative emotion and director contribution on board effectiveness. The fifth model contains all the variables.

The first model shows the regression of the control variables on board effectiveness. This model indicates that the variable meeting duration (in minutes) has a significant effect on board effectiveness ($b = 0.023$, $p = 0.00 < 0.05$; < 0.01). Control variable negative facial expressions (TMT) also has a significant effect on board effectiveness ($b = 19.759$, $p = 0.033 < 0.05$). The first hypothesis predicts that an increase in director contributions leads to an increase in board effectiveness, measured in the amount of motions and amendments. Model 2 shows that there is no significant effect of director contribution on board effectiveness ($b = -0.009$, $p = 0.320 > 0.05$). Therefore, hypothesis 1 has to be rejected.

Table 3 Linear regression models (n = 102)

Variables	Board effectiveness									
	Model 1		Model 2 (H1 +)		Model 3 (H2 +)		Model 4 (H3 -)		Model 5	
	Coefficient	Sign. level	Coefficient	Sign. level	Coefficient	Sign. level	Coefficient	Sign. level	Coefficient	Sign. level
Director contribution			-.009	.320	-.009	.334	-.010	.299	-.010	.314
			(.009)		(.009)		.009		(.010)	
Director contribution x positive facial expressions					.021	.898			.005	.978
					(.160)				(.170)	
Director contribution x negative facial expressions							.082	.741	.080	.761
							(.247)		(.261)	
Positive facial expressions	1.173	.763	.535	.892	1.039	.852	.480	.904	.595	.918
	(3.873)		(3.925)		(5.559)		(3.950)		(5.777)	
Negative facial expressions	5.377	.666	6.580	.599	(6.866)	.591	6.943	.582	6.997	.586
	(12.395)		(12.453)		(12.724)		(12.570)		(12.804)	
Board size	1.230	.194	.982	.316	.992	.315	1.040	.298	1.040	.301
	(.940)		(.972)		(.981)		(.993)		(1.000)	
Meeting frequency	.244	.179	.253	.164	.248	.185	.251	.171	.249	.185
	(.180)		(.180)		(.185)		(.181)		(.186)	
Meeting duration	.023	.000	.026	.000	.026	.000	.026	.000	.026	.000
	(.003)		(.004)		(.004)		(.004)		(.004)	
Gender diversity	17.688	.123	15.126	.197	15.141	.199	15.401	.193	15.397	.196
	(11.345)		(11.630)		(11.702)		(11.723)		(11.798)	
Political diversity	-159.069	.116	-130.736	.213	-133.020	.214	-124.255	.247	-124.943	.260
	(100.204)		(104.126)		(106.251)		(106.504)		(110.080)	
Age diversity	-2.428	.839	-.999	.934	-1.190	.922	-.711	.953	-.762	.951
	(11.888)		(11.973)		(12.138)		(12.071)		(12.288)	
Positive facial expressions (TMT)	-1.192	.693	-.071	.982	.002	.999	-.202	.951	-.181	.957
	(3.009)		(3.210)		(3.280)		(3.252)		(3.353)	
Negative facial expressions (TMT)	19.759	.033	18.495	.048	18.411	.050	18.678	.047	18.654	.050
	(9.106)		(9.193)		(9.272)		(9.260)		(9.359)	
Constant	91.989	.309	74.220	.420	76.151	.417	66.291	.488	66.938	.499
	(89.862)		(91.598)		(93.368)		(95.147)		(98.625)	

Note. Year and organization specific effects are included in all models. SEs are in parentheses

Hypothesis 2 proposes that the direct effect of director contribution on board effectiveness is stronger in meetings where board directors show more positive facial expressions. Model 3 illustrates a non-significant interaction effect of positive facial expression and director contribution on board effectiveness ($b = 0.021, p = 0.898 > 0.05$). Therefore, hypothesis 2 also has to be rejected. Hypothesis 3 proposes that the effect of director contribution on board effectiveness is weaker in meetings where board directors show more negative facial expressions. Model 4 indicates that the interaction effect of negative facial expressions on the relation between director contribution and board effectiveness is not significant ($b = 0.082, p = 0.741 > 0.05$). Consequently, hypothesis 3 has to be rejected as well. Model 5 contains all variables. This model indicates that only the effects of control variables meeting duration ($b = 0.026, p = 0.00 < 0.05; < 0.01$) and negative facial expressions (TMT) ($b = 18.654, p = 0.050 = \leq 0.05$) on board effectiveness remain significant.

4.3 Robustness checks

To check whether the direction and significance of the effect would change if small adjustments were made in the scales or sample, robustness checks were conducted. The models of the three robustness checks are presented in table 4.

4.3.1 Replacing variables

The first robustness check concerns replacements of variables. For the moderator variables positive and negative facial expressions additional variables were created. This also stands for the control variables positive and negative facial expressions from the top management team. The scores for these variables are aggregated by taking the mean of all the facial expression scores of the static images, instead of taking the mean of the mean facial expressions scores of the individual directors. In addition, an outlier in the dependent variable board effectiveness was winsorized by changing the value of the outlier to the second-highest value. This variable is included in the model. Model 6 contains all the variables. This model shows that there is no significant effect of director contribution on board effectiveness ($b = -0.005, p = 0.516 > 0.05$). Therefore, hypothesis 1 remains to be rejected. The interaction effect of facial expressions positive and director contribution on board effectiveness is also not significant ($b = -0.104, p = 0.415 > 0.05$). Therefore, hypothesis 2 also remains rejected. The model also illustrates that the interaction effect of negative facial expressions and director contribution on board effectiveness is not significant ($b = -0.104, p = 0.332 > 0.05$) and thus hypothesis 3 also remains rejected.

4.3.2 Sample adjustment

The second robustness check comprises a change in the sample. 15 observations are subtracted from the sample set leading to a sample of 87 meeting observations. This sample contains only the board meetings for which more than 50% of the static images generated outcomes. After conducting the regression analysis, the outcomes for the hypotheses remained the same. Model 7 includes all the variables. This model finds that director contribution has no significant effect on board effectiveness ($b = -0.001$, $p = 0.912 > 0.05$). Therefore, hypothesis 1 remains to be rejected. The interaction effect of positive facial expressions and director contribution on board effectiveness has no significant effect ($b = -0.265$, $p = 0.228 > 0.05$). Therefore, hypothesis 2 still has to be rejected. The interaction effect of negative facial expressions and director contribution on board effectiveness has no significant effect ($b = -0.017$, $p = 0.960 > 0.05$). Therefore, hypothesis 3 also has to be rejected. The effect of control variables board size ($b = 2.562$, $p = 0.034 < 0.05$) and gender diversity ($b = 29.029$, $p = 0.047 < 0.05$) on board effectiveness is significant.

4.3.3 Negative binomial regression

The third robustness check is done by conducting a negative binomial regression because the dependent variable in this study can be considered a count variable. It is an alternative to making data transformations because these transformations can have undesirable effects (Becker et al., 2018). Moreover, this variable is over-dispersed and therefore negative binomial regression is preferred because it includes a parameter that accounts for overdispersion and therefore seems more appropriate. Model 8 includes all the variables of the negative binomial regression and shows that hypothesis 1 remains to be rejected ($b = 0.008$, $p = 0.401 > 0.05$). Hypothesis 2 also has to be rejected ($b = -0.028$, $p = 0.863 > 0.05$). Hypothesis 3 has to be rejected as well ($b = -0.331$, $p = 0.245 > 0.05$).

Conclusively, the three hypotheses remain to be rejected after conducting three robustness checks.

Table 4 Models robustness checks

<i>Variables</i>	<i>Board effectiveness</i>					
	<i>Outlier + measurement</i>		<i>Adjusted sample</i>		<i>Negative binomial</i>	
	<i>Model 6 (n = 102)</i>		<i>Model 7 (n = 87)</i>		<i>Model 8 (n = 102)</i>	
	Coefficient	Sign. level	Coefficient	Sign. level	Coefficient	Sign. level
Director contribution	-.005 (.008)	.516	-.001 (.012)	.912	.008 (.009)	.401
Director contribution x positive facial expressions	-.104 (.127)	.415	-.265 (.217)	.228	-.028 (.162)	.863
Director contribution x negative facial expressions	-.173 (.177)	.332	-.017 (.339)	.960	-.311 (.268)	.245
Positive facial expressions	-.466 (4.402)	.916	-7.756 (7.124)	.280	-.788 (5.100)	.877
Negative facial expressions	11.303 (9.379)	.232	-8.171 (15.736)	.605	5.290 (13.221)	.689
Board size	.809 (.872)	.357	2.562 (1.181)	.034	1.044 (.860)	.225
Meeting frequency	.278 (.174)	.114	.184 (.240)	.444	.026 (.159)	.870
Meeting duration	.024 (.004)	.000	.027 (.005)	.000	.011 (.004)	.002
Gender diversity	13.549 (10.359)	.195	29.029 (14.300)	.047	10.108 (10.669)	.343
Political diversity	-86.232 (89.997)	.341	-162.729 (137.700)	.242	-70.126 (94.351)	.457
Age diversity	2.328 (11.192)	.836	-8.859 (14.548)	.545	.080 (11.073)	.994
Positive facial expressions (TMT)	-.508 (3.519)	.886	2.444 (4.583)	.596	-1.132 (3.362)	.736
Negative facial expressions (TMT)	29.239 (11.904)	.016	43.006 (11.633)	.000	14.050 (8.099)	.083
Constant	38.358 (81.100)	.638	52.189 (125.586)	.679	23.109 (84.795)	.785

Note. Year and organization specific effects are included in all models. *SEs* are in parentheses.

Discussion

In previously conducted studies, board director behavior was often predicted by making combinations of individual attributes of diversity connected to organization performance. These studies encountered 'black box' problems and provided little evidence on the question how it affects organization outcomes because underlying mechanisms were disregarded. Information elaboration and behavioral processes have often been considered to be emergent processes of diversity in groups (Roh, Chun, Ryou, & Son, 2018; Van Knippenberg et al., 2004; Williams & O'Reilly, 1998). Another critical component in social interaction is the display of affect. Therefore, the objective of this study was to elaborate on these processes in board meetings by focussing on director contribution, their facial expressions, and board effectiveness.

Ultimately, this study found no significant support for the three proposed hypotheses. To start with, this study found no significant association between director contribution and board effectiveness. This could suggest that the used theories on groups are less applicable to boards. A large amount of board literature is based on group dynamic theories or theories associated with groups. Payne et al. (2009) conducted research on how literature on groups relates to boards, as there was limited empirical knowledge on boards functioning as groups. This study of increased director contribution on board effectiveness was based on the concept of interaction patterns in which turn-taking functions as an overall measurement of director contribution. With that, the viewpoint of increased participation and use of knowledge and skill by sharing information. However, this is contradicted by some studies that found that the process is difficult to manage when a large amount of interactions had to be managed, leading to delays in the decision-making process (Boivie et al., 2016). A possible explanation for this unexpected outcome could be that theory on group interaction is less applicable to boards in comparison to traditional groups, due to differences in group size. Boards usually have more members and therefore have more potential for diversity than other groups.

As mentioned in the theoretical framework, it could also be the case that meetings are indeed experienced as information sessions rather than real decision frames (e.g., Forbes & Milliken, 1999; Herman, 1981; Pugliese et al., 2014). Earlier conducted research has tried to capture the association between participation within boards and firm performance. Judge and Zeithaml (1992) acknowledged that it is a complex phenomenon. The measurement of board involvement in their study was based on the combination of four demographics and tested with surveys. The

current study tried to measure this by observing turn-taking behavior. This makes it more complicated to match the outcomes to other research. Other measurements used in previous research that are not related to the financial performance of the organization are based on survey evaluations of individual board directors (e.g., Rutherford, Buchholtz, & Brown, 2007; Zona & Zattoni, 2007). The descriptives of this study show that in 73.5% of all board meeting observations up to 2 motions or/and amendments were submitted. This seems relatively low. However, there is no other study to compare these outcomes with.

Another objective of this study was to find out if the association between board contribution and board effectiveness was moderated by facial expressions from board directors. This expectation was based on the theories on emotional contagion and individual affect in decision-making processes. There have been numerous studies conducted on the effects of affect display of individuals and groups. However, a substantial amount has been conducted in lab settings or small groups (Van Knippenburg et al., 2010; Menges & Kilduff, 2015). Menges and Kilduff (2015) argue that emotional contagion can have a too short-lived effect to be able to account for converging affect in large groups. They did find evidence that it can extend beyond small group level, however, the evidence was weaker. Important to note is that it cannot be confirmed that emotion contagion did occur during the observed board meetings but was based on earlier findings implying that it is common to occur in cooperative settings.

For both hypotheses 2 and 3, the scores for positive and negative facial expressions were relatively low implying that the majority of the facial expressions were neutral. Hence, it is possible that emotional contagion and the influence of affect on individuals is less applicable to boards, reason being that it is too large of a group to find this effect. Another point specifically for negative facial expressions is that effect of negative affect has shown varied results in earlier conducted research (Barsade, 2015). Knight and Eisenkraft (2015), for example, found that the effect of negative affect is more ambiguous and can be more dependent on contextual exogenous and endogenous factors in comparison to positive affect.

Although none of the variables of primary interest show significant effects, one of the control variables, negative facial expressions of the top management team, had a significant association with board effectiveness in seven of eight models. Therefore, this could imply that affective states of top management do have an influence on the amount of amendments and/or motions submitted by the board (board effectiveness). Although this is not elaborated on in current board literature, it could be a lead for a new focus.

5.1 Contribution to literature

This study sought to make a contribution on how director contribution impacts board effectiveness, and how this effect is affected by positive and negative facial expressions displayed by directors during board meetings. Although no significant evidence was found for the three hypotheses, it did introduce a new method in board research. This method involved facial coding within the boardroom setting by using Microsoft Azure Face API. Moreover, this method made it possible to observe affect behavior as an underlying mechanism. This method was adapted from the study of Choudhury et al. (2019) who used it in their research on CEO communication styles. Human coding is an extensive and time-intensive process. Therefore, this method is considered suitable for larger samples, as according to Choudhury et al. (2019) the results are very similar to human coding.

Furthermore, this study contributed in using a new measurement of board effectiveness. This was done by observing board processes on meeting level. A better-defined measurement of board effectiveness is necessary to make progression in board research because the current measurements of organization performance provide less accurate evaluations of boards (Boivie et al., 2016; Desender et al., 2013). Although the defined measurement of this study is not perfect, it contributed in answering the call of Desender et al. (2013) in using a different measurement assessing what boards actually do, revealing the output of boards more directly. In this study group outcomes were defined by the submitted motions and amendments per board meeting.

Moreover, this study also discovered limits in the existing theory. First of all, this study confirms that it cannot be expected that theory on groups or small-group decision making is directly applicable to boards, although they can be considered a group. Boards are often associated with decision-making groups and information-processing groups (Forbes & Milliken, 1999). Boivie et al. (2016) argue in their study that future research on board effectiveness should build more heavily on literature about groups and work teams. The outcomes of this study emphasize the need to control for context-specific factors when relying on group and group decision-making theory, especially considering board size.

Furthermore, this study made a contribution to the unexplored area of affect display in board research. Theory on positive and negative affect has often been tested in small groups and lab settings and less in larger groups. The board in this study are larger groups with at least 27

directors and therefore not considered a small group. This study found no significant evidence of positive and negative affect influencing the information processing and decision-making process in a large group setting.

5.2 Implications for Management Practice

Although not of primary interest, this study found an association between negative facial expressions by top management team on board effectiveness. This could imply that affective states of managers on the top management team have an influence on the amount of amendments and motions submitted by the board (board effectiveness). Therefore, a practical implication for the management practice is that it is important for managers to be aware of their own facial expressions during meetings because it might influence judgments of board directors on top management team actions and proposed decisions.

5.3 Limitations and directions for future research

Although this study has made contributions, it also comes with several limitations creating future research opportunities. First of all, the sample used in this study examined the board meetings of four different water authorities that took place between 2013 and 2019. The boards of these water authorities have gone through re-elections, introducing a new board and changing the dynamics. However, the representation to other boards is limited for the reasons that it is in the public sector and has a two-tier structure. Therefore, external validity can be considered somewhat limited. However, characteristics of infrequent meetings and part-time involvement remains applicable regardless of sector or structure.

Second, with regard to the method used in this study, the variable director contribution does not take into account director domination. The variable is based on the total number of interactions to make an assessment on the group level, instead of taking averages of every speaker and thus creating an individual within the group measurement. Given the sample size and the time frame of this research, it was considered to be beyond the boundaries of possibility. However, director domination in turn-taking behavior would be interesting for future research.

Third, as secondary material is observed, the researcher does not have the ability to use the same materials for every board meeting. This entails that every water authority recorded board meetings with different cameras and thus results in varying qualities of the video footage.

Therefore, the Face API was able to provide a better representation of the data for some meetings in comparison to others.

Fourth, the dependent variable board effectiveness is measured based on board output. This has not been done in research on boards before. This study analyzed the direct output on meeting level. However, there are no other researches yet to compare the results with. The results show that 73.5% of the meetings up to two motions or/and amendments are submitted. An advancement in research on boards would be a clear-cut measure for board effectiveness that focusses on the output provided by the board, instead of financial firm performance which is affected by numerous exogenous and endogenous factors (Desender et al., 2013).

5.4 Conclusion

This study sought to make a contribution by making progression in opening up the ‘black box’ by observing actual information elaboration and affect display in the boardroom. This was done by observing director contribution by measuring the turn-taking behavior of board directors and positive and negative affect through facial expressions. This study found no significant evidence of increased director contribution increasing board effectiveness. Significant evidence for moderating effects of positive and negative affect through facial expressions was also not found. However, this study is the first to empirically investigate the processes of affect display within the boardroom and found limits to existing theories used in board research. The assumption is that board size is an important limiting factor in the application of group dynamic theories. Moreover, negative affective displays of top management team members were found to influence the amount of amendments and motions submitted by directors of the board, as a significant effect was found between negative facial expressions by the top management team and board effectiveness. Future research should include different (control) variables in examining underlying mechanisms involved in further exploring the ‘black box’ and applicability of group dynamics literature.

References

- Aguinis, H., Gottfredson, R. K., & Joo, H. (2013). Best-Practice Recommendations for Defining, Identifying, and Handling Outliers. *Organizational Research Methods, 16*(2), 270–301.
- Allison, P. D. (2009). *Fixed Effects Regression Models*. Thousand Oaks, Canada: SAGE Publications.
- Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. M. (2005). Affect and Creativity at Work. *Administrative Science Quarterly, 50*(3), 367–403.
- Ambady, N., Bernieri, F. J., & Richeson, J. A. (2000). Toward a histology of social behavior: Judgmental accuracy from thin slices of behavioral stream. *Advances in Experimental Social Psychology, 32*, 201-271.
- Ancona, D. G., & Caldwell, D. F. (1992). Demography and design: Predictors of new product team performance. *Organization Science, 3*(3), 321-341.
- Anderson, C., Keltner, D., & John, O. P. (2003). Emotional convergence between people over time. *Journal of Personality and Social Psychology, 84*(5), 1054–1068.
- Barsade, S. G. (2002). The ripple effect: Emotional contagion and its influence on group behavior. *Administrative Science Quarterly, 47*(4), 644–675.
- Barsade, S. G., & Knight, A. P. (2015). Group Affect. *Annual Review of Organizational Psychology and Organizational Behavior, 2*(1), 21–46.
- Becker, T. E., Robertson, M. M., & Vandenberg, R. J. (2018). Nonlinear Transformations in Organizational Research: Possible Problems and Potential Solutions. *Organizational Research Methods, 22*(4), 831–866.
- Bezemer, P. J., Peij, S., de Kruijs, L., & Maassen, G. (2014). How two-tier boards can be more effective. *Corporate Governance: The International Journal of Business in Society, 14*(1), 15–31.
- Blau, P. M. (1977). *Inequality and heterogeneity*. New York: Free Press
- Blevins, D. P., Tsang, E. W. K., & Spain, S. M. (2014). Count-Based Research in Management. *Organizational Research Methods, 18*(1), 47–69.
- Boivie, S., Bednar, M. K., Aguilera, R. V., & Andrus, J. L. (2016). Are boards designed to fail? The implausibility of effective board monitoring. *The Academy of Management Annals, 10*(1), 319–407.
- Bonaccio, S., O'Reilly, J., O'Sullivan, S. L., & Chiochio, F. (2016). Nonverbal Behavior and Communication in the Workplace. *Journal of Management, 42*(5), 1044–1074.

- Brodbeck, F.C., Kerschreiter, R., Mojzisch, A., & Schulz-Hardt, S. (2007) Group decision making under conditions of distributed knowledge: The information asymmetries model. *Academy of Management Review*, 32(2), 459-479.
- Certo, S. T., & Semadeni, M. (2006). Strategy Research and Panel Data: Evidence and Implications. *Journal of Management*, 32(3), 449–471.
- Choudhury, P., Wang, D., Carlson, N. A., & Khanna, T. (2019). Machine learning approaches to facial and text analysis: Discovering CEO oral communication styles. *Strategic Management Journal*, 40(11), 1705–1732.
- Daily, C. M., & Dalton, D. R. (1994). Corporate governance and the bankrupt firm: An empirical assessment. *Strategic Management Journal*, 15(8), 643–654.
- Dalton, D. R., Hitt, M. A., Certo, S. T., & Dalton, C. M. (2007). The fundamental agency problem and its mitigation. *The Academy of Management Annals*, 1(1), 1–64.
- Dalton, D. R., & Dalton, C. M. (2011). Integration of micro and macro studies in governance research: CEO duality, board composition, and financial performance. *Journal of Management*, 37(2), 404–411.
- Davidson, R. J. (2003). Seven sins in the study of emotion: Correctives from affective neuroscience. *Brain and Cognition*, 52(1), 129-132.
- Denham, B. E. (2016). *Categorical Statistics for Communication Research* (1st ed.). Hoboken, New Jersey: John Wiley & Sons.
- Desender, K. A., Aguilera, R.V., Crespi, R., & García-cestona, M. (2013). When does ownership matter? Board characteristics and behavior. *Strategic Management Journal*, 34(7), 823–842.
- Dutch Water Authorities. (2017). *Water Governance The Dutch Water Authority Model*. Retrieved from <https://dutchwaterauthorities.com/wp-content/uploads/2019/02/The-Dutch-water-authority-model-2017.pdf>
- Ekman, P., & Friesen, W. V. (1969). “The Repertoire of Nonverbal Behavior: Categories, Origins, Usage, and Coding.” *Semiotica* 1(1), 49–98.
- Emich, K. J. (2012). Who’s Bringing the Donuts? The Role of Positive Affect in Group Information Exchange. *Academy of Management Proceedings*, 2012(1), 122-132.
- Fischer, A. H., & Manstead, A. S. R. (2008). Social functions of emotion. In M. Lewis, J. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of emotions* (pp. 456–468). New York, NY: Guilford Press.
- Forbes, D. P., & Milliken, F. J. (1999). Cognition and corporate governance: understanding boards of directors as strategic decision-making groups, *Academy of Management Review*, 24(3), 489–505.

- Forgas, J. P., Laham, S. M., & Vargas, P. T. (2005). Mood effects on eyewitness memory: Affective influences on susceptibility to misinformation. *Journal of Experimental Social Psychology, 41*(6), 574–588.
- Gavetti, G., Greve, H. R., Levinthal, D. A., & Ocasio, W. 2012. The behavioral theory of the firm: Assessment and prospects. *Academy of Management Annals, 6*(1), 1-40.
- Gnisci, A., & Bakeman, R. (2007). Sequential Accommodation of Turn Taking and Turn Length. *Journal of Language and Social Psychology, 26*(3), 234–259.
- Guerrero, S., Lapalme, M. È., Herrbach, O., & Séguin, M. (2017). Board member monitoring behaviors in credit unions: The role of conscientiousness and identification with shareholders. *Corporate Governance: An International Review, 25*(2), 134–144.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate Data Analysis* (7th ed.). Essex, United Kingdom: Pearson Education Limited.
- Hambrick, D. (2007). Upper Echelons Theory: An Update. *The Academy of Management Review, 32*(2), 334-343.
- Hambrick, D. C., Misangyi, V. F., & Park, C. A. (2014). The Quad Model for Identifying a Corporate Director's Potential for Effective Monitoring: Toward a New Theory of Board Sufficiency. *Academy of Management Review, 40*(3), 323–344.
- Hambrick, D. C., Van Werder, A. V., & Zajac, E. J. (2008). New directions in corporate governance research. *Organization Science, 19*(3), 381–385.
- Harrigan, J., Rosenthal, R., & Scherer, K. (2008). *New Handbook of Methods in Nonverbal Behavior Research*. Oxford, United Kingdom: Oxford University Press.
- Harrison, D. A., & Klein, K. J. (2007). What's the difference? Diversity constructs as separation, variety, or disparity in organizations. *The Academy of Management Review, 32*(4), 1199-1228.
- Herman, E. S. (1982). *Corporate Control, Corporate Power*. Cambridge, United Kingdom: Cambridge University Press.
- Heyden, M. L. M., Oehmichen, J., Nichting, S., & Volberda, H. W. (2015). Board background heterogeneity and exploration-exploitation: The role of the institutionally adopted board model. *Global Strategy Journal, 5*(2), 154–176.
- Hillman, A. J., Nicholson, G., & Shropshire, C. (2008). Directors' Multiple Identities, Identification, and Board Monitoring and Resource Provision. *Organization Science, 19*(3), 441–456.
- Hoobler, J. M., Masterson, C. R., Nkomo, S. M., & Michel, E. J. (2016). The Business Case for Women Leaders: Meta-Analysis, Research Critique, and Path Forward. *Journal of Management, 44*(6), 2473–2499.

- Hoppmann, J., Naegele, F., & Girod, B. (2019). Boards as a Source of Inertia: Examining the Internal Challenges and Dynamics of Boards of Directors in Times of Environmental Discontinuities. *Academy of Management Journal*, *62*(2), 437–468.
- Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in Organizations: From Input-Process-Output Models to IMO Models. *Annual Review of Psychology*, *56*(1), 517–543.
- Jack, R. E., & Schyns, P. G. (2017). Toward a Social Psychophysics of Face Communication. *Annual Review of Psychology*, *68*(1), 269–297.
- Johnson, J. L., Daily, C. M., & Ellstrand, A. E. (1996). Boards of directors: A review and research agenda. *Journal of Management*, *22*(3), 409–438.
- Johnson, S. G., Schnatterly, K., & Hill, A. D. (2012). Board Composition Beyond Independence. *Journal of Management*, *39*(1), 232–262.
- Judge, W. Q., & Zeithaml, C. P. (1992). Institutional and strategic choice perspectives on board involvement in the strategic decision process. *Academy of Management Journal*, *35*(4), 766–794.
- Keltner, D., Oatley, K., & Jenkins, J.M. (2014). *Understanding Emotions*. Hoboken, NJ: Wiley
- Khanna, P., Jones, C. D., & Boivie, S. (2014). Director Human Capital, Information Processing Demands, and Board Effectiveness. *Journal of Management*, *40*(2), 557–585.
- Kidwell, B., & Hasford, J. (2014). Emotional Ability and Nonverbal Communication. *Psychology & Marketing*, *31*(7), 526–538.
- Knight, A. P., & Eisenkraft, N. (2015). Positive is usually good, negative is not always bad: The effects of group affect on social integration and task performance. *Journal of Applied Psychology*, *100*(4), 1214–1227
- Krumhuber, E., Manstead, A. S. R., Cosker, D., Marshall, D., Rosin, P. L., & Kappas, A. (2007). Facial dynamics as indicators of trustworthiness and cooperative behavior. *Emotion*, *7*(4), 730–735.
- Kumar, P., & Zattoni, A. (2017). Board monitoring and effectiveness: Antecedents and implications. *Corporate Governance: An International Review*, *25*(2), 76–77.
- Lawrence, B. S. (1997). Perspective - The Black Box of Organizational Demography. *Organization Science*, *8*(1), 1–22.
- Lerner, J. S., Li, Y., Valdesolo, P., & Kassam, K. S. (2015). Emotion and Decision Making. *Annual Review of Psychology*, *66*(1), 799–823.
- Liu, F., & Maitlis, S. (2013). Emotional Dynamics and Strategizing Processes: A Study of Strategic Conversations in Top Team Meetings. *Journal of Management Studies*, *51*(2), 202–234.

- Maitlis, S., & Ozcelik, H. (2004). Toxic Decision Processes: A Study of Emotion and Organizational Decision Making. *Organization Science*, 15(4), 375–393.
- Makri, M., Lane, P. J., & Gomez-Mejia, L. R. (2006). CEO incentives, innovation, and performance in technology- intensive firms: A reconciliation of outcome and behavior-based incentive schemes. *Strategic Management Journal*, 27(11), 1057-1080.
- Manusov, V., & Patterson, M. (Eds.). (2006). *Handbook of nonverbal communication*. Thousand Oaks, CA: Sage.
- Menges, J. I., & Kilduff, M. (2015). Group Emotions: Cutting the Gordian Knots Concerning Terms, Levels of Analysis, and Processes. *The Academy of Management Annals*, 9(1), 845–928.
- Milliken, F. J., & Martins, L. L. (1996). Searching for common threads: Understanding the multiple effects of diversity in organizational groups. *Academy of Management Review*, 21(2), 402-433.
- Milliken, F. J., & Vollrath, D. A. (1991). Strategic decision-making tasks and group effectiveness: Insights from theory and research on small group performance. *Human Relations*, 44(12), 1229-1253.
- Mizruchi, M. S. (1983). Who controls whom? An examination of the relation between management and boards of directors in large American corporations. *Academy of Management Review*, 8(3), 426–435.
- Montepare, J. M., & Dobish, H. (2003). The Contribution of Emotion Perceptions and Their Overgeneralizations to Trait Impressions. *Journal of Nonverbal Behavior*, 27(4), 237–254.
- Noordewier, M. K., & Van Dijk, E. (2018). Surprise: unfolding of facial expressions. *Cognition and Emotion*, 33(5), 915–930.
- Oreg, S., Bartunek, J. M., Lee, G., & Do, B. (2018). An Affect-Based Model of Recipients' Responses to Organizational Change Events. *Academy of Management Review*, 43(1), 65–86.
- Palia, D., & Lichtenberg, F. (1999). Managerial ownership and firm performance: A re-examination using productivity measurement. *Journal of Corporate Finance*, 5(4), 323-339.
- Payne, G. T., Benson, G. S., & Finegold, D. L. (2009). Corporate Board Attributes, Team Effectiveness and Financial Performance. *Journal of Management Studies*, 46(4), 704–731.
- Pettigrew, A. M. (1992). On studying managerial elites. *Strategic Management Journal*, 13(2), 163–182.
- Porter, M. E. (1991). Towards a dynamic theory of strategy. *Strategic Management Journal*, 12(2), 95–117.

- Pugliese, A., Bezemer, P.J., & Nicholson, G. J. (2014). Exploring Directors' Interaction During Board Meetings: A Video-Observational Analysis. *Academy of Management Proceedings*, 2014(1), 1-25.
- Pugliese, A., Nicholson, G., & Bezemer, P. J. (2015). An Observational Analysis of the Impact of Board Dynamics and Directors' Participation on Perceived Board Effectiveness. *British Journal of Management*, 26(1), 1-25.
- Roh, H., Chun, K., Ryou, Y., & Son, J. (2018). Opening the Black Box: A Meta-Analytic Examination of the Effects of Top Management Team Diversity on Emergent Team Processes and Multilevel Contextual Influence. *Group & Organization Management*, 44(1), 112–164.
- Rutherford, M. A., Buchholtz, A. K., & Brown, J. A. (2007). Examining the relationships between monitoring and incentives in corporate governance. *Journal of Management Studies*, 44(3), 414–430.
- Sacks, H., Schegloff, E. A., & Jefferson, G. (1974). A Simplest Systematics for the Organization of Turn-Taking for Conversation. *Language*, 50(4), 696-735.
- Sy, T., Choi, J.N. (2013). Contagious leaders and followers: exploring multi-stage mood contagion in a leader activation and member propagation (LAMP) model. *Organizational Behavior and Human Decision Processes*, 122(2), 127–140.
- Sy, T., Côté, S., & Saavedra, R. 2005. The contagious leader: impact of the leader's mood on the mood of group members, group affective tone, and group processes. *Journal of Applied Psychology*. 90(2), 295–305.
- TenHouten, W. D. (2012). *Emotion and Reason: Mind, Brain, and the Social Domains of Work and Love* (1st ed.). London, United kingdom: Routledge.
- Tuggle, C.S., Schnatterly, K., & Johnson, R.A. (2010) Attention patterns in the boardroom: How board composition and processes affect discussion of entrepreneurial issues. *Academy of Management Journal*, 53(3), 550-571.
- Van Kleef, G. A., Oveis, C., Van der Löwe, I., LuoKogan, A., Goetz, J., & Keltner, D. (2008). Power, distress, and compassion: Turning a blind eye to the suffering of others. *Psychological Science*, 19(12), 1315-1322.
- Van Kleef, G. A. (2009). How emotions regulate social life: The emotions as social information (EASI) model. *Current Directions in Psychological Science*, 18(8), 184–188.
- Van Kleef, G. A., De Dreu, C. K. W., & Manstead, A. S. R. (2010). An Interpersonal Approach to Emotion in Social Decision Making. *Advances in Experimental Social Psychology*, 42(10),45–96.
- Van Kleef, G. A., & Côté, S. (2018). Emotional Dynamics in Conflict and Negotiation: Individual, Dyadic, and Group Processes. *Annual Review of Organizational Psychology and Organizational Behavior*, 5(1), 437–464.

- Van Knippenberg, D., De Dreu, C., & Homan, A. (2004). Work group diversity and group performance: An integrative model and research agenda. *Journal of Applied Psychology, 89*(6), 1008-1022.
- Van Knippenberg, D., Kooij-de Bode, H. J. M., Van Ginkel, W. P. (2010). The interactive effects of mood and trait negative affect in group decision making. *Organization Science 21*(3),731–744.
- Vrij, A., Fisher, R., Mann, S., & Leal, S. (2006). Detecting deception by manipulating cognitive load. *Trends in Cognitive Sciences, 10*(4), 141–142.
- Williams, K., & O'Reilly, C. A. (1998). Demography and diversity in organizations: A review of 40 years of research. In B. Staw & L. Cummings (Eds.), *Research in organizational behavior* (pp. 77-140). Greenwich, CT: JAI Press.
- Zattoni, A., Gnan, L., & Huse, M. (2015). Does family involvement influence firm performance? Exploring the mediating effects of board processes and tasks. *Journal of Management, 41*(4), 1214–1243.
- Zhu, D. H., & Westphal, J. D. (2011) Misperceiving the Beliefs of Others: How Pluralistic Ignorance Contributes to the Persistence of Positive Security Analyst Reactions to the Adoption of Stock Repurchase plans. *Organization Science, 22*(4), 869-886.
- Zona, F., & Zattoni, A. (2007). Beyond the black box of demography: Board processes and task effectiveness within Italian firms. *Corporate Governance-an International Review, 15*(5), 852–864.

Appendices

Appendix A: Example overview motions and amendments submitted

Algemeen Bestuur 20-02-2019 3.2. Vaststelling Legger Oppervlaktewateren 2018	2019-001 Amendement W@I Vaststelling Legger Oppervlaktenwateren 2018	verworpen
Algemeen Bestuur 20-02-2019 3.7. Ingediende motie(s) vreemd aan de orde van de dag	2019-003 Motie PvdA Vegetarisch of Carnivoor geef het door	verworpen
Algemeen Bestuur 20-02-2019 3.7. Ingediende motie(s) vreemd aan de orde van de dag	2019-002 Motie PvdD Carnivoor, geef het door	verworpen
Algemeen Bestuur 20-02-2019 3.7. Ingediende motie(s) vreemd aan de orde van de dag	2019-004 Motie PvdA De heul van Wiel en Vogelzang	aangenomen

Appendix B: Python scripts

Script 1

```
import requests
import json
import os
import csv
import pandas as pd
from pandas.io.json import json_normalize

# set to your own subscription key value
subscription_key =
assert subscription_key

# replace <My Endpoint String> with the string from your endpoint URL
face_api_url = 'https://northeurope.api.cognitive.microsoft.com/face/v1.0/detect'

# replace C:/Test/ with the directory in which the photos are
files_dir = '/Users/iriskeemink/Desktop/HDSR12182018'
files = os.listdir(files_dir)

# the following lines create JSON files out of each image
for f in files:
    if f.lower().endswith(('.png', '.jpg', '.jpeg')):
        image_path = files_dir + '/' + f
        image_data = open(image_path, "rb").read()
        headers = {'Ocp-Apim-Subscription-Key': subscription_key, 'Content-Type':
'application/octet-stream'}
        params = {
            'returnFaceId': 'true',
            'returnFaceLandmarks': 'false',
            'returnFaceAttributes': 'age',
        }

        response = requests.post(face_api_url, params=params,
            headers=headers, data=image_data)
        analysis = response.json()
        print(analysis)
        with open(files_dir + '/' + f + '.json', 'w', encoding = "utf-8") as f:
            json.dump(response.json(), f)
```

Script 2

```
import requests
import json
import os
import csv
import pandas as pd
from pandas.io.json import json_normalize

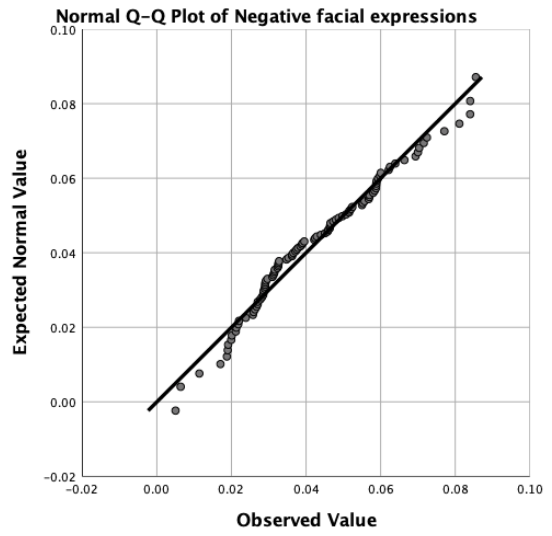
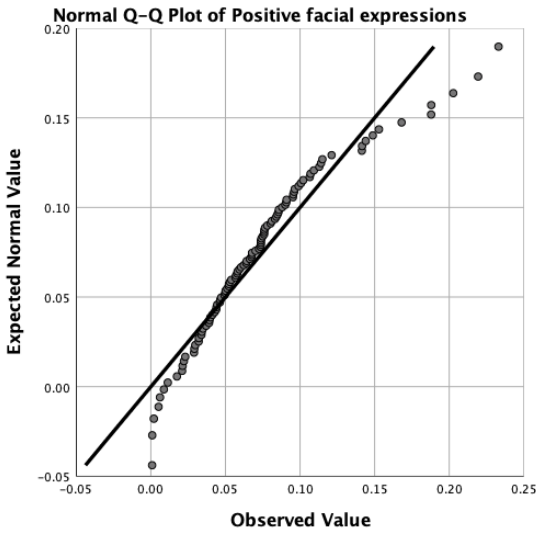
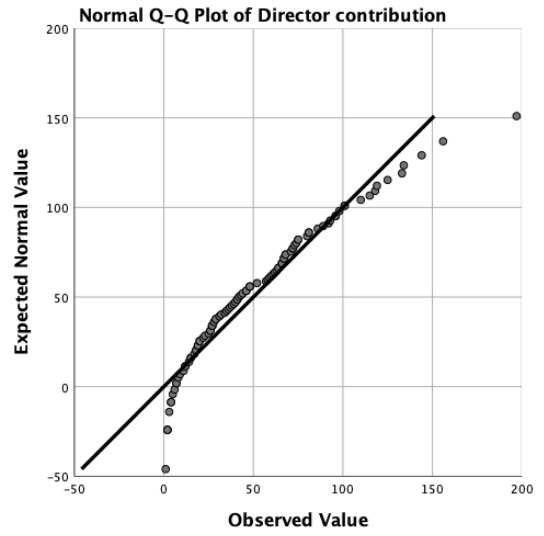
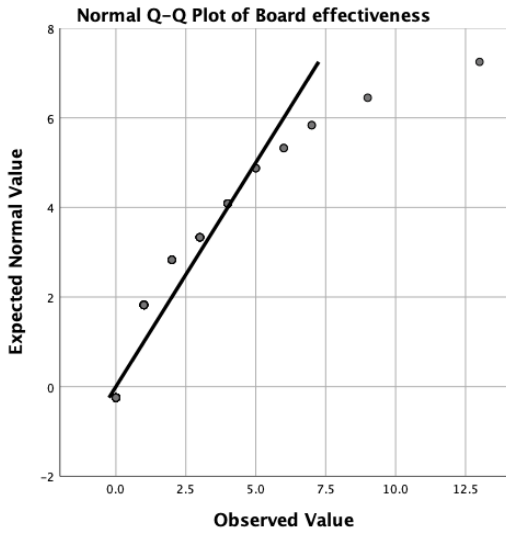
# replace C:/Test/ with the directory in which the photos are
files_dir = '/Users/iriskeemink/Desktop/HDSR12182018'
files = os.listdir(files_dir)

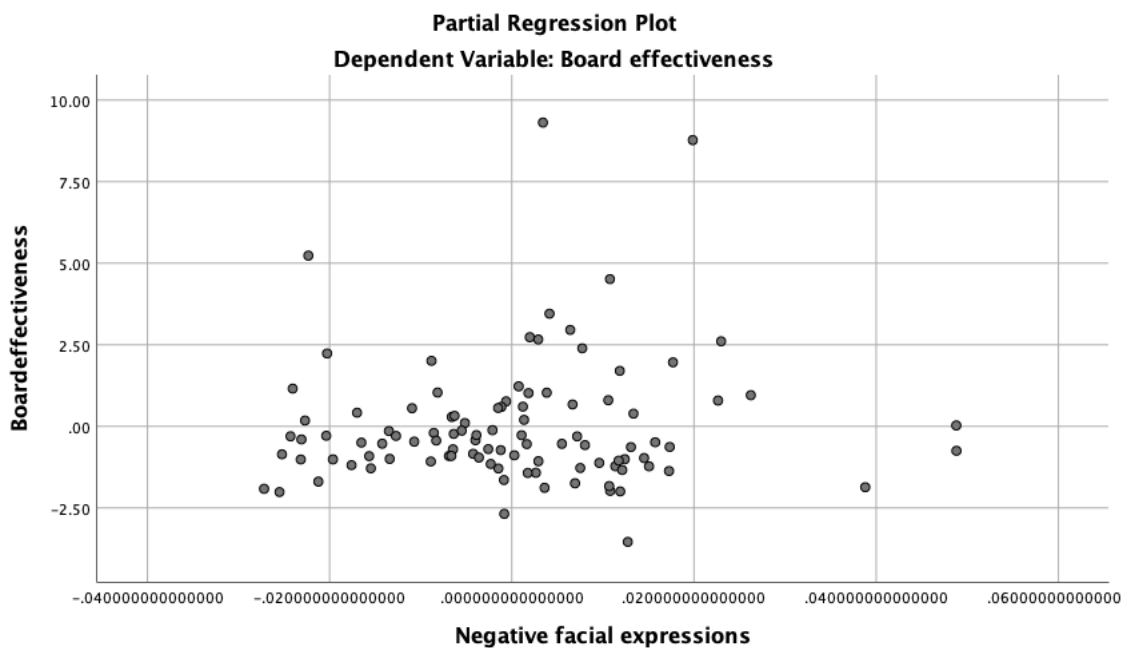
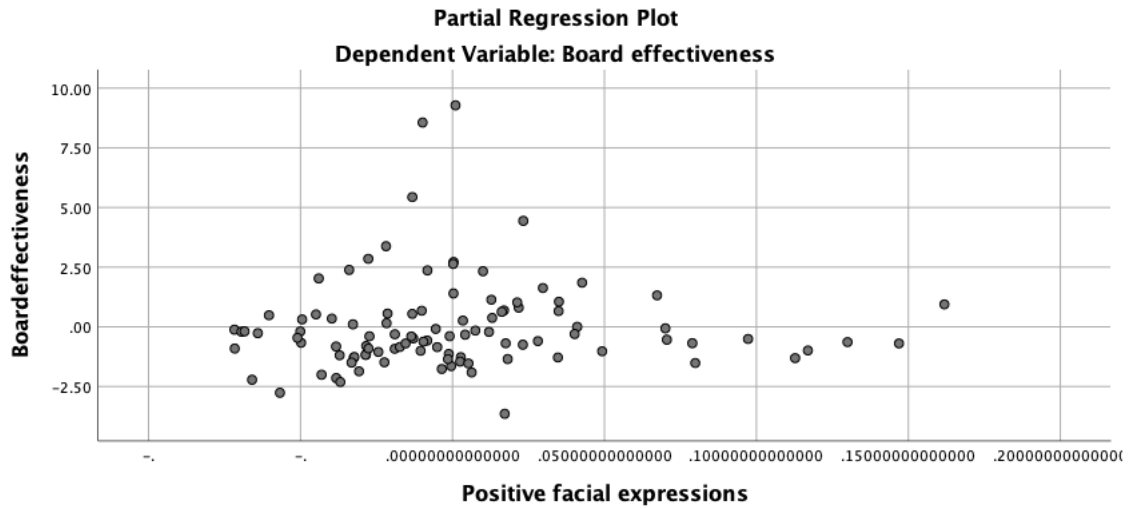
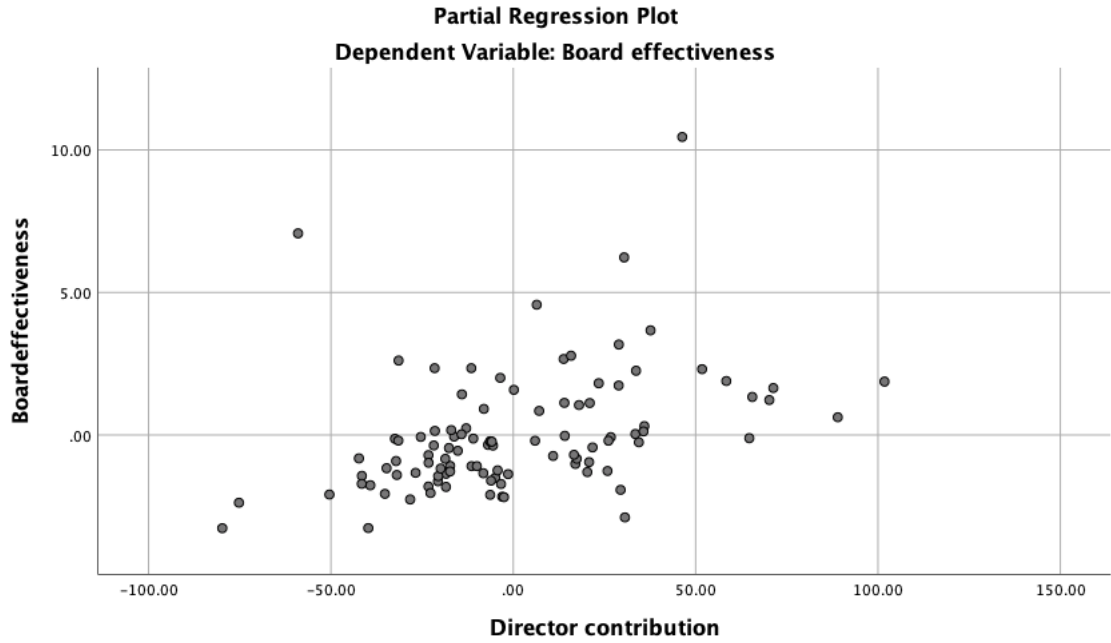
# the following lines transform the JSONs to a CSV
for g in files:
    print(g)
    if g.lower().endswith('.json'):
        print(g)
        with open(files_dir + '/' + g) as h:
            data = json.load(h)
            df = json_normalize(data).assign(filename=g)
            print(df)
# replace C:\Test\output_u.csv with the filename you want to have
df.to_csv('/Users/iriskeemink/Desktop/outputnew/HDSR12182018.csv', index=True,
mode='a')
```

Appendix C: Microsoft Azure API example output

```
▼ 0:  
  faceId: "129eded6-007a-4862-b76d-03e9be008360"  
  ▼ faceRectangle:  
    top: 620  
    left: 306  
    width: 295  
    height: 295  
  ▼ faceAttributes:  
    ▼ emotion:  
      anger: 0  
      contempt: 0  
      disgust: 0  
      fear: 0  
      happiness: 0.126  
      neutral: 0.809  
      sadness: 0.064  
      surprise: 0
```

Appendix D: Assumptions multiple regression





Model Summary^b

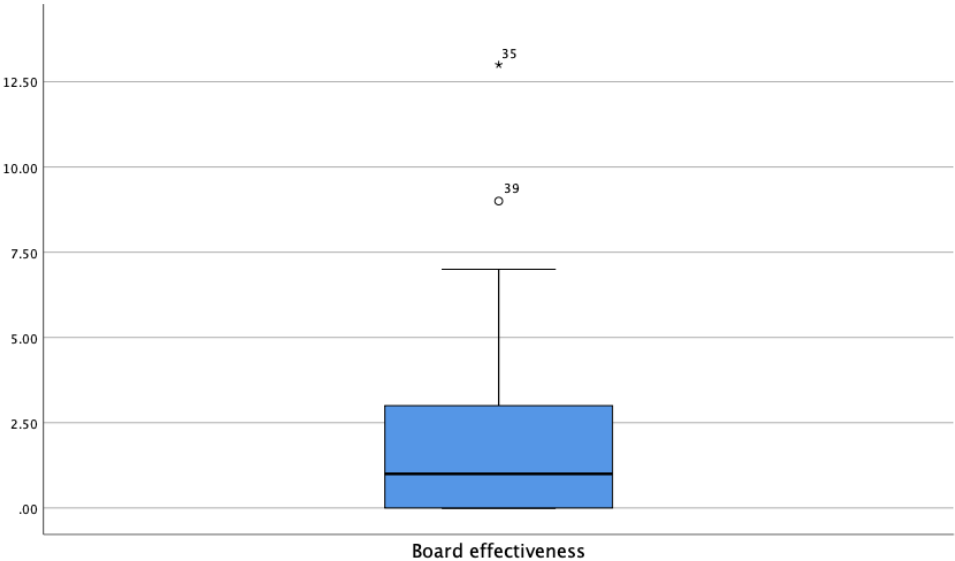
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
5	.775 ^a	.601	.490	1.593	2.348

Coefficients^a

Model		Collinearity Statistics	
		Tolerance	VIF
5	Board size	.017	57.508
	Meeting frequency	.072	13.886
	Meeting duration	.253	3.957
	Gender diversity	.080	12.461
	Political diversity	.051	19.500
	Age diversity	.061	16.394
	Positive facial expressions (TMT)	.683	1.465
	Negative facial expressions (TMT)	.702	1.424
	Dummy_2013	.108	9.223
	Dummy_2014	.068	14.649
	Dummy_2015	.139	7.194
	Dummy_2016	.140	7.135
	Dummy_2017	.169	5.932
	Dummy_2018	.157	6.352
	Dummy_Friesland	.046	21.826
	Dummy_Zuiderzee	.027	36.870
	Dummy_HDSR	.113	8.884
	Positive facial expressions	.347	2.885
	Negative facial expressions	.481	2.079
	Director contribution	.176	5.698
Moderator negative facial expressions	.580	1.724	
Moderator positive facial expressions	.363	2.753	

a. Dependent Variable: Board effectiveness

Appendix E: Outlier dependent variable board effectiveness



Appendix F: Frequency tables

Statistics					
		Board effectiveness	Director contribution	Positive facial expressions	Negative facial expressions
N	Valid	102	102	102	102
	Missing	0	0	0	0
Median		1	45	.068	.039
Std. Deviation		2.232	39.310	.047	.018
Variance		4.980	1.545.262	.002	0
Skewness		2.176	.978	1.191	.402
Std. Error of Skewness		.239	.239	.239	.239
Kurtosis		6.574	1.014	1.853	-.364
Std. Error of Kurtosis		.474	.474	.474	.474
Percentiles	25	0	20	.042	.029
	50	1	45	.068	.039
	75	3	73.250	.092	.057

Board effectiveness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	40	39.2	39.2	39.2
	1	28	27.5	27.5	66.7
	2	7	6.9	6.9	73.5
	3	8	7.8	7.8	81.4
	4	10	9.8	9.8	91.2
	5	3	2.9	2.9	94.1
	6	2	2	2	96.1
	7	2	2	2	98
	9	1	1	1	99
	13	1	1	1	100
Total		102	100	100	