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Social Relationships and Group Dynamics within the Supervisory Board and their Influence on CEO Compensation

Fabian Dutschkus · Christian Lukas

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Abstract As financial performance measures are not the sole determinant of chief executive officer (CEO) compensation, researchers have investigated social relationships between the CEO and the supervisory board's (SB's) members to identify other determinants. However, different conclusions have been obtained so far. We argue that disregarding group dynamics in the board's social categorization, which arise because of social relationships between board members, can help explain the mixed evidence. Our results suggest that group dynamics within the SB impact the level of CEO compensation. Surprisingly, more robust social ties between the CEO and SB members can lead to lower CEO compensation. In addition, the effects of social relationships depend on the specific type of social relationships.

Keywords Social Relationships · Executive Compensation · Supervisory Board Independence

1 Introduction

Though chief executive officer (CEO) compensation is not determined solely by a company's performance, a positive correlation between executive compensation and firm profitability is documented in a number of studies (Murphy 1985, 1999; Conyon 2014; Edmans and Gabaix 2016). While the positive correlation lends sup-

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port to an efficient contracting argument, Edmans and Gabaix (2016) assert that the large share of pay that is explained by manager fixed effects in a study by Graham et al. (2012) could indicate rent extraction by managers. Hence, other influences beyond economic factors seem to matter. In this context, researchers have investigated social relationships between the CEO and other board members, especially members of the compensation committee (CC) or the supervisory board (SB).¹ If CEO compensation depends on the latter's decision, the CEO has an incentive to influence the compensation-setting process. Social relationships can help the CEO shape the opinion of individual members of the SB in her/his favor. However, the CEO does not interact with individual members in isolation. Members of the SB, in turn, interact with each other. Presumably, the positive view of the (performance of the) CEO that a specific member holds would be reflected in the communication with other members. In this way, the influence of the CEO could reach beyond her/his interactions with individual members. The interaction among members, therefore, becomes a vital group dynamic process that very likely impacts the work of the SB and its decisions. This paper aims to analyze the effect of these social relationships and group dynamics on CEO compensation.

The research on social relationships between the CEO and the SB and its impact on the former's compensation started in the 1990s (see Sect. 2). However, to the best of our knowledge, only a few contributions examine social relationships *within* the SB and their impact on CEO compensation. This paper intends to contribute to filling this research gap and, at the same time, responds to calls for CEO compensation research outside the USA (Edmans and Gabaix 2016).

The managerial power theory (MPT), proposed by Bebchuk et al. (2002), is centered on the idea of the CEO's influence on the compensation-setting process. A pivotal aspect of this influence is the social relationship between CEO and management board or SB members in a one- or two-tier governance system, respectively. This theory emphasizes that CEO's relationships with individual members can also generate their own dynamics in the SB. The extent of the dynamics is affected by factors including reciprocity, similarity, and the presence of authorities within the team (Bebchuk et al. 2002). The dynamic changes in these relationships are understood as a group dynamic process in the present study.

There is evidence that board composition and CEO compensation are linked. The former refers to characteristics of board members, and different characteristics likely have an influence on how social relationships evolve. Westphal and Zajac (1995) demonstrate that demographic similarity between the board and the CEO is associated with higher compensation for the CEO; Hwang and Kim (2009) document a similar effect for social relationships. In addition, educational (dis)similarities can affect the outcome of the compensation-setting process (Fiss 2006). Social relationships based on a common educational background increase the tolerance for poor performance of the CEO (Nguyen 2012). In contrast to these studies, other researchers fail to establish a link between board composition and CEO compensation (Belliveau et al. 1996; Daily et al. 1998; Conyon 2014; Edmans et al. 2017).

¹ The CC is a sub-committee of the SB in the German governance system. (See Sect. 2.) Since we have data on the supervisory board level, we only refer to the SB in this paper.

One plausible explanation for the mixed findings could be the neglect of social relationships within the SB.

The SB generally appoints the chairperson through majority voting, owing to which the latter gains higher status and more appreciation by members of the SB. Members are even more sensitive to the influence of social relationships given their lower social status (Belliveau et al. 1996). They may even strive for social relationships with the chairperson, as this could uplift their own status. The disparity in status, in turn, stimulates group dynamics.

Furthermore, Westphal (1999) shows that social relationships between CEO and board members foster trust and identification with the former. Hence, social relationships between CEO and the SB matter and so do those within the board. The latter could be an additional influencing factor in determining CEO compensation. The intensity of relationships could moderate the CEO's influence on the SB. Social relationships of the CEO with individual members of the SB may be ineffective if these members do not have social relationships among themselves. In contrast, if a specific member has a substantial influence on other members, this could intensify the CEO's impact on the compensation-setting process.

In this study, the influence of social relationships within the SB is empirically tested with a panel regression method using data spanning four years between 2013 and 2016. The data set comprises 25 German firms (twenty from Dax-30, four from M-Dax, and one from S-Dax). The regression results confirm the importance of considering social relationships within the SB. Social relationships among members of the SB affect the compensation-setting process and its outcome. We observe that the type of social relationship, social status of the members, and strength of social relationships are essential. For example, social relationships based on equal employment (i.e., same present or past positions and companies) positively impact CEO compensation. Quite surprisingly, we find a contrary effect for social relationships emanating from recreational interests. In addition, we identify notable moderation effects. For instance, if social relationships within the SB based on employment become stronger, CEO compensation decreases unless the social relationship between CEO and chairperson of the SB is sufficiently strong. The paper is structured as follows. Sect. 2 expounds theoretical foundations and our hypotheses. Sect. 3 introduces the data and methodology. Sect. 4 elaborates on the results obtained. Finally, Sect. 5 delineates the conclusions.

The paper is structured as follows. In Sect. 2, we expound theoretical foundations and derive our hypotheses. The data and methodology is introduced in Sect. 3. In Sect. 4, we discuss the results. The conclusion is drawn in Sect. 5.

2 Theoretical foundations and hypotheses

2.1 Social relationships

In our study, social-psychological aspects based on self-categorization theory (Turner 1987, 2010) explain the existence and development of social relationships. Following that theory, comparisons based on group members' personal characteristics,

opinions, and capabilities cause the categorizations of self and others. These social categorization processes lead to in-group members for similarities and out-group members for differences (Van Knippenberg and Schippers 2007) and form the basis for evolving social relationships. People orient themselves on people with as much conformance as possible concerning characteristics (O'Reilly III et al. 1988). That is, they prefer people similar to them. Meeting someone born in the same region with a similar educational background or hobby can create a (weak) initial feeling of connectedness, sympathy, and affection (Byrne et al. 1966, 1967). This similarity may entail a leap of faith and facilitate building social relationships.

Besides similarity, reciprocity has relevance for social relationships. Reciprocity is a social norm that determines how people behave in a given social context; the concept is rooted in social exchange theory (Homans 1958; Blau 1986; Cook 2015). It dictates an obligation whenever one member has done a favor to another member. Expectations of behavior arise. They can lead to a multitude of beneficial and continuous exchanges. However, non-compliance with these obligations can lead to sanctions (O'Reilly and Main 2010).

In sum, the psychological concepts of similarity and reciprocity characterize social relationships. They evolve from any social connection that could initiate categorization processes. These processes are based on members' (dis)similarity and initiate reciprocity.

2.2 Social relationships and CEO compensation

Social relationships among group members are beneficial for the group if the majority of its members are in-group members. Greater homogeneity in the group leads to greater satisfaction (Barsade et al. 2000) and raises the individually perceived influence on the team. Consequently, if SB members exhibit similarities that give rise to social relationships, and if the CEO can establish social relationships with individual SB members, the CEO could gain influence on the entire board. Increased harmony and unity among the SB members could make them less resistant to manipulations by the CEO. In this way, the latter can exert power.

As remarked earlier, MPT focuses on the ability of the CEOs to influence their compensation. According to Bebchuk et al. (2002), this influence of the CEO results from her/his social relationships with the SB members. These relationships conflict with the arm's length principle. Consequently, the CEO may have the power to increase compensation beyond the efficient level from contracting at arm's length. Accordingly, the SB does not act solely in the interests of the shareholders because it is no longer independent of the CEO. Bebchuk et al. (2002) and Main et al. (1995) mention several reasons why social relationships cause these dependencies. Concerning the research question of the present paper, there are a few particularly relevant reasons that we will discuss now.

First, reciprocal actions due to, e.g., the nomination (and selection) of the SB members by the CEO may cause dependencies. Based on game-theoretic considerations, Sethi and Somanathan (2003) argue that reciprocal actions can be expected if (i) agents punish selfish actions, (ii) opportunistic behavior is expected from all agents, or (iii) if the matching process is assortative. In these three in-

stances, reciprocity is an equilibrium. As an example for (iii), Krishnan et al. (2011) and Bruynseels and Cardinaels (2014) find that CEOs select more socially connected directors (e.g., for audit committees) in order to circumvent the mandated independence. CEOs match with directors expected to “cooperate,” i.e., to reciprocate for being selected. Undoubtedly, reciprocity as the source of dependencies appears to be more relevant in the one-tier system than in the two-tier system. In the latter, SB members are appointed through voting in the shareholder meeting. Given that the SB itself can propose new members, there would be the possibility of a CEO’s influence on the slate of board members. However, the CEO’s influence on the eventual decision is less pronounced in the two-tier system than in the one-tier system.

Second, group dynamics between the CEO and the supervisory board may generate dependencies and overly favorable evaluations of CEO performance. One possible explanation relates to social dynamics or evolving and changing social relationships between CEO and SB members. For example, social dynamics can lead to higher tolerance for poor performance (Nguyen 2012). The influence of social dynamics on the CEO’s compensation is evidenced in a number of studies (e.g., Westphal and Zajac 1995; Fiss 2006; Hwang and Kim 2009; Rose et al. 2014). Another explanation is self-serving cognitive dissonance, which can explain favorable judgments. O’Reilly III et al. (1988), Westphal (1999) and Hoitash (2011) show that sympathy and other psychological factors influence the cognitive comparison process of SB members. Having sympathy for the CEO could lead to a more favorable evaluation of the CEO’s actions and performance – although the job description of SB members calls for a critical evaluation. Yet, as higher CEO compensation represents the likely consequence, this may benefit the SB members if they are CEOs elsewhere and need to justify their paycheck.

The various ways of creating dependencies and influencing SB members are not independent of each other, and it is, therefore, tricky to empirically analyze them separately. Nevertheless, we conclude that social relationships offer a way for the CEO to circumvent the arm’s length principle. Thus, the CEO gains power and can use it to obtain higher compensation. This reasoning underlies our first hypothesis.

Hypothesis 1 *The stronger the social relationships between the CEO and the SB members, the higher is the CEO compensation.*

As outlined above, similarity and reciprocity are pertinent to the development of social relationships. The similarities between CEO and SB members with respect to educational background, current position, or recreational interests could foster personal interaction and, thus, help establish a social relationship.²

² Similarities, irrespective of their nature, breed social relationships. It is hard to argue if the nature of similarity matters and, if yes, what the direction of the effect could be. Therefore, we do not formulate separate hypotheses for specific social relationships, i.e., social relationships based on specific similarities.

2.3 Dynamics of social relationships within the supervisory board

As stated earlier, social relationships between SB members and the CEO can become more “effective” for the latter if there are also social relationships within the SB. CEO’s efforts of persuasion may then need not target every single board member; addressing a sub-group of board members could suffice. Members themselves interact with each other, and given their social relationships, they may not question the arguments of other members and become more likely to share their views. Ultimately, more members could share the thoughts of the CEO, which affects performance evaluation. Hence, social relationships within the board can be relevant for setting CEO compensation.

We argue that similarities between members of the SB form the basis for developing social relationships within the board. These relationships are not static but subject to change. We use the term group dynamic process in this context. Three factors simultaneously influence this process: (i) the potential majority of in-group members, (ii) self-categorization of members, and (iii) the status of the chairperson.

A number of studies document the importance of team composition with respect to the team members’ backgrounds. Similarities between members can relate to, for example, age, other career experience, education, socioeconomic roots, or recreational interests. The more similar members are, the more homogeneous is the team and vice versa. Heterogeneous groups are associated with a higher likelihood of implementing innovations (Bantel and Jackson 1989) and changes in corporate strategy (Wiersema and Bantel 1992). In contrast, homogeneous teams display improved communication (Zenger and Lawrence 1989), faster and more efficient coordination (Carpenter 2002; Hambrick et al. 1996), better integration between teams (Michel and Hambrick 1992), and reduced conflicts (Pelled et al. 1999).

Self-categorization theory (Turner 1987, 2010) explains the polarization of groups (into homogeneous or heterogeneous) as conformity with a polarized norm that, unlike other groups, defines one’s own group affiliation within a particular social context (Hogg et al. 1990). In-group members share similarities, but the categorization process leads to out-group members if there are differences (Van Knippenberg and Schippers 2007). However, the affiliation with in- or out-group members can change dynamically. For example, if the number of in-group members reaches a threshold with respect to the group size, out-group members could abruptly disappear, i.e., everyone becomes an in-group member. On the one hand, criticism and thus the social pressure on the rest of the out-group members increase (Hornsey and Imani 2004; Esposito et al. 2013). On the other hand, members tend to favor in-group members (Van Knippenberg and Schippers 2007) because of, for example, better integration of members (Barsade et al. 2000). Additionally, Barsade et al. (2000) find that social relationships between the CEO and the CC (team) influence the social categorization within the committee. Social connections with team members lead to greater use of participative decision-making of the CEO, whereby members feel that they have more influence (Barsade et al. 2000). An increased self-perception to participate in decisions fosters trust and satisfaction within the team. These positive attributes of the in-group members could influence the rest of the team because members need to cooperate, leading to a constant exchange of information. This ex-

change of information helps to intensify the contact with the other members, which could help establish a harmonious relationship (Van Knippenberg and Schippers 2007).

In line with the arguments above, we hypothesize that similarities between SB members and self-categorization processes can lead to an SB that primarily consists of in-group members. If social relationships between the CEO and SB members exist, the SB will be inclined to evaluate CEO performance better and award higher compensation to the CEO. The more substantial the latter effect, the more intense must be social relationships within the SB and between the CEO and the SB. Consequently, we predict:³

Hypothesis 2a *The stronger the social relationships between the CEO and the SB members (excluding the chairperson), the higher is the CEO compensation.*

Hypothesis 2b *Stronger social relationships within the SB (excluding the chairperson) augment the positive effect of social relationships between the CEO and SB members (excluding the chairperson) on CEO compensation.*

To what extent do social relationships between the CEO and an SB member with a dominant position and, thus, a higher social status influence the social categorization process within the SB? Apparently, it is the chairperson of the SB, who has a particularly influential position, which entails a higher social status than a “normal” membership in the SB. Therefore, social relationships between the CEO and the chairperson could impact the former’s compensation. Two factors account for this impact. First, the chairperson has an additional influence on the behavior of the members, since the members elected her/him. Members generally elect a chairperson who they can trust. This trust is based on social relationships. Consequently, members are inclined to act or vote in accordance with the views of their chairperson. Second, the chairperson possesses a higher social status, owing to which members typically strive for social relationships with her/him to uplift their own social status (Belliveau et al. 1996). This striving for social relationships leads to group dynamics in social categorization between members of the SB and redefines the similarities or differences among them. Given this influence of the chairperson on other members of the SB, the social relationship between CEO and chairperson gains in importance. Belliveau et al. (1996) examine the influence of social status between the CEO and the chairperson of the CC. They demonstrate that social status also determines the effect of social relationships and the chairperson has a notable role in the CEO’s potential influence on the committee members because of these social relationships. However, in their analysis, Belliveau et al. (1996) ignore relations between the chairperson and committee members. In this regard, Haleblan and Finkelstein (1993) emphasize the importance of dominant members of a team.

³ We did not include the chairperson of the SB as a member to avoid bias in the hypotheses’ results due to the chairperson’s assumed effect (see Hypothesis 3). Therefore, we also separate the main effect (Hypothesis 2a).

A dominant CEO could restrict access to information and exert substantial influence on the opinions and decisions of the other members.

We conclude that the dynamics in social categorization processes and those originating from the higher status of the SB chairperson intensify social relationships between the chairperson and board members. Social relationships between the CEO and the chairperson are more beneficial for the CEO, i.e., they lead to higher CEO compensation, the more intense social relationships between the chairperson and board members are. Therefore, we predict:

Hypothesis 3a *The stronger the social relationships between the CEO and the chairperson of the SB, the higher is the CEO compensation.*

Hypothesis 3b *Stronger social relationships between the CEO and the chairperson of the SB augment the positive effect of social relationships between the chairperson and SB members on CEO compensation.*

3 Data and methodology

3.1 Institutional background

The study is embedded in the German corporate governance context. Germany features a two-tier system of governance. The management board (Vorstand) headed by the CEO (Vorstandsvorsitzender) manages the entire company and determines its policies and strategies. The SB (Aufsichtsrat) monitors and advises the management board, appoints and recalls members of the management board, performs auditing and reporting functions, and convenes the annual shareholder meeting.⁴ In addition, the SB decides the level and structure of the compensation for the management board (AktG. § 111, Bundesministerium der Justiz und für Verbraucherschutz 1965). Therefore, the supervisory board fulfils the obligations of a compensation committee of firms in, e.g., the USA.

The German Corporate Governance Codex does not require firms to establish a CC (Verguetungsausschuss). Yet, given the immensity of duties of the SB, many firms set up such a committee (Bachmann 2020). Members of the CC must be members of the SB so that the former is a sub-committee or working group of the latter. The committee reports to the SB, which eventually decides CEO compensation. Therefore, the SB can be considered the compensation-setting authority.

The strict distinction between management and supervision differs fundamentally from the one-tier system, for example, in the USA or UK, where the board performs both functions. Hence, Germany represents a unique empirical setting to investigate the influence of social relationships and group dynamics on CEO compensation.

⁴ For a detailed description of the German Corporate Governance system see Uepping (2015, pp. 13–17).

3.2 Sample

For the present study, German companies listed in the Dax-30, M-Dax, and S-Dax were considered. The sample period spans the years 2013 to 2016. We collected the following data for the chairperson of the management board (CEO), the chairperson of the SB, and the members of the SB: year of birth, gender, place of birth, nationality, place of residence, subject area, degree, title, city (of education and work), previous companies, previous positions, voluntary activities, hobbies, and the respective period (of the education, the positions and the stays in cities). Data sources are Munzinger Database, CVs published on the websites of previous and current employers, and the LinkedIn networking platform. CEO compensation and several control variables (number of employees, return on assets) were extracted from corporate reports for the respective years.

We started the data collection with 30 Dax companies, 50 M-Dax, and 50 S-Dax companies⁵. However, as we could not collect biographical data for all CEOs and SB members, the number in our sample amounts to 27. Not taking all companies into account could lead to a selection bias. Therefore, we conducted the Heckman test for panel data models based on Semykina and Wooldridge (2010). However, the test only considers missing data of the dependent variable. Therefore, we set social relationships as the dependent variable and tested whether the structural conditions of the companies in the sample are more likely to lead to social relationships. More precisely, we tested how the model $CEOSBAllSR = Total\ Compensation + No.\ of\ Employees + RoA + CEO\ Age + CEO\ Title + CEO\ Change + \epsilon$ fits the selection model $Exists\ in\ Sample = Total\ Compensation + RoA + Balance\ sheet\ total + \epsilon$. For this test, we were not able to collect CEO compensation for all 130 companies. Therefore, we could not consider 13 companies from the M-Dax and 21 companies from the S-Dax. In addition, Deutsche Bank (Dax-30) could not be considered because the change from a double to a single CEO distorted the amount of compensation. Furthermore, the companies SAP and freenet show outliers regarding the total compensation of the CEO and are, therefore, not considered either.⁶ As a result, the Heckman test for panel data models shows that the interaction of the inverse Mills ratios with the time variable is not significantly different from zero ($p > 0.999$ for each year). Thus, we assume that there is no selection bias. Moreover, we can add another argument to corroborate our assertion. In our sample, the majority of individuals do not have social relationships with other individuals.⁷ This means that not only individuals who have more social relationships (i.e., similarities concerning recreational interests, education, etc.) with

⁵ The number of companies included in the S-Dax was only increased to 70 in September 2018.

⁶ The company freenet provided the lowest compensation of 1,125,000 euros in 2013 in our considered sample of 27 companies. In addition, the compensation increases by more than three times in 2015 (3,575,000) and finally falls again by 21 percent in 2016. The company “SAP” changed from a dual leadership to a single leadership in 2014, which caused the compensation to initially decrease in 2015 (EUR 4,950,400) to more than double in 2016 (EUR 13,982,400). The outliers lead to a distribution of the residuals which does not correspond to a normal distribution in the fixed effects regression models.

⁷ For example, on average across all years, 37% of SB members have made hobbies public. Of these, 54% have hobbies in common with the CEOs.

Table 1 Companies in the sample

Dax-30	M-Dax	S-Dax
Adidas, BASF, Bayer, Beiersdorf, BMW, Continental, Daimler, Deutsche Post, Deutsche Telekom, E.ON, Fresenius Medical Care, HeidelbergCement, Henkel, Infineon Technologies, Linde, Merck, RWE, Siemens, ThyssenKrupp, Volkswagen	Evonik Industries, Lanxess, Osram, Licht, ProSieben-Sat.1 Media	Wacker Chemie

others are willing to provide information about these relationships, but individuals with few or even without such relationships make their recreational interests and educational background public. Eventually, our sample consists of 560 persons from 25 companies. Table 1 presents an overview of companies in the sample.

Table 4 in Sect. 3.3 provides an overview of the data set's characteristics.

3.3 Variable operationalization

3.3.1 CEO compensation

Likewise Westphal and Zajac (1995), Hwang and Kim (2009), Fracassi and Tate (2012), we use *Total Compensation* to measure the compensation of the CEO, which is our dependent variable. In particular, total compensation according to the German Corporate Governance Code is used. It includes all monetary compensation components, options and other share-based components⁸, pension benefits, other commitments (in particular in the event of termination of employment), fringe benefits of any kind, and benefits from third parties promised or granted in the financial year with regard to the activities of the Management Board (Regierungskommission Deutscher Corporate Governance Kodex 2017, p. 7).

3.3.2 Types of social relationships

Social relationships are quantified in terms of the characteristics that CEO and members of the SB possess. The characteristics are assigned to different types of social relationships. The types of social relationships most frequently used in the literature are *Education*, *Past or Present Employment*, and *Other Activities (or Non-Professional Activities)*, as, for example, in Fracassi and Tate (2012) or Bruynseels and Cardinaels (2014). Following prior research of Hwang and Kim (2009), Fracassi and Tate (2012), and Bruynseels and Cardinaels (2014)), we standardize measurements of social relationships between 0 and 1, where higher numbers indicate stronger ties.

In the literature, there exist different ways to measure the type *Education*. While some authors focus on the same educational background, in which social relationships arise from the same degree, title, and/or subject area (Westphal and Zajac 1995; Fiss 2006)), others emphasize the same experiences arising from the same school and, at best, from the same school at the same time (Cohen et al. 2008; Fracassi and Tate 2012; Nguyen 2012; Bruynseels and Cardinaels 2014). In our view, each

⁸ We did not need to assess the option values; companies are required to state the values in the compensation report.

Table 2 Types and characteristics

Types	Characteristics
Employment	Same present and/or past positions and companies
Educational Background	Same degree, title* and/or educational specialization (subject area)
Educational Experience	In the same city; in the same city with the same degree; in the same city at the same time; in the same city at the same time and with the same degree
Other Activities	For the characteristics of other activities cf. Table 9 in Appendix 1

* Note: Absence of a title is a similarity, too

approach highlights a relevant aspect. Therefore, we split the type *Education* into type *Educational Background* and type *Educational Experience*.

Our measurement of type *Educational Experience* is based on Cohen et al. (2008), who distinguish four possible characteristics that give rise to a social relationship of that type. They differ with respect to the strength of the effect on the social relationship: (i) the same school⁹ (weakest lasting effect), (ii) the same school and the same degree, (iii) the same school at the same time, and (iv) the same school at the same time and with the same degree (strongest lasting effect). We assign increasing weights to these characteristics, given that the effect associated with them is becoming more robust from subtype (i) to (iv). Therefore, social relationships corresponding to subtypes (i), (ii), (iii), and (iv) were multiplied by 1, 3, 6, and 10, respectively. The weights reflect an increasing marginal effect of the similarities on building a social relationship. This approach is in line with Fracassi and Tate (2012), who restrict education connections to subtypes (iii) and (iv). Finally, the total score of social relationships obtained as the normalized sum of these weighted relationships divided by the number of individuals. Consider a group of six individuals in which five show education connections; then we determine for each individual the connection of the highest type to another individual. Assume two of them are connected via type (iv), two others have a type (ii) connection, and one individual shows a connection of type (i) to another individual (that has yet another connection of a higher type to another individual). The total score amounts to $(1 \cdot 1 + 2 \cdot 3 + 0 \cdot 6 + 2 \cdot 10)/(10 \cdot 6) = 9/20$.¹⁰ Since we could not identify the school in each case, we use the city in which the individuals graduated as a proxy instead. Table 2 presents a summary of the types we deploy.

The measurement of type *Educational Background* takes the degree, title, and specialization (subject) into account. Table 10 in Appendix 2 provides an overview

⁹ All teaching institutions are to be considered as “school.”

¹⁰ We implement this measurement with an algorithm that is easier to program while ensuring the same score for the measure: we count (a) the number of individuals who are connected with type (i) or higher; then we count (b) the number of individuals who are connected with type (ii) or higher, and we do so (c) for type (iii) and (d) for type (iv) as well. This implies that, for example, two individuals connected via type (iv) in (d) also show up in (a)–(c), so that the connection is accounted for several times. The effect is offset by choosing (lower) weights of 1, 2, 3, and 4, respectively for the numbers obtained in (a), (b), (c), and (d). The weighted sum of the connections is then normalized. In the above example, we calculate the score as follows: $(5 \cdot 1 + 4 \cdot 2 + 2 \cdot 3 + 2 \cdot 4)/(10 \cdot 6) = 9/20$; note that the scores are identical.

Table 3 Measurement of social relationships (SR): Type Other Activities of a sample company

	Other activities					Compare other activities:			
	Soccer	Jogging	Instruments	Honorary post	Tennis	CEO with SB	CEO with SBC	CEO with SBM	SBC with SBM
CEO	1	0	0	1	0	–	–	–	–
SBC	0	1	0	1	0	1	1	–	–
SBM i	1	0	0	0	0	1	–	1	0
SBM ii	0	1	0	1	0	1	–	1	1
SBM iii	1	1	0	0	0	1	–	1	1
SBM iv	0	0	0	0	0	0	–	0	0
SBM v	0	0	0	0	1	0	–	0	0
SBM vi	0	0	0	0	1	0	–	0	0
SR between CEO and SB:						4/7	–	–	–
SR between CEO and SBC:						–	1	–	–
SR between CEO and SBM (i–vi):						–	–	3/6	–
SR between SBC and SBM (i–vi):						–	–	–	2/6

Note: CEO Management Board Chairperson; SBC Supervisory Board Chairperson; SBM Supervisory Board member

of subjects. The calculation of the score for this type follows the same procedure as for type *Employment* and *Other Activities*.

We measured the types of social relationships *Past or Present Employment* and *Other Activities* (or *Non-Professional Activities*) similar to Fracassi and Tate (2012) and Bruynseels and Cardinaels (2014). Social relationships based on present employment arise if two persons in a company (e.g., CEO and chairperson of SB of company A) hold the same position in other companies. For example, if the CEO serves as an external director in company B and the chairperson does so in company C. Such social relationships also arise if they have different positions within the same company D. For *Past Employment*, companies worked for and positions held before joining the sample firm are relevant. Analogous to Bruynseels and Cardinaels (2014), in this study, the social relationships based on past or present employment collectively define the type *Employment*.

Social relationships based on other activities are, for example, shared memberships in clubs or charities (Fracassi and Tate 2012). For a detailed list of characteristics of type *Other Activities* cf. Table 9 in Appendix 1. Likewise Fracassi and Tate (2012) and Bruynseels and Cardinaels (2014), we did not set time restrictions for other activities. Most people very likely perform these activities on a long-lasting basis; thus, we assumed they performed them in the period under consideration.

In the following, we illustrate the measurement of social relationships (SR) using type *Other Activities*. First, we do so for social relationships between the CEO and the SB, the CEO and the SB chairperson (SBC), as well as between the CEO and the SB members (SBM i–vi). Social relationships between CEO and all SB members (including the chairperson) are measured as follows: If at least one activity of the CEO is identical to an activity of a member, it is coded with 1. When all activities of the CEO are compared with all members' activities, the sum of the identical activities

Table 4 Characteristics of the data set

Characteristic	Min	Max	Mean	SD
Total compensation	1,946,853	15,861,478	5,433,347	2,351,103
No. of Employees	3400	626,715	131,502.5	151,558.5
RoA	-7.6	14.81	6.12	4.58
Board Size (for members for whom data is available)	4	29	13.49	5.27
Board Size	7	31	17.25	4.79
CEO SB Employment	0.13	0.98	0.57	0.22
CEO SB Educational Background	0.05	0.65	0.28	0.12
CEO SB Educational Experience	0	0.38	0.08	0.12
CEO SB Other Activities	0	0.86	0.31	0.27
SBM Employment	0.14	0.9	0.49	0.18
SBM Educational Background	0.08	0.87	0.50	0.16
SBM Educational Experience	0	0.48	0.12	0.13
SBM Other Activities	0	0.76	0.28	0.22

is then divided by the number of members of the SB (including chairperson). The social relationships between the CEO and the SBC, CEO and SBM (i–vi), and between SBC and SBM are determined analogously (see Table 3).

Second, we explain the measurement of social relationships within the SB (SBM i–vi). Fig. 1 illustrates the measurement. First, a member is selected for whom an activity is given (here member 1). This activity is compared with the other members step by step. If there is a first match with a member for this activity, the connection is set to 2 because two members perform the same activity. If another match between the member and another member exists, the connection is set to 3. This process continues until all members have been checked. Next, a member is selected with whom a connection already exists (here member 3). This member's activities will be compared again with all members (except member 1). If there is a match, the number of connections is increased by 1 again. Once all members who have a connection with member 1 have been checked, those who have a connection to member 3 are checked. This process continues until all members have been checked for matches. If there are members left who have activities listed, we compare them with the remaining members who have not yet been compared. Finally, the highest number of connections is chosen and divided by the number of members. In the example in Fig. 1, the strength of the social relationship type *Other Activities* between member one and the other board members is 3/6.

Hwang and Kim (2009), Fracassi and Tate (2012), and Bruynseels and Cardinaels (2014) aggregate the connections based on the different types of relationships to a single variable. This aggregation increases the statistical power of the variable, but it gives equal weight to the impact of the different types (Fracassi and Tate 2012). Therefore, Bruynseels and Cardinaels (2014) test the aggregate impact and the impact of the individual types. They find that the different kinds of relationships do not have the same effect on the power of the CEO (Bruynseels and Cardinaels 2014). For this reason, we consider both the effect of individual types of social

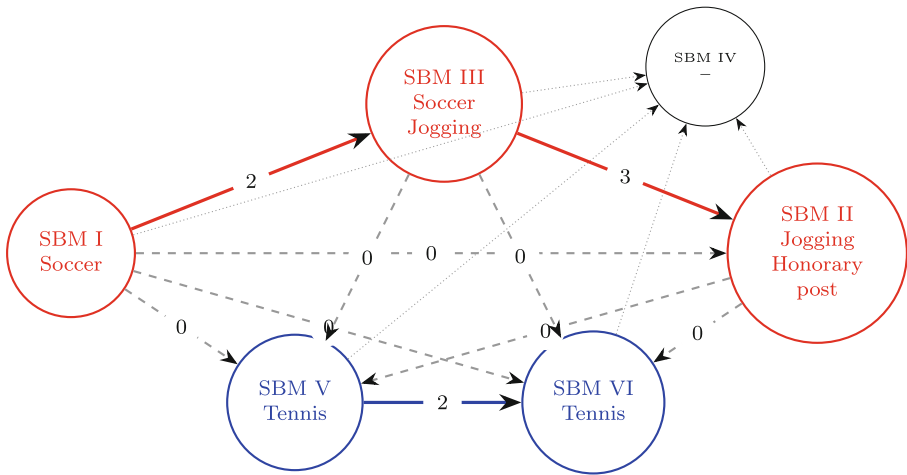


Fig. 1 Comparison of “Other Activities” within SBM

relationships and the aggregate measure of types in the analysis. The variable *All SR* describes the aggregate measure of types of social relationships. This variable is different from zero for every CEO in the sample.

3.3.3 *Control variables*

Following Belliveau et al. (1996), Fiss (2006), Hwang and Kim (2009), and Fracassi and Tate (2012), we use the following control variables: *CEO Age*, *CEO Title*, *CEO Change*, *Board Change*, *Board Size*, *No. of Employees* and return on assets (*RoA*). *CEO Title* refers to the education level of the CEO and is intended to control for a higher salary based on a title (Fiss 2006). The variable *CEO Change* controls for a higher salary due to a change of CEO. This variable is a binary variable and is one if there was a change of CEO in the year under consideration. The variable *Board Change* controls for changes in the compensation of the CEO due to a change in the members of the SB. This variable is measured analogously to the variable *CEO Change*. *No. of Employees* controls for company size and *RoA* for company performance.

3.4 **Regression model**

The collected data has a panel structure consisting of observations from several companies at several consecutive points in time. It should be noted that for regression analysis, our dependent variable *Total Compensation* could be influenced by its time-lagged values, i.e., by compensation in previous periods. The use of the Arellano–Bond estimator in dynamic panel models would take this effect into account (Bond 2002; Arellano and Bond 1991). However, upon using this method,

our sample size reduces because we lose observations of two years.¹¹ Since only the observations of two years would remain to estimate the influences of social relationships, we decided against the Arellano–Bond estimator. Instead, we deploy the fixed-effects model to estimate the regressions. This model takes into account all four years of our sample. (The random-effects model is inappropriate due to a necessary requirement not being met. For details, see the next two paragraphs.) The estimator may nevertheless be biased due to the issue described.¹²

We estimate different regression models using the aggregate measure of social relationships or the individual types of social relationships. We also estimate moderation effects in the latter models.

We tested the regressions for (i) endogeneity with the Hausman test, (ii) homoscedasticity with the Goldfeld-Quandt test, (iii) serial correlation with the Breusch-Godfrey/Wooldridge test, and (iv) normal distribution with the Shapiro-Wilk normality test. Table 11 in Appendix 3.1 summarizes results and measures taken to circumvent any problems with regression requirements.

Owing to the heteroscedasticity in all models, we used the fixed-effects model for each regression. The inconsistent covariance estimates were recovered by the heteroscedasticity-consistent covariance matrix estimation using the method of White (White, 1980; Millo, 2017; Zeileis, 2004). The results of the regressions of Sect. 3.5 contain consistent covariance estimates. The Shapiro-Wilk normality test indicates that the residuals of some of the regressions are not normally distributed. Consequently, the normal distribution of residuals of all models is additionally verified graphically as well (cf. Fig. 7 in Appendix 3.2). These graphs show that the residuals behave similar to a sample from a normal distribution. Thus, a normal distribution of all models can be assumed (Wilk and Gnanadesikan, 1968; Thode, 2002).

The models were also tested for multicollinearity (cf. Fig. 2). Some type-based social relationships between the CEO and SB members are significantly positively correlated with each other. In addition, social relationships within the SB often correlate significantly positively with social relationships between the CEO and the SB members. The strength of the correlation in both cases can be classified as moderate.¹³ Additionally, we computed the variance inflation factors (VIF values; cf. Tables 12, 13 and 14 in Appendix 3.3). Values greater than 5 for the interaction term and the related variables are normal, expected, and inevitable. The models do not indicate multicollinearity between the independent variables.

¹¹ To determine the estimator, it is not sufficient to collect only the dependent variable for additional years. The determination of the estimator requires all independent variables of the model (Bond 2002; Arellano and Bond 1991).

¹² Consideration of a time-lagged variable in the fixed effects model leads to serial correlation and an inconsistent estimator (Bond 2002).

¹³ The correlation coefficient is determined according to Pearson. Correlations that can be classified as strong are not used together in a regression.

Table 5 Regression results (fixed-effects): Model (1) & (2)

	Total Compensation	
	(1)	(2)
CEOSB AllSR	−40,888.52*	
	(21,890.61)	
CEOSB Employment		38,428.08**
		(15,024.60)
CEOSB Educational Background		−29,797.50
		(26,351.66)
CEOSB Educational Experience		−40,858.14*
		(21,979.07)
CEOSB Other Activities		−30,939.95**
		(13,115.48)
No. of Employees	−35.43	−28.18
	(17.29)	(16.97)
RoA	163,716.50***	203,290.60***
	(57,227.27)	(60,524.24)
CEO Age	118,076.50*	99,603.49
	(68,231.42)	(67,193.11)
CEO Title (existent)	12,207.57	689,599.60
	(562,563.50)	(594,053.80)
CEO Change	−1,313,055.00***	−1,269,145.00***
	(492,959.50)	(474,449.90)
Board Change	383,589.00	578,735.70**
	(294,544.10)	(290,635.90)
Board Size	59,570.96	62,184.14
	(78,061.29)	(74,884.61)
Observations	100	100
R ²	0.38	0.46
Adjusted R ²	0.08	0.17
F Statistic	5.10***	5.03***
	(df = 8; 67)	(df = 11; 64)

Note: * $p < 0.5$; ** $p < 0.01$; *** $p < 0.001$; standard error in parentheses

3.5 Results

Table 5 shows the regression related to Hypothesis 1. Social relationships (SR) between the CEO and the entire SB (chairperson and members) were analyzed, disregarding the SR within the SB and between the CEO and the chairperson of the SB. We later accounted for these SR in a separate model.

Model (1) shows a significant negative influence of SR (*CEOSB AllSR*) on *Total Compensation*. Therefore, the results do not support Hypothesis 1. Similarly, we obtain ambiguous results in Model (2), where we regress on the different types of SR. There is a significant positive effect of type *Employment* but a significant negative effect of type *Educational Experience* and type *Other Activities* on *Total*

Table 6 Regression results (fixed-effects): Model (3), (4), (5), & (6)

	Total Compensation			
	(3)	(4)	(5)	(6)
CEOSBM All SR	−41,461.03*		−30,112.02	
	(22,081.71)		(40,839.49)	
SBM All SR			1,388.00	
			(37,930.38)	
CEOSBM Employment		37,528.84**		13,521.13
		(14,790.14)		(39,424.06)
CEOSBM Educational Background		−28,549.25		−136,819.30**
		(25,305.88)		(73,965.84)
CEOSBM Educational Experience		−37,773.99*		−21,904.76
		(21,794.54)		(41,837.56)
CEOSBM Other Activities		−33,731.88**		−18,037.66
		(12,943.79)		(21,571.03)
SBM Employment				−36,762.85
				(51,473.86)
SBM Educational Background				−15,182.69
				(38,961.14)
SBM Educational Experience				14,016.06
				(24,202.52)
SBM Other Activities				−11,744.05
				(21,880.52)
No. of Employees	−35.36	−29.03	−36.78	−28.45
	(17.28)	(16.88)	(18.07)	(18.43)
RoA	164,672.50***	200,926.00***	162,963.60***	196,414.70***
	(57,246.68)	(60,605.65)	(58,501.20)	(65,910.88)
CEO Age	120,057.60*	110,577.30*	117,359.20	34,119.21
	(68,415.41)	(67,357.40)	(75,032.49)	(82,303.90)
CEO Title (existent)	−1,923.19	618,848.20	−9,597.91	617,563.70
	(564,333.80)	(588,966.90)	(578,951.50)	(756,606.60)
CEO Change	−1,305,969.00***	−1,275,313.00***	−1,283,917.00***	−1,532,039.00***
	(492,701.10)	(471,092.70)	(510,865.30)	(505,181.50)
Board Change	377,154.40	569,797.90*	383,476.80	527,918.30**
	(295,064.30)	(290,202.30)	(300,007.60)	(297,074.60)
Board Size	62,249.48	66,319.34	66,947.87	146,515.30*
	(78,491.30)	(74,995.53)	(83,842.85)	(85,543.43)
CEOSBM All SR			−219.33	
× SBM All SR			(867.86)	
CEOSBM Employment				456.04
× SBM Employment				(641.99)
CEOSBM Educational Background				1,559.30*
× SBM Educational Background				(1,061.32)
CEOSBM Educational Experience				−631.33
× SBM Educational Experience				(1,215.59)

Table 6 (Continued)

	Total Compensation			
	(3)	(4)	(5)	(6)
CEOSBM Other Activities				−269.90
× SBM Other Activities				(456.10)
Observations	100	100	100	100
R ²	0.38	0.47	0.38	0.54
Adjusted R ²	0.08	0.17	0.06	0.18
F Statistic	5.11***	5.09***	3.98***	3.44***
	(df = 8; 67)	(df = 11; 64)	(df = 10; 65)	(df = 19; 56)

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; standard error in parentheses

Compensation. Type *Educational Background* is not statistically significant. It appears that the different types of SR affect CEO compensation differently. As the effects and direction of the effects of different types show either positive or negative signs, Hypothesis 1 also cannot be confirmed in Model (2).

Table 6 presents the results concerning Hypotheses 2a and 2b. For these hypotheses, we analyze the SR between the CEO and the SB members without the chairperson of the SB. The chairperson of the SB is excluded to avoid a possible bias due to her/his dominant position. Notwithstanding, the results of Models (3) and (4) are comparable with Models (1) and (2). We find that a significant negative effect of SR (*CEO SBM All SR*) in Models (1) and (3) no longer exists when the relationships within the SB are considered. The same applies to the significant influences of types *Employment*, *Educational Experience* and *Other Activities* in Models (2) and (4). Therefore, Hypothesis 2a cannot be confirmed.

In Models (5) and (6), the moderation effect of SR within the SBM was tested. The results of Model (6) show a significant positive influence of the moderator variable *CEO SBM Educational Background* × *SBM Educational Background* on *Total Compensation*. However, one cannot interpret this influence without accounting for the level of the respective SR. Because of the standardization of variables, the level of SR among the SBM or between CEO and SB is low (high) when its value is close to 0% (100%).¹⁴

Fig. 3 visualizes the moderation effect. A high level of SR based on *Educational Background* between the CEO and the SB members leads to an increasing compensation if SR among the SB members increase. There exists a threshold of 0.88 for the strength of SR between SB members such that CEO compensation is higher if the CEO has SR with SB members compared to a situation without SR. Additionally, if SB members have only very few SR with each other, CEO compensation is higher, the lower the level of SR between CEO and SB members.

Hypothesis 2b does not find support in the results, possibly because SR based on *Educational Background* only increase the CEO compensation if almost all members

¹⁴ The figures do not show absolute compensation levels. Because of the standardization of the variables, one cannot infer an absolute change in compensation from a change in SR.

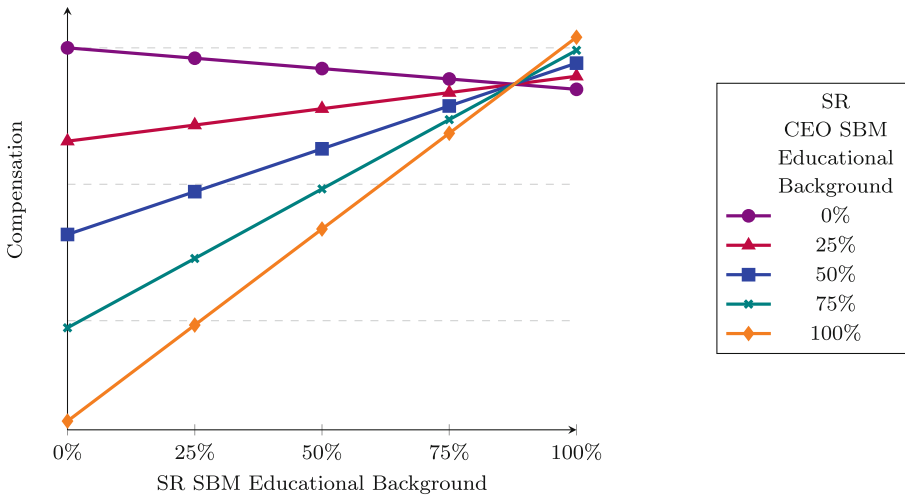


Fig. 3 Moderation effect of social relationships based on type *Educational Background*

of the SB have SR with each other and the other types of SR show no significant effect.

Table 7 shows the results concerning Hypotheses 3a and 3b. The SR between the CEO and the SBC and between the SBC and the SBM were analyzed. Model (7) and (8) in Table 7 consider only the social relationships between the CEO and the SBC. The result of Model (7) shows that SR (*CEO SBC All SR*) between the CEO and the chairperson have no significant influence on *Total Compensation* of the CEO. When differentiating types of social relationships (Model (8)), *Educational Background (CEO SBC Educational Background)* shows a significant negative impact on compensation. Hypothesis 3a cannot be confirmed. However, in line with the results for Hypotheses 1 (cf. Table 5) and 2a (cf. Table 6), the results for Hypothesis 3a suggest that the different types of social relationships can have an influence on CEO compensation. In Model (9), the moderation effect of SR between the SBC and the SBM is considered (*CEO SBC All SR × SBC SBM All SR*). Here, the results are the same as in Model (7). Model (10) indicates that SR based on type *Employment* between the CEO and the SBC significantly increase the compensation of the CEO if SR between the SBC and the SBM are considered (*CEO SBC Employment × SBC SBM Employment*). We find a similar moderation effect for SR based on type *Same Educational Experience (CEO SBC Same Educational Experience × SBC SBM Educational Experience)*. In addition, the results of Model (10) document a statistically significant, negative influence of the moderating variable *CEO SBC Other Activities × SBC SBM Other Activities* on total compensation. Again, the interpretation of the different effects of these moderating variables must take the level of the respective SR into account. We use the same approach as for the results of Model (6).

Fig. 4 visualizes the moderation effect of SR based on type *Employment* between the CEO and the SBC; Fig. 5 does so for type *Educational Experience*. Surprisingly, the effect of closer ties between CEO and CSB is not as straightforward as expected. It takes a certain level or strength of social relationships between SBC and SB

Table 7 Regression results (fixed effects): Model (7), (8), (9), & (10)

	Total Compensation			
	(7)	(8)	(9)	(10)
CEOSBC All SR	−26,114.94 (19,465.44)		−21,435.71 (40,153.73)	
SBC SBM All SR			−17,097.51 (34,573.44)	
CEOSBC Employment		20,773.72 (14,507.64)		−31,045.13 (45,744.87)
CEOSBC Educational Background		−18,775.23* (12,890.98)		4,374.88 (43,050.21)
CEOSBC Educational Experience		−1,267.48 (61,687.15)		−63,029.28* (24,674.86)
CEOSBC Other Activities		−11,316.72 (9,389.26)		15,641.04 (13,368.99)
SBC SBM Employment				−16,332.49 (24,755.73)
SBC SBM Educational Background				−45,794.56 (55,504.00)
SBC SBM Educational Experience				−3,084.84 (30,141.90)
SBC SBM Other Activities				5,594.33 (18,120.95)
No. of Employees	−31.77 (17.48)	−29.87 (17.84)	−34.19 (18.43)	−31.87 (18.44)
RoA	128,361.60** (61,542.60)	147,218.40** (63,291.51)	129,153.90** (63,174.04)	117,153.80** (67,137.77)
CEO Age	110,305.90* (68,932.62)	107,458.60* (69,412.77)	98,939.74 (76,140.07)	147,651.40* (75,220.03)
CEO Title (existent)	−84,817.86 (619,185.30)	−171,667.70 (677,801.90)	−63,051.96 (692,483.30)	−340,183.60 (804,058.80)
CEO Change	−1,333,014.00*** (500,282.00)	−1,277,852.00** (523,353.80)	−1,348,374.00*** (507,524.40)	−1,411,418.00*** (535,925.00)
Board Change	488,700.00* (293,083.90)	531,287.10* (297,840.60)	533,723.30* (307,548.40)	696,111.70** (324,091.10)
Board Size	22,632.20 (74,896.63)	37,119.60 (76,621.85)	28,946.96 (76,747.03)	38,637.52 (86,952.84)
CEOSBC All SR			−11.99	
× SBC SBM All SR			(994.58)	
CEOSBC Employment				701.23*
× SBC SBM Employment				(513.03)
CEOSBC Educational Background				281.39
× SBC SBM Educational Background				(1,134.83)
CEOSBC Educational Experience				2,600.01*
× SBC SBM Educational Experience				(2,925.09)

Table 7 (Continued)

	Total Compensation			
	(7)	(8)	(9)	(10)
CEO SBC Other Activities				-703.71***
× SBC SBM Other Activities				(252.39)
Observations	100	100	100	100
R ²	0.36	0.39	0.37	0.48
Adjusted R ²	0.06	0.05	0.03	0.09
F Statistic	4.78***	3.67***	3.76***	2.77**
	(df = 8; 67)	(df = 11; 64)	(df = 10; 65)	(df = 19; 56)

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; standard error in parentheses

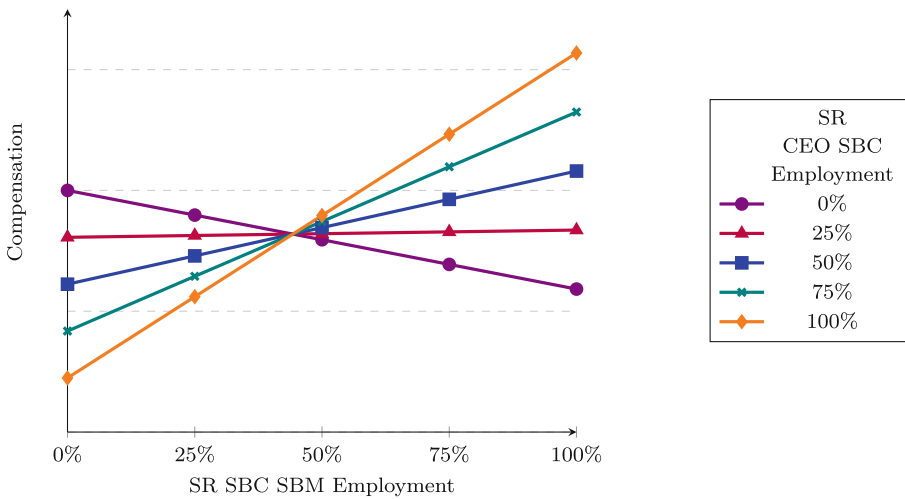


Fig. 4 Moderation effect of social relationships based on type *Employment*

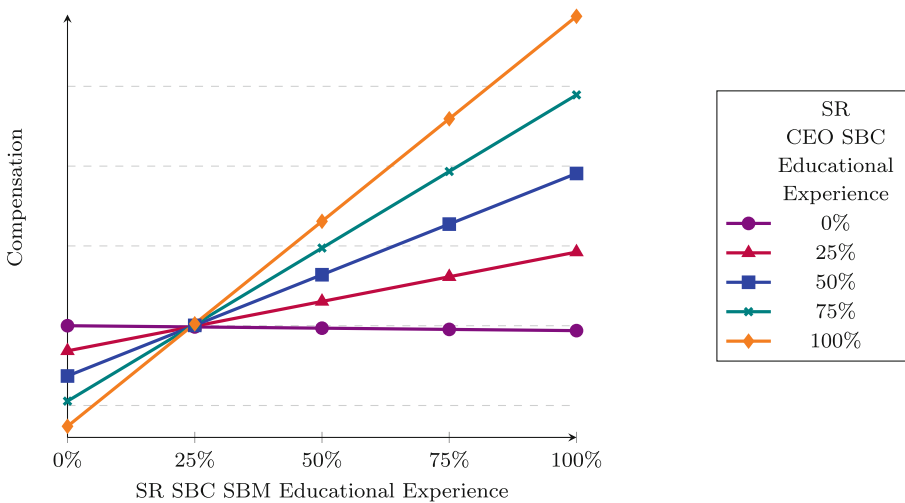


Fig. 5 Moderation effect of social relationships based on type *Educational Experience*

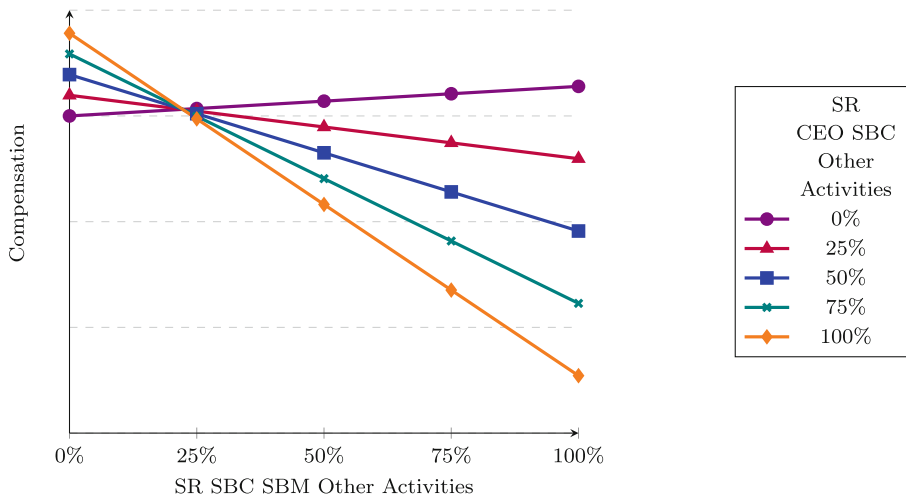


Fig. 6 Moderation effect of social relationships based on type *Other Activities*

Table 8 Summary of statistically significant results

	Social relationships	Type of Social Relationship				
		All	E	EB	EE	OA
H1	CEO-SB	(-)*	(+)**		(-)*	(-)**
H2a	CEO-SBM	(-)*	(+)**		(-)*	(-)**
H2b	Moderation effect (CEO-SBM x between SBM)			(+)*		
H3a	CEO-SBC			(-)*		
H3b	Moderation effect (CEO-SBC x SBC-SBMnoC)		(+)*		(+)*	(-)**

Note: *E* – Employment; *EB* – Educational Background; *EE* – Educational Experience, *OA* – Other Activities; *SB* – Supervisory Board, *SBC* – Supervisory Board Chairperson; *SBM* – SB members without SBC, * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

members such that closer social ties between CEO and SBC pay off for the CEO. Consequently, Hypothesis 3b finds support for SR based on type *Employment* and type *Educational Experience*. However, if there are no SR between CEO and SBC of type *Employment*, a more socially connected SB is associated with *lower* CEO compensation. The picture becomes even more dismal from the CEO's perspective for SR of type *Other Activities*. Given a modest level of SR between SBC and SB members, CEO compensation decreases if the level of SR between CEO and SBC increases (Fig. 6). Hypothesis 3b cannot be confirmed for SR based on type *Other Activities*.

The significant moderation effects highlight the importance of group dynamic processes in the CEO compensation-setting process. Furthermore, the type of SR has a role to play in this process. When considering an aggregate measure of SR, we

see a negative impact of SR on CEO compensation – in contrast with our hypotheses. If this effect is statistically significant, it can be attributed to SR of type *Educational Experience* and *Other Activities*. It reiterates the fact that the type of SR matters for the level of CEO compensation. Table 8 summarizes the statistically significant findings of our study.

4 Discussion

Contrary to our initial assumption, social relationships between CEO and members of the SB can have a negative impact on CEO compensation. Different roles of individual types of social relationships drive the result. In addition, the sign of moderation effects also depends on the specific type of social relationships. Given the size of the coefficients, results suggest social relationships have economic significance besides their statistical significance. The probable economic significance calls for further research on the impact of social relationships on CEO compensation to corroborate the finding.

We projected a positive influence of social relationships between CEO and the SB in Hypothesis 1. However, we find a negative influence overall and, case by case, a positive or negative influence. As such, our findings add (to the available) evidence that the connection between social relationships and CEO compensation is far from being straightforward or explicit. Hwang and Kim (2009) document a positive influence of an aggregate measure of social relationships on CEO compensation in a sample of US firms, but we find a contrasting effect. Different institutional settings in which the analyses are embedded might provide an intuitive explanation for the variation in results. The one-tier system of governance in the USA can give rise to social relationships based on reciprocity and subsequently more lenience in setting CEO compensation than the two-tier system in Germany. Yet, the different findings could also be driven by the aggregate measure of social relationships deployed in these studies. Most notably, Hwang and Kim (2009) do not include *Other Activities* in their aggregate measure. However, we include it and this type has a highly statistically significant negative impact on CEO compensation.

Our analysis that considers different types of social relationships is in line with Bruynseels and Cardinaels (2014) in suggesting that different types engender different effects. While those based on *Educational Background*, *Educational Experience*, and *Other Activities* account for adverse effects, the type *Employment* increases CEO compensation. The negative effect of type *Educational Background* somewhat contrasts the finding of Nguyen (2012) that a shared educational background increases the board's tolerance for poor performance of the CEO. Tolerating poor performance to a larger extent would go hand in hand with higher CEO compensation given a certain level of CEO performance. A possible reason for the incongruent results could be the sample and the associated determination of educational background. In Nguyen (2012), a sample of French firms is used, and social relationships of type *Educational Background* result from attending very selective elite schools (*Grandes écoles*) and graduate schools. In our sample of German firms, joint attendance of a “regular,” far less selective university accounts for much of the

measure for social relationships. One could argue that selective elite schools create stronger bonds than regular universities.

Absent effects of social relationships or effects in other than the predicted direction could be caused by mature board members with a possibly narcissistic personality. Such board members may not be susceptible to group dynamics, which are supposed to turn them into in-group members if they have been out-group members before. Moreover, they could distinguish themselves from the CEO and evaluate CEO performance more critically, leading to lower CEO compensation. Hence, group dynamics could depend on the age of individual board members.

As different types of social relationships lead to different effects on CEO compensation, separate variables are required in regression models. Even if, ex-ante, there is no argument in favor of weighting a particular social relationship more than another, researchers should estimate separate effects of social relationships as well as their aggregate effect. In addition, the fact mentioned above raises the question of *why* we observe different effects. How do social relationships based on, for example, other activities or educational background differ from those based on employment? We can speculate that it could have to do with the salience and frequency of similarities that give rise to social relationships of different strength, or personal traits are associated with certain hobbies. Exploring the actual mechanisms behind the different types of social relationships and how they affect CEO compensation is left for future research.

Hypothesis 2b and 3b focus on the group dynamic process by taking social relationships within the SB and between the chairperson and the SB into account. Direct effects of social relationships virtually vanish, and a negative influence of type *Educational Background* shows up. In addition, we notice statistically significant moderation effects, especially in Model (10). Here, social relationships between CEO and SBC and between the board and its chairperson were analyzed. The results show that the relevance of the types of social relationships for the categorization process varies with the social status of the SB members. For social relationships between members having the same social status, equal educational background seems to be more important for the categorization of in- and out-group members than the other types of social relationships (Model (6)). In determining a figure of identification and achieving a higher status among the board members, social relationships based on employment experience, educational experience and shared other activities seem more critical (Model (10)). In this analysis, the question resurfaces why different types of social relationships apparently create different group dynamic processes and, eventually, affect CEO compensation differently.

In line with other research, we assign the lowest strength of SR to type *Educational Background* because of the frequency of occurrence of this social relationship (McPherson et al., 2001; Bruynseels and Cardinaels, 2014). However, in Model (6), the low strength of this type seems sufficient to initiate the group dynamic process between the members of the SB. The frequency of existing social relationships based on educational background suggests that the CEO is likely to be able to establish these social relationships with members more quickly than would be the case with other social relationships. It could also explain why the other types of social relationships do not impact compensation when considering the relationships between

SB members (Model (6)). Given the low strength of type *Educational Background*, the CEO can only positively influence her/his compensation if the level of social relationships based on that type among board members is high. The lack of consideration of the level of social relationships based on educational background among the members could provide an alternative explanation why Fiss (2006) finds that differences in the educational level increase CEO compensation. Consequently, other research may obtain opposite results if the level of social relationships based on the educational background among the members of the SB is very high.

An equal strength to induce the group dynamic process attributed to type *Employment* can be attributed to type *Educational Experience* (Bruynseels and Cardinaels 2014). The present study's results reveal an increase in compensation if CEO and chairperson as well as chairperson and SB members share social relationships based on employment and educational experience (Model (10)). The strength of the types seems sufficient to form an identification figure in the chairperson, achieve a higher social status among the SB members because of social relationships with the chairperson, and initiate the group dynamic process between the board members.

Concerning type *Employment*, the same experiences (in comparable positions) lead to the same viewpoints in the assessment of performance (Dearborn and Simon 1958). Therefore, it is easier to evaluate changes in company performance in relation to one's own performance (Waller et al. 1995). Westphal and Zajac (1995) assume that common schemata or belief structures relevant to strategic decision-making arise through collective work experience. These common schemata lead to the same approach in identifying and solving causes for strategic issues (Hambrick and Mason 1984; Hambrick et al. 1996; Pelled et al. 1999). Consequently, if there are social relationships based on the same employment experience between the chairperson and SB members, the latter ones are more likely to have the same opinion as the former about the necessary and "right" (or "good") performance of a CEO. The consensus leads to increased compensation only if the CEO and the chairperson have social relationships based on employment, too. Hoitash (2011) also concludes that social relationships based on employment increase CEO compensation, although he does not consider social relationships within the SB.

The present study's results on social relationships based on the same educational experience confirm the considerations of Cohen et al. (2010). The same educational experience establishes a connection that leads to a non-constant but inherent exchange of information. An information advantage arises because this exchange occurs earlier than an exchange via the company's information channels, e.g., meetings or reports (Cohen et al. 2010). Consequently, if the chairperson shares the same educational experience with the SB members, this could lead to an information advantage for the former. In turn, the chairperson likely passes the information on to the CEO if the latter shares the same educational experience with the former. Given sufficient levels of social relationships of that type, CEO compensation increases. Note that it takes both social relationships between CEO and chairperson and between the chairperson and the board.¹⁵ In line with that argument, Nguyen (2012) notes that

¹⁵ This positive moderation effect of type *Educational Experience* should not be confused with the negative direct effect of that type reported in the discussion pertaining to Hypothesis 1.

social relationships based on the same educational experience increase the board's tolerance of poor CEO performance. The increased tolerance for poor performance and faster access to information could lead to higher CEO compensation.

Social relationships based on other activities can reduce CEO compensation. This finding is valid when social relationships between the chairperson and SB members are disregarded (Model (2)). Yet, it may also hold true when they are taken into account (Model (10)). In the latter case, it takes a sufficiently high level of these social relationships between the CEO and chairperson and between chairperson and board. While joint activities may lead to the most vital social relationship (Bruynseels and Cardinaels 2014), they may also increase the risk of disclosing relationships between the CEO and the board members (e.g., because of a publicly observable activity). This disclosure could lead to a lower reputation of board members, for example, in the eyes of the shareholders. As a result of the loss of confidence, the board members may lose reputation utility and react with a stricter assessment of an appropriate CEO compensation. However, the disclosure of social relationships between CEO and chairperson because of activities could also lead to discrediting the latter, which would reduce her/his persuasiveness for higher CEO compensation. According to Bruynseels and Cardinaels (2014), the disclosure of social relationships is a solution to limit or even prevent the additional power of the CEO owing to social relationships. However, in the study of Rose et al. (2014), precisely this disclosure leads to an increase in CEO compensation. It is difficult to explain why the disclosure of dependencies should lead to a higher payment. Findings in Rose et al. (2014) could again indicate that researchers should consider social relationships within the SB to better understand their influence on social relationships.

5 Conclusion

The present study examines the influence of the CEO's social relationships with the SB members on CEO compensation. It takes into account the group dynamic process within the board. The results suggest that the types of social relationships, the social status of individual board members, and the strength of social relationships determine whether and to what extent social relationships affect CEO compensation. Many in-group members in the board can lead to an increased or decreased influence of the chairperson and the CEO on the SB members if they have social relationships with the SB members. In addition, the CEO could benefit from social relationships with the chairperson if the latter has sufficiently strong social ties with other members of the SB. Yet, no generalizations can be made to what extent social relationships within the SB increase the ability of the CEO to influence CEO compensation.

The present study underlines the importance of social influence mechanisms in organizations, particularly in the top management of organizations. The findings reveal that social relationships within the SB largely influence the compensation-setting process. Our study can help better understand situations where the determination of CEO compensation depends on more factors than conventionally assumed. Consequently, a better knowledge of these situations assists firms in designing more effective incentive systems.

The present study is subject to limitations. We measure social relationships only via proxies. Whether these personal relationships exist between the persons examined remains an open question. The discrepancy between measured and actual relationships could also explain the inconsistencies in prior research. Rose et al. (2014) address this problem and try to measure actual relationships. They find a significantly positive influence of social relationships on the CEO compensation. This finding makes it at least challenging to disprove that social relationships affect CEO compensation.

Another potential limitation of our study is the non-consideration of CEO compensation of past periods, which may have an impact on the compensation of the period under review. In our regression models, we do not control for this possible effect, which may bias the estimators. Hence, the explanatory power of our results could be limited in that respect.

For future research, the present study should be repeated based on the measurement of actual social relationships rather than proxies. Furthermore, researchers could investigate exactly how social relationships influence decisions and the social categorization of the SB members. For example, situations could be conceivable where increased CEO compensation resulted from the benefits of harmony (e.g., improved communication, more efficient coordination) because of social relationships between the CEO and the SB. In addition, the different evaluations of the types of social relationships depending on the social status among the members of the SB should be examined in detail to be able to reach conclusions about their influence and weightings in the decision-making process.

6 Appendices

6.1 Characteristics of other activities

Table 9 Characteristics of other activities

Characteristic	Classified activity/activities
Model making	Model making, model railway, model cars, model helicopter pilot
Golf	Golf
Card games	Skat
Plants	Plants, garden, farming, nature
History	History, archeology, philosophy
Horseback riding	Horseback riding, horses, horse racing
Literature	Literature, reading
Soccer	(e.g. watch or/and play) soccer, soccer teams
Hiking/walks	Hiking, climbing, mountains, mountaineering, walking
Art, culture and music	Visual arts, architecture, culture, painting, opera, far eastern culture, Japanese ethics, Japanese culture, theaters, dancing, photography, antiques, carnival, music, classical music, spiritual music, jazz, singing, art, collection
Winter sports	Skiing
Bicycle	(e.g. ride a) bicycle
Languages	Spanish, French, Swedish, Italian, English, foreign languages
DIY	DIY
Motor sport	(interested in) motorbike or/and automobiles
Water sports	Sailing, fishing, rowing, diving, swimming
Jogging	Jogging, marathon, triathlon
Fitness	Fitness
Instruments	Playing instruments (e.g. playing the piano,)
Luxury food	Cigars, wine, cooking
Honorary post	Honorary post, charity
Movies	Movies, cinema, television
Ice hockey	Ice hockey
Basketball	Basketball
Formula 1	Formula 1
Handball	Handball
Rugby	Rugby
Family	Family, children, married
Chess	Chess
Policy	Policy, parties
Fencing	Fencing
Religion	Religion
Technique	Technique
Flying	Flying, pilot
Sport shooting	Sport shooting
Small animals	Small animals, beekeeping
Tennis	Tennis

Table 9 (Continued)

Characteristic	Classified activity/activities
Boxing	Boxing
Bowling	Bowling
Hunting	Hunting
Journalism	Publications and articles
Computer science	Computer science, programming
Physics	Physics
Fire brigade	Fire brigade
Travels	Travels

Note: Verbs are ignored during classification. For example, if person A plays football and person B is just a fan of a team, this is not relevant for classification. Both are assigned to the football group

6.2 University education: Most popular subjects

Table 10 University Education: Top 10 subjects

Subject	Total
Business Administration	249
Law	152
Chemistry	51
Mechanical Engineering	38
Economics	37
Physics	36
Industrial clerk	22
bank clerk	21
Social sciences	19
Chemical laboratory assistant	18

6.3 Regression requirements

6.3.1 Tests for endogeneity, homoscedasticity, serial correlation, and normal distribution

Table 11 summarizes the test results of the model assumptions of the panel regression.

The test of endogeneity (Hausman test) shows that endogeneity is present in the tested regression Models (1), (2), (3), (4), (5), (8), and (9) (cf. Table 11) and, therefore, we use the fixed-effects model (Hausman 1978). There is no endogeneity in the tested regressions (6), (7), and (10), but we find a high serial correlation, which is why the fixed-effects model is also chosen for these regressions. However, all models show heteroscedasticity which leads to an invalid Hausman test (Wooldridge 2002, pp. 259, 289). Consequently, the fixed-effects model is used for all regressions.

Inconsistent covariance estimates due to heteroscedasticity are recovered by the heteroscedasticity-consistent covariance matrix estimation using the method of White (White, 1980; Millo, 2017, p. 14; Zeileis, 2004).

The Shapiro-Wilk normality test shows that the residuals of Models (1), (2), (3), (4), (5), (7), and (9) are not normally distributed. However, it is common for the test to reject the H_0 hypothesis ($H_0 =$ normal distribution) in large samples. Hence, a significant test does not necessarily indicate a bias in the results (Field et al. 2012, p. 182). In addition, we verified graphically the normal distribution of residuals of all models (cf. Fig. 7 in Appendix 3). These graphs show that the residuals behave similarly like a sample from a normal distribution and thus a normal distribution of all models can be assumed (Wilk and Gnanadesikan, 1968, p. 16; Thode, 2002, pp. 22, 24).

According to Havlicek and Peterson (1974, p. 1111), only little distortion of the t-distribution can be assumed if the other models of the sample are normally distributed. Consequently, at worst, a small distortion of the t-distribution can be assumed for models 1, 2, 3, 4, 5, 7, and 9; models 6, 8, and 10 are normally distributed.¹⁶

¹⁶ Havlicek and Peterson (1974, p. 1112) demonstrate that if the models are not normally distributed, the t-distribution shows small distortion if the distribution has the same direction and variance.

Table 11 Test results (p-values) of the model assumptions of the panel regression

	Regressions:									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Endogeneity	0.01	0.00	0.01	0.01	0.02	0.93	0.08	0.00	0.00	0.33
“random-effects” (r) or “fixed-effects” (f)	f	f	f	f	f	f	r	f	f	f
Homoscedasticity										
Serial correlation (Order 1)	0.86	0.59	0.85	0.60	0.85	0.00	0.00	0.97	0.99	0.90
Normal distribution	0.01	0.02	0.01	0.04	0.01	0.01	0.01	0.02	0.03	0.11

Note: The “random-effects” model is denoted with *r* and the “fixed-effects” model with *f*. Homoscedasticity is tested with Goldfeld-Quandt test ($H_0 = homoscedasticity$), serial correlation is tested with Breusch-Godfrey/Wooldridge test ($H_0 = no\ serial\ correlation$), endogeneity is tested with Hausman test ($H_0 = no\ endogeneity$) and normal distribution is tested with Shapiro-Wilk normality test ($H_0 = normal\ distribution$)

6.3.2 Normal distribution of residuals – graphical verification

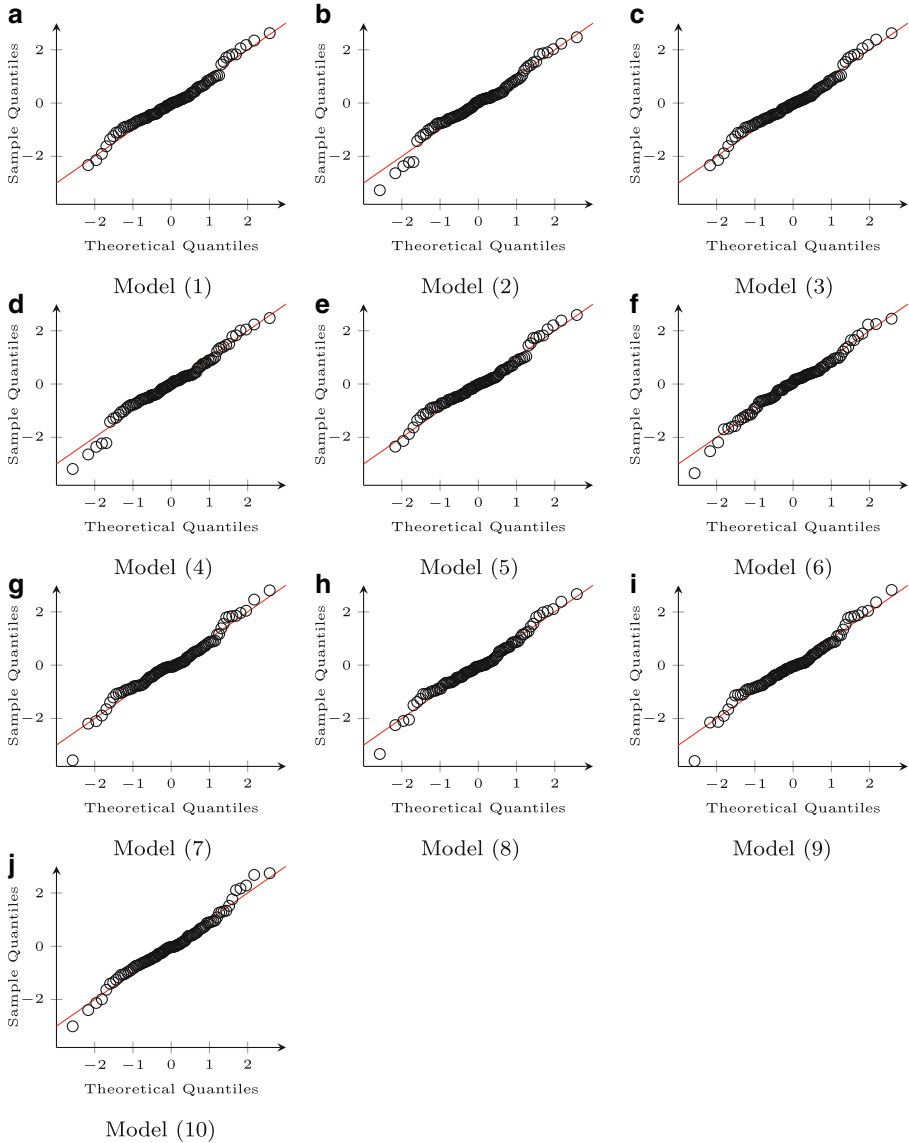


Fig. 7 Distribution of z-standardized residuals. **a** Model (1); **b** Model (2); **c** Model (3); **d** Model (4); **e** Model (5); **f** Model (6); **g** Model (7); **h** Model (8); **i** Model (9); **j** Model (10)

6.3.3 Multicollinearity – VIF values

Table 12 VIF Values Model (1) & (2)

	(1)	(2)
All SR	1.20	
Employment		1.49
Educational Background		1.68
Same Educational Experience		1.43
Other Activities		1.51
No. of Employees	1.21	1.23
RoA	1.16	1.39
CEO Age	1.38	1.44
CEO Title	1.31	1.62
CEO Change	1.25	1.33
Board Change	1.15	1.23
Board Size	1.56	1.61

Table 13 VIF Values Model (3), (4), (5) & (6)

	(3)	(4)	(5)	(6)
CEO SBM All SR	1.22		5.45	
SBM All SR			4.50	
CEO SBM Employment		1.51		13.23
CEO SBM Educational Background		1.64		15.42
CEO SBM Same Educational Experience		1.42		5.23
CEO SBM Other Activities		1.49		5.01
SBM Employment				13.53
SBM Educational Background				9.36
SBM Same Educational Experience				2.28
SBM Other Activities				4.31
No. of Employees	1.21	1.21	1.26	1.35
RoA	1.16	1.41	1.17	1.48
CEO Age	1.38	1.46	1.46	1.88
CEO Title	1.31	1.62	1.36	2.84
CEO Change	1.25	1.32	1.31	1.49
Board Change	1.16	1.25	1.16	1.26
Board Size	1.57	1.60	1.60	2.05
CEO SBM All SR:			11.42	
SBM All SR				
CEO SBM Employment:				29.82
SBM Employment				
CEO SBM Educational Background:				25.65
SBM Educational Background				
CEO SBM Same Educational Experience:				5.55
SBM Same Educational Experience				
CEO SBM Other Activities:				8.35
SBM Other Activities				

Table 14 VIF Values Model (7), (8), (9) & (10)

	(7)	(8)	(9)	(10)
CEO SBC All SR	1.22		6.42	
SBC SBM All SR			2.59	
CEO SBC Employment		1.64		13.70
CEO SBC Educational Background		1.19		12.48
CEO SBC Same Educational Experience		1.14		3.99
CEO SBC Other Activities		1.82		5.35
SBC SBM Employment				5.66
SBC SBM Educational Background				7.33
SBC SBM Same Educational Experience				1.67
SBC SBM Other Activities				1.88
No. of Employees	1.21	1.39	1.30	1.53
RoA	1.29	1.31	1.32	1.46
CEO Age	1.36	1.39	1.62	1.66
CEO Title	1.41	1.82	1.76	2.21
CEO Change	1.25	1.28	1.24	1.33
Board Change	1.11	1.12	1.13	1.27
Board Size	1.37	1.43	1.45	2.01
CEO SBC All SR:			10.39	
SBC SBM All SR				
CEO SBC Employment:				20.01
SBC SBM Employment				
CEO SBC Educational Background:				19.41
SBC SBM Educational Background				
CEO SBC Same Educational Experience:				3.95
SBC SBM Same Educational Experience				
CEO SBC Other Activities:				6.88
SBC SBM Other Activities				

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