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Does a gender pay gap exist on executive boards? An empirical multilevel analysis of executive board compensation in German listed companies

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Abstract

Using a three-stage multilevel model, this paper investigates whether the compensation of female and male members of top management teams differs systematically. For this, the payment and the determinants of compensation of approximately 600 executive board members of German DAX, MDAX, and SDAX companies in the years 2016–2019 were analysed. The differences in remuneration are theoretically founded at the company level by agency theory and at the individual level by human capital theory. The empirical results show that women receive lower compensation than men on average throughout the period under review. However, these differences in pay are especially attributable to the fact that women serve on average for a shorter period on the executive board and rarely hold the CEO position. There is also evidence that executive compensation depends directly on individual attributes (length of service on and position in the board) and company-specific characteristics (firm size and performance) that differ systematically between men and women, but gender determines compensation only indirectly through these factors. The study also confirms that women are still underrepresented on executive boards. With these results, this paper contributes to corporate governance research in the context of the dualistic board system and encourages the discussion about women in leadership positions.

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1 Introduction

In recent years, the topic of gender diversity has found its way into business research and practice through numerous studies and debates. In the context of corporate governance, especially with the introduction of various legal amendments [e.g., the first Act on Equal Participation of Women and Men in Leadership Positions or the CSR-Directive], gender diversity in the top management levels of companies is the topic of heated disputes. The so-called *glass ceiling* regularly comes up in this context (Bozhinov et al. 2019), which is now penetrated by so-called *quota women* (Bozhinov et al. 2017). With the introduction of the Act on Equal Participation of Women and Men in Leadership Positions in 2015 in Germany, listed companies and companies subject to full co-determination must, on the one hand, consider a 30% quota for the underrepresented gender when filling new supervisory board positions (Section 96 [2] AktG). On the other hand, companies must publish targets and deadlines for the proportion of women on the supervisory and executive boards in the Corporate Governance Statement [Section 111 [5] AktG in conjunction with Section 289f [2] No. 4 German Commercial Code (GCC)]. In addition, the second Act on Equal Participation of Women and Men in Leadership Positions came into force in August 2021 (Section 76 [3a] of the German Stock Corporation Act). This requires listed companies and companies with co-determination to appoint at least one woman to the executive board if it consists of more than three members (BMFSFJ 2021).

Despite such social and political efforts, the proportion of women on the executive boards, the top management team (TMT), of German listed companies remains at a low 8% in 2019. Women hold the position of chairman in only 3% of companies. Their average length of service on the TMT is 4.3 years—two and a half years (≙ 34%) less than that of their male colleagues. Furthermore, female executive managers earn, on average, almost 200,000 euros (≙ 8.6%) less than male executive managers (based on the data set presented in Sect. 4.1). The low representation and the unadjusted pay gap suggest that women continue to experience lower board acceptance and are inhibited by the *glass ceiling* (Bertrand and Hallock 2001; Hendrix 2011; Malhotra et al. 2021). Based on human capital theory, compensation research argues that lower pay is attributable to lower human capital (e.g., educational background and work experience). According to human capital theory, the lower average remuneration of female TMT members suggests that they have less human capital than their male colleagues. Systematic differences in human capital can rule out the existence of an adjusted and unexplained gender pay gap on the TMT of German listed companies (Holst and Busch 2009). Against this background, this paper explores whether personal or firm-specific characteristics can explain female executive managers' lower average compensation or whether an adjusted and unexplained gender pay gap exists that suggests persistent acceptance problems toward female executive managers. The study examines which individual and company-specific characteristics determine executive managers' compensation and the extent to which these differ between female and male executive managers.

The underrepresentation of female leaders drives not only the social debate but also research in this field. For example, numerous studies have looked at the

prevalence (Fehre and Spiegelhalder 2017), influence (Reguera-Alvarado et al. 2017; Manita et al. 2018), and determinants (Fehre et al. 2014; de Cabo et al. 2019; Kirsch and Wrohlich 2020) of gender diversity in control and governance processes. In addition, some studies examined the determinants of executive remuneration (Marchetti and Stefanelli 2009; Rapp and Wolff 2010; Andreas et al. 2012; Bugeja et al. 2016; Acero and Alcalde 2020). Few studies explicitly addressed gender pay gaps, revealing systematically lower compensation of female executive managers (Bell 2005; Elkinawy and Stater 2011; Maume et al. 2019). However, a more in-depth analysis of the extent to which the remuneration of female and male executive board members differs has so far only taken place in the context of the monistic board system—particular for U.S. companies. The monistic system, which combines management and control in the executive board, differs fundamentally from the German corporate governance system. The system is characterised by dualistic management and supervision by the executive and supervisory board. Due to the different organizational and social framework conditions, empirical results on the monistic system can only be transferred to the dualistic system to a limited extent (Handschumacher and Ceschinski 2020).

Based on the evidence of lower average remuneration of female executive board members in German listed companies, empirical evidence on the gender pay gap in boards of the monistic system and the differences between the one-tier and two-tier system, this paper addresses gender-specific differences in executive board compensation in the context of the dualistic corporate governance system and the question of whether an adjusted gender pay gap exists on the TMT of German listed companies. The low representation of female executive managers suggests that entry barriers still exist for women, hindering their advancement to the top management level. Building on this fact, I question whether women who have already been appointed to the executive board face further acceptance problems reflected in (unfounded) lower compensation. Therefore, I use three-stage multilevel models to analyse board members' compensation concerning personal and firm-specific determinants to uncover possible gender differences.

Gender-determined executive managers' compensation is estimated using an extensive hand-collected unbalanced longitudinal dataset comprising approximately 600 executive managers from 104 listed German companies for 2016–2019 (390 company years and 1655 executive manager years). Three-stage multilevel analyses are used to determine the relationship between executive compensation and the gender of a TMT member, controlling for personal and company-specific characteristics. The results initially indicate that male executive managers receive a systematically higher payment. Considering personal and company-specific criteria, empirical evidence reveals that these characteristics determine executive managers' remuneration and that individual and firm-specific characteristics of female and male executive managers differ.

The article is structured as below: Following the introduction, the second chapter presents the research context, the state of research and the research needs deriving from it. Based on the agency theory and human capital theory, the empirical analysis is theoretically stated in the third chapter, and the hypothesis is formulated. Chapter four explains the design of the empirical study presented in chapter five.

The empirics' presentation begins with descriptive statistics, which are followed by the results of the multilevel analyses and robustness checks. Chapter six discusses the results. The paper ends with a conclusion and outlook.

2 Research context, state of research and research gap

For some years, national and international research has been increasingly interested in the topic of corporate governance in general and gender diversity in executive and supervisory bodies in particular (Kirsch 2018; Bozhinov et al. 2019). In this context, research has focused on the internationally established monistic board system and in particular on U.S. companies, while the dualistic system prevailing in Germany has received less attention (Handschumacher et al. 2018; Beck et al. 2020). The German corporate governance system, which is a prototype of dualistic systems (Andreas et al. 2012), differs from the monistic systems in several aspects. For this reason, research findings on corporate governance in general and executive compensation in particular can only be applied to the dualistic system to a limited extent. The main difference lies in the separation between the supervisory and management bodies. The supervisory board controls the executive board, appoints its members and determines their remuneration. The supervisory board of co-determined companies is composed of representatives of the shareholder and the employees (Elston and Goldstein 2003; Bottenberg et al. 2017). In addition, a statutory gender quota is prescribed for supervisory boards, which has led to an increase in the proportion of women on the supervisory body in recent years. In particular, when evaluating gender pay differences, the extent to which gender-diverse boards set the compensation is important (Shin 2012). Apart from the dissimilarities in the structure of the control and management bodies, German listed companies are characterized by a concentrated ownership structure. Institutional investors, family businesses and foundations regularly act as dominant shareholders and have a major influence on the company through stronger and long-term ties (Rapp et al. 2011; Winkler and Behrmann 2019; Beck et al. 2020). Finally, according to the Executive Compensation Disclosure Act and the recommendations of the German Corporate Governance Code (GCGC), German listed companies have to publish the compensation of their executive boards individually, which allows for more in-depth empirical research (Beck et al. 2020). In contrast, previous studies can or could only be examined based on the entire executive board or the average pay, as the publication of individual compensation was not mandatory and is still not mandatory everywhere (Acero and Alcalde 2020).

Several national and international studies have been published on executive remuneration and its determinants (Marchetti and Stefanelli 2009; Rapp and Wolff 2010; Andreas et al. 2012; Bugeja et al. 2016; Acero and Alcalde 2020; Beck et al. 2020). These publications reveal that board remuneration depends on company characteristics, such as size (Marchetti and Stefanelli 2009; Andreas et al. 2012; Bugeja et al. 2016; Acero and Alcalde 2020), leverage (Andreas et al. 2012), performance (Andreas et al. 2012), ownership structure (Rapp and Wolff 2010; Barontini and Bozzi 2011) and the company's industry (Andreas et al. 2012). Besides, individual

characteristics of executive managers influence their remuneration. These characteristics include, for example, reputation (Bugeja et al. 2016) and the duration of the service on the board (Marchetti and Stefanelli 2009; Acero and Alcalde 2020; Beck et al. 2020). Acero and Alcalde (2020) also indicate that the gender of executive managers is not a determinant of remuneration. Contrary, Marchetti and Stefanelli (2009) postulate that executive manager remuneration and the degree of gender diversity in the executive board are positively associated.

In the context of the German corporate governance system, Beck et al. (2020) investigate the structure and composition of executive board compensation of large, listed companies in Germany from 2006 to 2018 by compiling an extensive and up-to-date dataset. Furthermore, they look at the development, determinants and effects of compensation and discover that female executive board members of DAX and MDAX companies earn less than male board members. However, the effect is only detectable when controlling for firm fixed effects. According to these findings, women are more likely to work for companies that pay higher salaries. The results, though, are not the focus of this paper and therefore have not been further explored and explained. Further studies that examine gender-specific executive remuneration and go beyond descriptive statistics are rare in German research. Ernst and Young GmbH (2020) regularly conducts a descriptive analysis of executive compensation of German companies listed in the DAX, MDAX, and SDAX. This investigation discloses that in 2019 female executive managers—excluding CEOs—receive higher remuneration than male executive managers. However, the descriptive study does not consider other factors influencing payment, revealing an unadjusted gender pay gap. Moreover, Hirsch (2013) documents in an empirical study that the larger the share of women at the management level, the smaller the unexplained gender pay gap in the two management levels below. Furthermore, Bozhinov et al. (2017) postulate that significant differences exist in the level of remuneration of female and male supervisory board members.

International studies also confirm that a gender pay gap exists in executive boards. A recently published paper by Schneider et al. (2021) revealed a gender pay gap for the boards of major European companies and indicates that external recruitment of women to the board is significant to the extent of the pay gap. The authors attribute this to gender stereotyping and discrimination, which are more pronounced in the case of external appointments. Maume et al. (2019) also look at European countries with and without statutory gender quotas and show that female managers earn significantly less than male managers whereby the differences are less pronounced in countries where a gender quota is mandatory. In the U.S. research context, where individual board compensation has been required to be disclosed for some years and (with exception) no gender quota is mandated, empirical evidence predominantly supports the existence of a gender pay gap. According to Carter et al. (2017), female executives of the largest publicly traded U.S. companies earn lower salaries compared to male executives due to women's higher risk aversion. Furthermore, Perryman et al. (2016) postulate that women on TMT are compensated significantly less than men. However, the compensation differences are smaller, with a higher proportion of women on the top management level. Similarly, Bell (2005) affirms that female executives earn significantly less than male executives, controlling for

firm-specific, industry-specific, and personal characteristics. The results depict that the pay differences are independent of the human capital (title, age, and tenure) of the board members. In this study, again, the gender pay gap is smaller, the higher the representation of women on the board or if the board is led by a female CEO. Several studies of U.S. companies confirmed these findings (Bertrand and Hallock 2001; Muñoz-Bullón 2010; Elkinawy and Stater 2011; Shin 2012). Contrary to those papers, Bugeja et al. (2012) cannot empirically confirm a gender pay gap.

This paper builds on the studies above and closes the existing research gap regarding the following aspects: First, it contributes to current gender research. To this end, I analyse both the representation and remuneration of female executive managers in more depth and with comparison to the compensation of male executive managers. Thus, the study indicates the acceptance of women in executive positions. Secondly, the research is based on an up-to-date and comprehensive set of hand-collected data on female executives' representation. The data's actuality is essential in this context, as the proportion of women on executive boards has increased in recent years—due to social and legal developments—and older studies cannot provide empirical evidence due to low representation (Boerner et al. 2012). This is further relevant as previous studies postulate that the extent of the gender pay gap is related to women's representation on the board (Bell 2005; Elkinawy and Stater 2011; Perryman et al. 2016). In addition, detailed and individualised remuneration data is often not available, as the disclosure is not required by law everywhere. German listed companies have been obliged to disclose individualised executive remuneration (Tröger and Walz 2019). This allows to draw on individual remuneration data and reveal internal company differences in managers' pay (Acero and Alcalde 2020). Third, I conduct multilevel estimations, which have rarely been used in this context, but allow for deeper insights and are in line with state-of-the-art research methodology (Acero and Alcalde 2020; Hair and Fávero 2019). Previously, Acero and Alcalde (2020) examined executive pay determinants using a two-stage multilevel model. This paper goes further by integrating a third level, which considers time trends in compensation (Shin 2012). Fourth, this is the first time that such a study has been conducted in the context of the German dualistic corporate governance system. Research findings from other countries (especially with the monistic system) can only be transferred to a limited extent due to legal and institutional differences (Handschumacher and Ceschinski 2020; Beck et al. 2020) For this reason, it is of interest to find out how these differences, such as the supervisory board and its composition (in terms of co-determination and gender quota) or the ownership structure of the company, have an influence on the remuneration. The study thus closes the existing research gaps and contributes to corporate governance and gender diversity research.

3 Theories and hypothesis

Agency theory and human capital theory are regularly used in the literature to explain the amount and structure of executive remuneration. In this context, agency theory states how the remuneration system of a company should be organised

depending on the company-specific framework conditions and how this system differs between companies. In contrast, human capital theory addresses the influence of individual characteristics on pay and how this can differ at the personal level.

In the German corporate governance system, the shareholders entrust the executive board with the management of the company. According to agency theory, this results in a separation of ownership and control, which, assuming diverging interests of the board members and shareholders, leads to agency costs at the expense of the shareholders (Jensen and Meckling 1976; Rapp and Wolff 2010). These costs are manifested, for example, in excessive compensation or low labour commitment of the executive board (Bebchuk and Fried 2003; Döscher 2014; Handschumacher and Ceschinski 2020). To reduce these agency costs, the supervisory board monitors the executive board on the shareholders' behalf. However, this also results in an agency relationship between the supervisory board and the shareholders. In addition, it is not possible to have complete control over the executives. Therefore, the supervisory board sets (monetary) incentives that lead to a congruence of interests between the management board and the shareholders (Friedl 2012; Döscher 2014). The more complex the control of the board, the more comprehensive the incentive system should be. The incentives are usually implemented through (performance-related) compensation for the executive board (Andreas et al. 2012). Against this background, the (variable) compensation of the executive board should depend on firm performance and on the extent to which the executive board can be monitored by the shareholders' control mechanism (Rapp and Wolff 2010; Andreas et al. 2012).

A suitable compensation system can encourage the members of the TMT to operate in the interests of the shareholders. The shareholders' interest lies in maximizing the long-term value of the company. If the compensation is linked to the value of the company, the managers have a personal interest in managing the company in line with the shareholder value (Döscher 2014). For this purpose, various options are used to set the variable compensation granted to board members based on different performance measures: Depending on the term of the assessment basis, the variable compensation can be classified into long-term and short-term compensation. The short-term variable compensation is based on key performance indicators for the current financial year. According to Böcking et al. (2017), personal target agreements or company profit represent the most common assessment basis in German listed companies. In contrast, multi-year compensation is based on both the current year and previous fiscal years. Multi-year components can be paid either directly or deferred, with the latter payment often granted on a share-based basis (Böcking et al. 2017). Companies frequently use company profit, share price or return on shares to measure long-term variable compensation (Böcking et al. 2017). If there is a high proportion of performance-related compensation, this will increase (or decrease) in accordance with the firm performance. Nevertheless, empirical research does not find consistent results regarding the correlation between company performance and executive board compensation. This is partly due to the fact that different performance measures are used in practice and consequently also in empirical research. The results also depend on the key figures to which the established remuneration system is linked and the consideration of these in the analysis. A positive correlation can be assumed if variable remuneration components form the basis of the

analysis (Winkler and Behrmann 2019). In this context, Elkinawy and Stater (2011) as well as Rapp and Wolff (2010) confirm that compensation is related to firm performance. Besides, compensation should depend on the degree of control exercised over the TMT. If there are extensive opportunities for control, the board's ability to pursue its own interests is reduced, and with it the agency costs for shareholders. Shareholders are therefore less dependent on incentivizing their board members with high compensation. The larger the company, the more difficult it is to monitor and review the strategies and actions of the manager. To prevent high agency costs, the focus in larger companies should be on the incentive component and thus the (variable) compensation of the board members. There is therefore a consensus in empirical research that larger firms pay their executive board members higher compensation (Muñoz-Bullón 2010; Rapp and Wolff 2010; Barontini and Bozzi 2011; Elkinawy and Stater 2011; Vieito and Khan 2012; PricewaterhouseCoopers GmbH 2020). In addition to the more complex control structures, higher compensation in larger companies can also be justified by the fact that the complexity of tasks and the demands placed on board members increase with the size of the company (Schwalbach and Graßhoff 1997). The demands in large companies require highly qualified board members who must be compensated accordingly (Fernandes 2008). Conversely, monetary incentives are less important when a company's ownership structure allows control over board members. Package or major shareholders, who usually have long-term ties to the company and board, can exercise greater control over managers (Winkler and Behrmann 2019) and, for example, have contact with the company's control and management bodies through private and informal channels (Sauerwald et al. 2016). On the one hand, the increased opportunities for control cause the TMT to exert less influence on their own remuneration (Elston and Goldberg 2003). On the other hand, revenues must have a lower incentive effect and set at a lower level (Boyd 1994; Rapp and Wolff 2010). Empirical research postulate that increasing shareholder concentration has a negative effect on the level of executives' revenue (Rapp and Wolff 2010). Furthermore, the compensation depends on the control of the supervisory board, which is responsible for the compensation of the executives. If the executive board has a great influence on the supervisory board or if the supervisory board demonstrates a low level of monitoring effectiveness, this results in excessive compensation for the managers (Handschumacher et al. 2019; Handschumacher and Ceschinski 2020). With recourse to the agency theory, it can be theoretically concluded that the compensation paid to the TMT depends on company-specific parameters. Accordingly, systematic differences in remuneration between companies are to be expected.

On individual basis, the human capital theory explains compensation differences due to differences in personal human capital (Mincer 1958; Hendrix 2011). Human capital represents the sum of individual skills, knowledge, and experience (Fehre and Spiegelhalder 2017). Individuals can decide to invest in personal human capital out of a benefit-cost-calculation and thus increase their career opportunities (Mincer 1958; Busch and Holst 2010). Individuals who have more comprehensive human capital have better career opportunities and receive higher pay (Strunk and Hermann 2009). The theory places education, work experience, and pay in a causal relationship (Hendrix 2011). Pay differences that can be

attributed to differences in human capital are considered legitimate differences and are described by explained pay gaps (Holst and Busch 2009).

Concerning studies of individual characteristics of executive managers, some postulate that board members barely differ in their human capital. Due to the high barriers to enter the executive board, a selection has already taken place regarding the qualifications and experience of the managers (Perryman et al. 2016). A homogeneity in the human capital of board members is expected (Bell 2005; Holst and Busch 2009). However, it must be countered that although the capital of the TMT is at a high level among all members, board members have diverse academic and professional backgrounds and differ in terms of the extent of their professional experience. These qualifications should in turn, according to the human capital theory, determine the level of remuneration. Some studies can empirically prove a connection between an executive's level of education and professional expertise and his or her remuneration (Gray and Benson 2003; Vieito and Khan 2012; Acero and Alcalde 2020). In particular, the academic education and the extent of professional experience (in the current and previous company) should be rewarded with higher compensation. Furthermore, executive managers who hold a superior position on the board and thus bear greater responsibility are compensated accordingly. In line with the human capital theory, board chairs have enhanced skills and experience that qualify them for this position. These qualifications should, in turn, be reflected in remuneration (Field et al. 2017; Muñoz-Bullón 2010; Shin 2012). Drawing on human capital theory, it can be theoretically concluded that individual characteristics, in addition to firm-specific determinants, determine executive compensation. Accordingly, individual variations in remuneration can also be assumed within the executive board of a company.

Based on the theories, board members who have the same qualifications and operate under comparable conditions should receive an equivalent compensation. Nevertheless, previous studies have revealed a gap in executive compensation that cannot be related by individual and company-specific parameters (Bell 2005). It can be observed that these differences are gender-determined (e.g., Carter et al. 2017; Maume et al. 2019). In these cases, an unexplained gender pay gap occurs because discrepancies in the remuneration of male and female board members can be demonstrated despite comparable human capital and analogous framework conditions. This undeclared compensation differences may be attributable to discrimination and acceptance problems, which are manifest in an unexplained pay gap (Holst and Busch 2009; Hendrix 2011). Descriptive analysis depicts that the average compensation diverges for female and male board members. Unless this can be explained by differences in human capital and divergent framework conditions (adjusted gender pay gap), it suggests an unexplained gender pay gap, which has already been empirically revealed in previous studies, especially in the context of the monistic system (Elkinawy and Stater 2011; Perryman et al. 2016; Maume et al. 2019). According to the theory, the prior publications and the descriptive results, the research aims to answer the question whether there is a part in executive remuneration that cannot be explained by individual and firm-specific parameters, but by the gender of a board member. I examine the hypothesis accordingly:

Hypothesis Considering personal and company-specific characteristics, male executive board members receive higher remuneration than female executive board members.

4 Research design

4.1 Sample and data basis

The empirical study is based on a population of approximately 600 executive managers from about 100 companies listed in the most extensive German indices DAX, MDAX, and SDAX over the period from 2016 to 2019. Banks, insurance companies, financial service providers, and companies with foreign ISINs were omitted as they are subject to different regulatory frameworks. A few board members or companies had to be removed from the dataset as not all relevant information was available. The data was collected annually (2016–2019) as of the cut-off date of December 31.

To compile the dataset, the composition of the executive board was taken from the companies' annual report. This includes the name of the board member including academic title as well as the position on the board (CEO, CFO or other). The year of appointment to the executive board and, if applicable, the year of leaving the board were taken from the annual report, as well. Based on this information, the length of service was calculated. Also the compensation data are taken form the annual report. Due to the Act on the Disclosure of Executive Board Remuneration, German listed companies have been obliged to disclose executive remuneration in the notes to the annual report or the management report on an individualized basis and by name (Section 285 sentence 1 no. 9a of the GCC[1]). Furthermore, listed companies must not only disclose the amount of remuneration, but also report in detail in their management report on the underlying remuneration system with its individual components and bases of assessment (Section 289a [2] sentence 1 of the GCC, as amended on 26 November 2015). However, the GCC does not prescribe a standardized form for the disclosure of compensation, making comparisons between companies and over time more difficult (Tröger and Walz 2019). Taking up this limitation, the GCGC, as amended on 7 February 2017 (Sect. 4.2.5),[2] recommends

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[1] The disclosures on compensation refer to the legal status at the time of data collection (2016–2019) and therefore do not take into account the amendments resulting from the ARUG II and the publication of the new GCGC in 2020. Whereas previously only the GCGC recommended a separate compensation report, since 2020 listed companies have been required to publish this report independently of the notes to the annual report and the management report. The extent to which the publication of additional compensation information and the changes regarding the auditing of this information will have an impact on the design of the compensation system should be the subject of future research.

[2] The GCGC, as amended on 5 May 2015, already recommended the publication of the compensation in line with the model table. This enables uniform collection of remuneration over the period under review. However, the recommendations of the GCGC differ with regard to compensation in that the previous version does not require that early disbursements of multi-year variable compensation components should not be permitted and that these should not yet be based on a forward-looking characteristic (Sect. 4.2.3) (Ceschinski et al. 2018).

Does a gender pay gap exist on executive boards? An empirical…

335

publishing a separate compensation report and thus an individualised presentation of remuneration according to standardized model tables. Although publication in accordance with the recommendation of the GCGC is not mandatory, almost all companies comply with this recommendation. These tables therefore offer the possibility of standardized data collection on individual executive board compensation across companies. The individually received total remuneration as well as the granted short- and long-term variable compensation were collected based on the model tables of the GCGC (Beck et al. 2020). In the case of pro rata membership to the TMT in the financial year, the remuneration is extrapolated to the full year. The data on the proportion of women on the supervisory board were also obtained from the annual reports. Since the financial year 2017, companies have been required to publish the target figures on the proportion of women on the supervisory board (and executive board) and the status of implementation, as well as their diversity concept (Section 289f [2] No. 4, 5 and 6 GCC) For 2016, the proportion of women was recorded accordingly based on the composition of the supervisory board. Further personal information on age, education and previous positions was taken from the CVs published on the companies' websites. Where these were not available, other trustworthy internet sources were used. The company key figures on size, performance, leverage, and free float were taken from *Thomson Reuter Datastream*. Table 5 in the appendix provides an overview of the variables considered in the data collection and their sources.

4.2 Variables

4.2.1 Dependent variable

Dependent variable I use the logarithmised received total remuneration (fixed remuneration, fringe benefits, variable remuneration, and pension expenses) of each board member as the dependent variable ($TotalComp_{LN}$). In contrast to the compensation granted, the received compensation is not based on future targets (de Angelis and Grinstein 2015). However, a disadvantage of using the received compensation is that multi-year variable compensation components depend on performance indicators that are not attributable to the corresponding year under review. The compensation received therefore does not consider compensation already granted based on the performance of the executive board member in the corresponding year but paid in subsequent years (Beck et al. 2020). For this reason, I conduct further analyses with the granted compensation of the board members. The granted compensation describes the compensation of a board member upon achievement of a defined target or, in the case of share-based compensation, corresponds to the fair value at the time of grant (de Angelis and Grinstein 2015; GCGC 2017). I use variable compensation here, as fixed compensation is usually paid out directly. Furthermore, I differentiate between 1-year ($ShortVComp_{LN}$) and multi-year ($LongVComp_{LN}$) variable compensation (Sommer et al. 2013). If the multi-year compensation contains share-based components, the fair value at grant stated by the companies was used (Rapp

et al. 2011).[3] In particular, when comparing share-based compensation levels, it is useful to refer to the compensation granted, as this better reflects the compensation arrangements than pay-outs based on share price developments, which depend on numerous external influencing factors (Crasselt 2008). To condense large discrepancies in remuneration, I use the natural logarithm of compensation (Muñoz-Bullón 2010; Perryman et al. 2016; Usman et al. 2018).

Independent variable The independent variable describes the gender of a board member. This is recorded in the dummy variable *Gender*, which indicates whether the person is male (1) or female (0).

Control variables In examining the determinants of executive compensation, I distinguish between individual and firm-specific factors. Regarding individual characteristics, I control for the educational qualification and professional experience of the board members. I capture the differences in education through both the academic field of study and the educational degree. The dummy variables *UniversityDegree* and *DoctoralDegree* show whether the highest educational qualification of the person is a university degree (excl. PhD) or a doctorate (reference category is *NoAcademicDegree*). The dummy variables *Economics*, *Law* and *Science* (incl. engineering) show whether the board member has a degree in one of these fields (reference category is *Humanities*). I approximate the professional experience gained on the board based on the length of membership on the board from the date of appointment to the date of leaving or the year under review (*Tenure*). In addition to this, the dummy variable *External* shows whether someone previously worked in another company or was appointed to the board within the company. The variable compares board members who have gained experience within the company with those who have qualified for the board through their experience in other companies (Schneider et al. 2021). To record the work experience outside the board, I include the variable *Age* since the length of professional experience (in prior positions) correlates closely with age. After considering academic degrees and work experience, I consider the position within the board based on the dummy variables *CEO* and *CFO*. The variable *CEO* indicates whether the member is chairman of the executive board, while the variable *CFO* shows whether someone is the chief financial officer or deputy chairman (reference category is *RegularMember*). Besides, I control for high compensation due to severance payments by introducing a dummy variable indicating whether a member left the board in the year under study (*Exit*).

At firm level, I control for firm size ($Size_{LN}$) using the natural logarithm of total assets (Marchetti and Stefanelli 2009; Tröger and Walz 2019; Acero and Alcalde 2020) and two dummy variables that capture whether a firm is listed in the *DAX* or *MDAX* (reference category is *SDAX*). I control for firm performance using both accounting-based and market-based key figures (Andreas et al. 2012). The two

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[3] The value of the share-based compensation corresponds to the fair value stated in the compensation report, which is generally determined by the companies using the black–scholes model (Döscher 2014). However, not all companies disclose the valuation methods used to determine the fair values of the share-based compensation granted (Schaller 2011). For further discussion on the use of the company's own disclosure of the fair value of share-based compensation granted, see Döscher 2014.
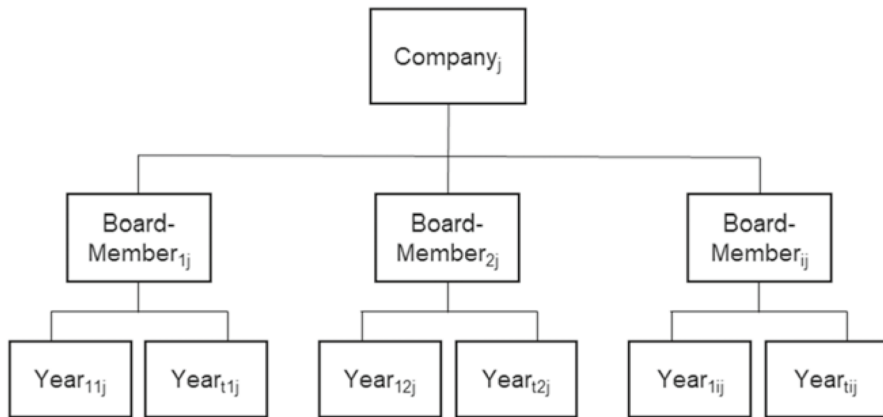
Fig. 1 Hierarchical structure of the multilevel model

measures are approximated by return on capital employed (*ROCE*) and earnings per share (*EPS*) and are used by some companies as the measurement basis for performance-based compensation (Döscher 2014). The variable *DiversityCommittee* captures the proportion of women on the remuneration committee of the supervisory board. In companies where no compensation committee is formed, I use the proportion of women on the committee responsible for compensation or the proportion in the supervisory board. The control variable is based on empirical evidence that gender-diverse supervisory boards have higher monitoring effectiveness (Handschumacher and Ceschinski 2020). Furthermore, studies confirm that demographic similarities positively influence compensation. Thus, a high proportion of women on the compensation committee has a positive effect on the remuneration of female board members (Shin 2012). Two further variables control for the ownership structure based on the proportion of shares in free float (*FreeFloat*) and the company's leverage ratio (*Leverage*). Industry effects are controlled by 14 dummy variables (reference category is *Utilities*) corresponding to the industry classification of Deutsche Börse AG (Schwalbach and Graßhoff 1997; Marchetti and Stefanelli 2009).

4.3 Multilevel model and research method

For the analysis of individual executive remuneration, I use a multilevel model. Therefore, the data is clustered into three hierarchical levels (Fig. 1). First, the time level (level 1) is defined, which contains the repeated measurements of executive compensation per observation year (*t*) (Hair and Fávero 2019). Second, the measurement repetitions are grouped at the individual level (level 2) per board member (*i*). Finally, the board members are grouped according to their affiliation (*j*) on a company level (level 3). Thus, time-invariant (level 1), individual (level 2), and firm-specific aspects (level 3) can be considered in the remuneration (Shin 2012).

Multilevel models are appropriate when individuals (executive managers) within a group (company) are similar in specific criteria, in which they, in turn, differ from the individuals of other groups (Hox and Maas 2017). As the agency theory states, the executive managers of a company are remunerated according to the same compensation system, which is subject to the same framework conditions and differs from other companies. Again, the remuneration of board members differs on an individual level according to the assumption of human capital theory. Furthermore, a temporal development in board remuneration is expected. This means that not only individual and firm-specific aspects are considered, but also, for example, unobserved cyclical variables at the macro level. Following the model of Hair and Fávero (2019), temporal effects based on 4-year measurement repetitions are integrated into the model as a third level.

Methodologically, the model has the advantage over Ordinary Least Squares (OLS) regressions that multilevel models consider the dependence of a group's observations (Hox and Maas 2017). It is postulated that executive managers of a company are not independent of each other. In OLS regressions, this represents a contradiction of the basic assumptions and can lead to a bias in the results (Krause and Urban 2013; Hosoya et al. 2014; Hair and Fávero 2019). Thus, the multilevel model corrects for bias due to different sample sizes across companies and standard bias due to clustering within a company (Griffin et al. 2021).

The analysis is based on the following multilevel model for board member i in company j in year t:

4.3.1 Level 1 model (time level)

$$Y_{tij} = \beta_{0ij} + \beta_{1ij} \times \left(T_{tij}\right) + r_{tij}. \tag{1}$$

4.3.2 Level 2 model (individual level)

$$\beta_{0ij} = \gamma_{00j} + \gamma_{01j} \times \left(X_{ij}\right) + \mu_{0ij}, \tag{2}$$

$$\beta_{1ij} = \gamma_{10j} + \gamma_{11j} \times \left(X_{ij}\right). \tag{3}$$

4.3.3 Level 3 model (company level)

$$\gamma_{00j} = \pi_{000} + \pi_{001} \times (W_j) + \varepsilon_{00j}, \tag{4}$$

$$\gamma_{01j} = \pi_{010} + \pi_{011} \times \left(W_j\right), \tag{5}$$

$$\gamma_{10j} = \pi_{100} + \pi_{101} \times \left(W_j\right), \tag{6}$$

$$\gamma_{11j} = \pi_{110} + \pi_{111} \times \left(W_j\right). \tag{7}$$

This results in the following model:

$$Y_{tij} = \pi_{000} + \pi_{001} \times W_j + \pi_{010} \times X_{ij} + \pi_{011} \times X_{ij} \times W_j$$
$$+ T_{ij} \times (\pi_{100} + \pi_{101} \times W_j + \pi_{110} \times X_{ij} + \pi_{111} \times X_{ij} \times W_j) + r_{tij} + \mu_{0ij} + \varepsilon_{00j}.$$
(8)

The three-level model describes the estimation of the remuneration (Y_{tij}) in year t of the executive manager i in a company j. The level 1 model contains the variable to distinguish the observation years (T_{tij}). The level 2 model includes the independent variable and all control variables to describe the board members' individual characteristics (X_{ij}). The level 3 model consists of control variables to describe firm-specific characteristics (W_j).

The coefficient π_{000} (intercept) corresponds to the expected value of compensation of a manager (i) in a firm (j) when all explanatory variables are zero. The coefficient π_{001} shows the slope of the expected value of executive compensation when W_j varies by one unit, and π_{010}, in turn, offers the slope of the predicted value of executive compensation when X_{ij} varies by one unit. The coefficient π_{011} indicates the development of the remuneration's expected value per year when both W_j and X_{ij} increase or decrease. The coefficient π_{100} presents the change in the expected value of remuneration per observation year. The difference in the predicted value of executive payment per observation year when W_j varies by one unit is determined in π_{101}. π_{110} corresponds to the slope of the expected value of executive remuneration per observation year if X_{ij} varies by one unit. Furthermore, the coefficient π_{111} represents the evolution of executive remuneration's expected value per year when both W_j and X_{ij} increase and decrease, respectively. The residuals r_{tij}, μ_{0ij}, and ε_{00j} explain the variance of the intercepts of the three levels (Hair and Fávero 2019).

The multilevel models are calculated by maximum likelihood estimations (Hox and Maas 2017). This is performed initially for the intercept-only model, which contains only the dependent variable and intercept. The result of the intercept-only model's estimation gives the overall mean value of executive remuneration (Y_{000}). The model reveals how the variance of executive compensation is distributed across the individual level (Nezlek et al. 2006). Therefore, the calculation shows whether remuneration varies over time, between board members and between companies. The total variance of payment is decomposed into the variances between the years of observation, between the board members, and between the companies (Arnegger and Hoffmann 2014). For this purpose, the inter-class correlation (ICC) is calculated, which indicates the level of correlation of the dependent variables within level 2 and between level 3 (level 3 ICC) or within level 1 and between level 2 (level 2 ICC). The ICC describes, on the one hand, the similarity of individuals of a company regarding their remuneration (level 3: $\rho_{Company}$); on the other hand, the similarity of the income of a board member in different years (level 2: $\rho_{Boardmember\ I\ Company}$) (Hair and Fávero 2019).

Furthermore, the likelihood ratio test is used to investigate whether the multilevel model is statistically superior to OLS regressions. Based on diagnostic procedures, the assumptions that homoscedasticity and symmetrical distribution of the total residuals are present in the multilevel models are confirmed. All models are calculated with standard errors clustered in companies.

Based on the results of the intercept-only model (model 1), I estimate further multilevel models by extending the intercept-only model by the variable *Year* (model 2), then by the independent variable *Gender* (model 3), followed by the control variables of the individual level (model 4) and finally by the control variables of the company level (model 5). I further conduct robustness checks, with the short- and long-term granted compensation (model 6–7) and vary the control variables (model 8–10). Beyond that, I estimate a linear panel regression with firm fixed effects (not tabulated).

5 Empirical analysis

5.1 Descriptive statistics

5.1.1 Women's representation on the executive board

The data set includes 469 executive managers for the year 2019. For 103 companies, the average number is 4.7 members per board. Of these executive managers, 439 are male, and 44 are female. This corresponds to an average number of 0.4 ($\triangleq$ 7.7%) female members per board. The proportion of women increased by 2.5 percentage points from 2016 to 2019. There is only one company with a balanced gender ratio of 50% in the entire period under consideration. Further, in 2019, 66 out of 103 companies ($\triangleq$ 64%), are managed exclusively by men. The maximum number of women in executive positions is two, with companies having up to ten board members. Female managers are also underrepresented about the chair position. Only in three companies ($\triangleq$ 2.9%) a female CEO represents the executive board. In ten companies ($\triangleq$ 9.7%), a woman holds the position of deputy CEO or CFO. It is also revealed that the proportion of women on the executive board is higher in DAX companies than in MDAX and SDAX companies. Accordingly, the proportion of women on the board is positively correlated with the size of the company (Pearson's $r=0.33^{***}$). The proportion of women on the boards is significantly higher in the automotive (12%), financial services (13%), telecommunications (12%) and transportation (20%) sectors and significantly lower in the basic resources (0%), construction (0%), consumer (4%), industrial (7%), media (0%), retail (5%), technology (0%) and utilities (0%) sectors.

5.1.2 Executive board remuneration

In 2019, the average received total compensation of executive managers is 2478 thousand euro, and the median is 1789 thousand euro. The average pay of female executive managers is 2303 thousand euro (median 1800 thousand euro), and that of male executive managers is 2496 thousand euro (median 1789 thousand euro). Figure 2 shows the development of female and male executive managers' compensation over the 4 years under review. The trend shows that, on average, companies pay
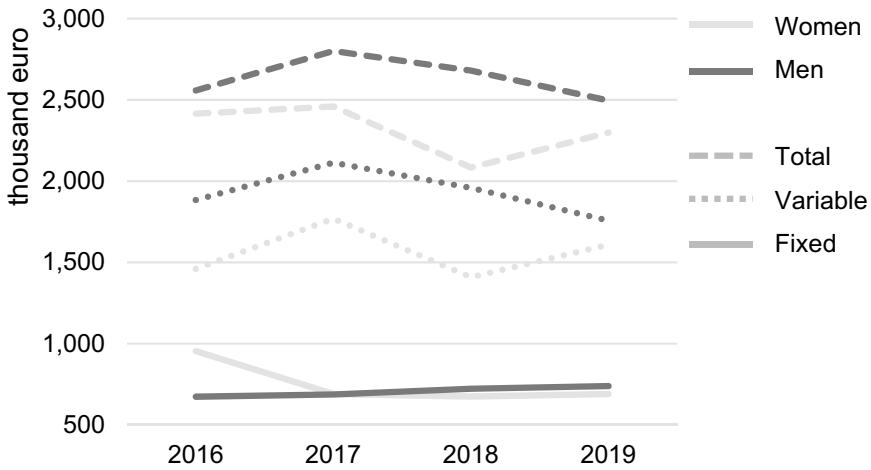
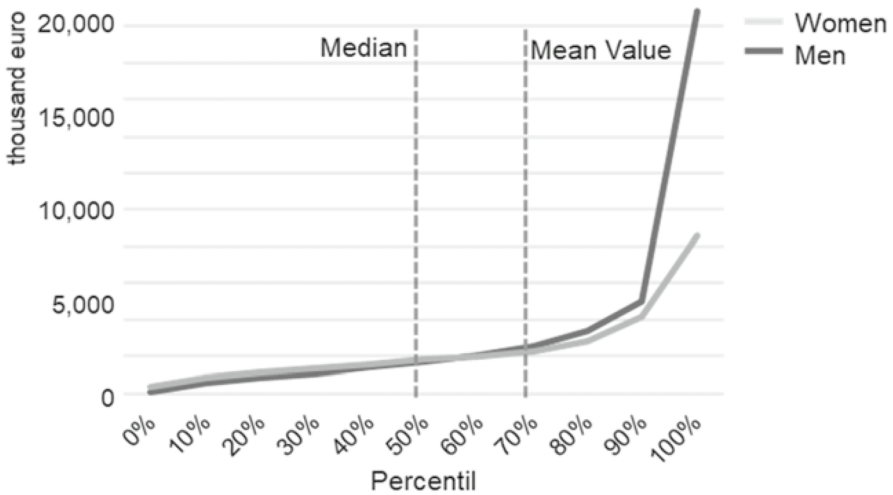**Fig. 2** Received compensation of male and female executives 2016–2019

Fig. 3 Distribution of total received compensation for male and female executives 2019

higher variable, fixed, and total remuneration to male executive managers than to female executive managers. However, the discrepancies narrowed in 2019.

Since the remuneration median is below the arithmetic mean, the distribution is skewed and high incomes shift the mean to the right. An examination of the percentiles in Fig. 3 shows that there are outliers in both genders, especially among male executive managers, regarding the level of remuneration. In terms of content, this is due to high severance payments and the remuneration of the chairperson of the executive board.
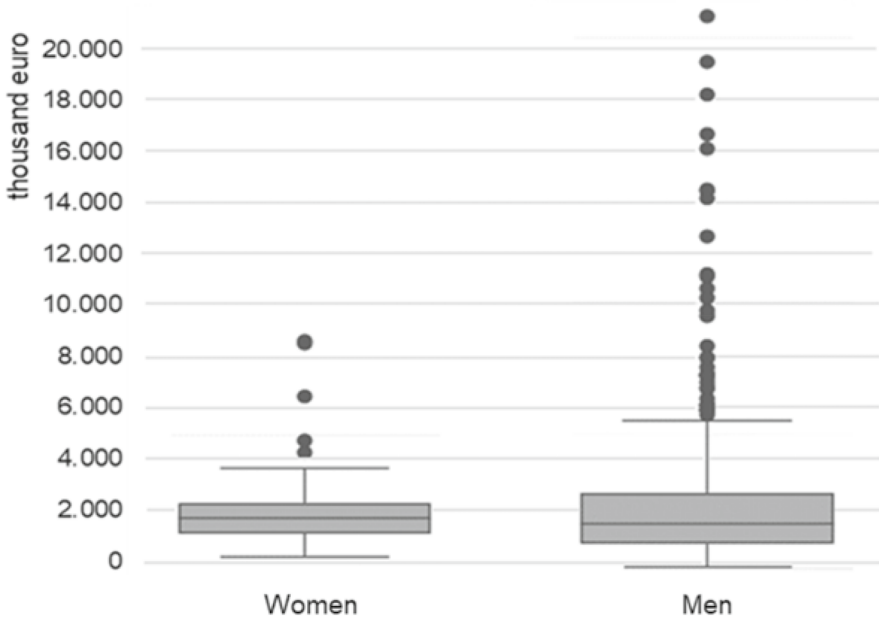
Fig. 4 Outliers of compensation for male and female executives in 2019

Figure 4 also illustrates outliers in remuneration. Some male and few female executive managers receive excessive pay. However, the midfield of board remuneration does not differ significantly for men and women.

5.1.3 Executive manager characteristics

In 2019, the executive managers are on average 53, at least 30, and at most 80 years of age. Men (Ø 53 years) are slightly older than women (Ø 51 years). On average, executive managers have been on the board for 6.4 years. Male executive managers (Ø 6.6 years) have been on the board for an average of almost two and a half years longer than female executive managers (Ø 4.3 years). Besides, men (58%) are more often recruited internally than women (34%), who often worked in another company before being appointed to the executive board.

Only 2% of board members do not have an academic degree—this is equivalent for women and men. 70% of board members have completed a university degree as their highest educational qualification. 28% additionally have a PhD. The doctorate is held more frequently by men (30%) than by women (9%). Female and male board members also differ in terms of their academic specialisations. Slightly more than half of the board members have a degree in economics (men 57%; women 51%). While 22% of female board members have a degree in natural sciences or engineering, the proportion of male board members is 36%. In contrast, women more often have a law (16%) or humanities degrees (7%) than their male colleagues (law 5%; humanities 2%).

Table 1 Descriptive statistics 2016–2019

Variable	Obs	Mean	Std. Dev	Min	Max
TotalComp	1655	2,353,818.00	2,300,081.00	− 176,000.00	21,800,000.00
ShortVComp	1655	598,340.40	611,328.70	− 398,000.00	9,979,770.00
LongVComp	1655	850,794.40	1,219,250.00	0.00	19,200,000.00
Gender	1655	0.91	0.28	0.00	1.00
NoAcademicDegree	1655	0.02	0.15	0.00	1.00
UniversityDegree	1655	0.68	0.47	0.00	1.00
DoctoralDegree	1655	0.29	0.46	0.00	1.00
Economics	1655	0.53	0.50	0.00	1.00
Law	1655	0.07	0.25	0.00	1.00
Science	1655	0.35	0.48	0.00	1.00
Humanities	1655	0.27	0.16	0.00	1.00
External	1655	0.44	0.50	0.00	1.00
Exit	1655	0.08	0.27	0.00	1.00
Tenure	1655	6.51	5.18	1.00	28.00
Age	1655	52.88	5.87	27.00	80.00
CEO	1655	0.24	0.42	0.00	1.00
CFO	1655	0.18	0.39	0.00	1.00
DAX	1655	0.37	0.48	0.00	1.00
MDAX	1655	0.33	0.47	0.00	1.00
SDAX	1655	0.29	0.46	0.00	1.00
DiversityCommittee	1655	0.18	0.18	0.00	1.00
EPS	1655	3.56	3.94	0.00	26.68
ROCE	1655	8.92	8.74	− 32.28	48.13
Size	1655	40,100,000.00	79,900,000.00	71,700.00	475,000,000.00
FreeFloat	1655	71.96	21.94	0.00	100.00
Leverage	1655	36.38	20.74	0.00	91.7

The descriptive statistics of the dependent, independent, and control variables are shown in Table 1.

5.2 Empirical statistics

The empirical results on the determinants of board compensation are presented in models 1–5 of Table 2. I explore the hypothesis that board compensation is related to the gender of the board member through several multilevel estimations, with the stepwise addition of individual and firm-specific control variables.

Table 2 Multilevel models 1–5

Dependent var	Model 1 TotalComp$_{LN}$	Model 2	Model 3	Model 4	Model 5
Intercept	14.270****(0.065)	− 71.698***(28.482)	− 72.150*****(28.397)	19.311 (27.850)	45.121* (25.273)
Year		0.043***(0.014)	0.043***(0.014)	− 0.003 (0.014)	− 0.018 (0.013)
Gender			0.210***(0.052)	0.055 (0.043)	0.059 (0.044)
UniversityDegree				0.090 (0.119)	0.058 (0.113)
DoctoralDegree				0.085 (0.120)	0.057 (0.114)
Economics				− 0.030 (0.078)	− 0.011 (0.078)
Law				− 0.080 (0.095)	− 0.075 (0.094)
Science				− 0.024 (0.076)	− 0.017 (0.077)
External				0.086***(0.036)	0.104***(0.037)
Exit				0.137 (0.086)	0.147 (0.088)
Tenure				0.032***(0.006)	0.034***(0.006)
Age				0.008***(0.003)	0.007***(0.003)
CEO				0.501***(0.041)	0.506***(0.042)
CFO				0.046 (0.042)	0.040 (0.042)
DAX					0.299* (0.182)
MDAX					0.156 (0.110)
DiversityCommittee					− 0.095 (0.129)
EPS					0.013***(0.005)
ROCE					− 0.001 (0.003)
Size$_{LN}$					0.245***(0.052)
FreeFloat					− 0.000 (0.002)
Leverage					− 0.003 (0.003)
Industry				Yes	Yes
Wald chi^2		9.120***	26.410***	694.560***	1392.46***

Table 2 (continued)

Dependent var	Model 1 TotalComp$_{LN}$	Model 2	Model 3	Model 4	Model 5
Random-effects parameters					
$\sigma^2_{Company}$	0.384	0.381	0.387	0.337	0.120
$\sigma^2_{Boardmember}$	0.187	0.200	0.195	0.067	0.067
$\sigma^2_{Resiudal}$	0.185	0.179	0.179	0.176	0.179
ICC					
$\rho_{Company}$	0.507	0.501	0.508	0.578	0.328
$\rho_{Boardmember \mid Company}$	0.755	0.764	0.764	0.692	0.511
No. of groups					
Company	104	104	104	104	104
Boardmember	585[a]	585	585	585	585

[a]The number of female board members in the database is 57, corresponding to 10% (2016–2019)

5.2.1 Intercept-only model

First, I estimate the intercept-only model, which contains only the dependent variable (*TotalComp$_{LN}$*) and the intercept. The model is applied to check the necessity and appropriateness of a multilevel estimation. The result shows that the overall mean (Y_{000}) of expected annual log executive remuneration is 14.27 (Table 2: model 1). The level 3 ICC is 51% ($\rho_{Company} = 0.51$) and the level 2 ICC is determined with 75% ($\rho_{Boardmember\ I\ Company} = 0.75$). Therefore, the correlation between annual compensation for the same company is 51%, and the correlation between annual compensation is 75% for the same board member of one company. Thus, the annual compensation is less correlated between companies, they are more correlated in terms of compensation for the same board member of a company.

The likelihood ratio test presents significant results indicating that annual compensation differences between executive managers and between companies are significant ($p \leq 0.000$). Based on the results of the intercept-only model, a multilevel model seems appropriate for this analysis (Hair and Fávero 2019).

5.2.2 Linear trend model with random intercepts

5.2.2.1 Level 1 The following model builds on the intercept-only model and is supplemented by the control variable *Year*. The estimation confirms that the temporal influence on board remuneration is significant and determines an annual increase in income of about 4% [$= 100 \times (e^{0.043} - 1)$ %] per year to be expected (Table 2: model 2). The likelihood ratio test result is again significant ($p \leq 0.000$), which means that the multilevel model can be applied.[4]

5.2.2.2 Level 2 The independent variable *Gender* extends the following model. The estimation shows on the one hand that the remuneration of the executive managers follows a linear trend over the years of observation, and on the other hand that the gender of the executive board members is significantly and positively related to their remuneration (Table 2: model 3). This gives evidence that male executive managers—without controlling for individual and firm-specific characteristics—receive about 23% [$= 100 \times (e^{0.210} - 1)$ %] higher remuneration than female executive managers.

Furthermore, individual control variables are added to the model. The results indicate that the correlation between remuneration and gender is not significant (Table 2: model 4). Differences in compensation are correspondingly due to other individual factors: *External*, *Tenure*, *Age,* and *CEO* are positively and significantly related to the dependent variable *TotalComp$_{LN}$*. This indicates that the level of experience and the position on the board determine the remuneration. According to the positive coefficients of these control variables, the compensation of externally appointed executive managers is 9% [$= 100 \times (e^{0.086} - 1)$ %] higher than internally appointed executive managers' compensation. For each year of membership

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[4] The linear trend model with random intercepts and slopes is not estimated because the likelihood ratio test does not show any significant results for it.

and age, compensation increases by 3% [$= 100 \times (e^{0.032} - 1)$ %] and 1% [$= 100 \times (e^{0.008} - 1)$ %] respectively. The position CEO has the greatest influence, resulting in 65% [$= 100 \times (e^{0.501} - 1)$ %] higher remuneration compared to a regular member. In contrast, there is no longer a statistically verifiable influence for the variable *Year*, nor for the other control variables. None of the control variables that capture the educational level of the managers is significant. This result is in line with Acero and Alcalde (2020), who cannot find a statistical relationship between executive pay and the educational qualification of the board members. In light of these results, it can be concluded that educational qualifications no longer matter at this level of management (Perryman et al. 2016).

5.2.2.3 Level 3 In the final analysis, firm-specific control variables are added to the model. The results strengthen that gender is not significantly associated with executive pay (Table 2: model 5). Thus, the hypothesis that there is a connection between the gender of a board member and his or her remuneration must be rejected. The individual-level variables (*External*, *Tenure*, *Age*, *and CEO*) are again positively associated with total compensation. Regarding the firm-specific characteristics, the coefficients of the variables *DAX*, *EPS,* and *Size$_{LN}$* are significant. According to the significant coefficients of these control variables, executive managers of a company listed in the DAX receive about 35% [$= 100 \times (e^{0.299} - 1)$ %] higher compensation than executive managers in SDAX-companies. Compensation also increases by 1% [$= 100 \times (e^{0.257} - 1)$ %] when earnings per share increases by one unit and by 0.2% ($= 0.244$) when total assets increase by 1%. This is in line with previous research findings that postulate a positive relationship between company size and executive compensation (e.g., Marchetti and Stefanelli 2009; Andreas et al. 2012; Bugeja et al. 2016). Furthermore, the results show that companies in the sector basic resources pay significantly lower remuneration compared to the reference category (utilities), while companies in the automobile, construction and industrial sectors pay significantly higher remuneration to their board members (not tabulated).

5.3 Robustness check

To check the robustness of the findings, I first vary the dependent variable. I replace the natural logarithm of total received board compensation (*TotalComp$_{LN}$*) with the short-term (*ShortVComp$_{LN}$*) and long-term (*LongVComp$_{LN}$*) variable board compensation granted. The results also identify a non-significant relationship between variable compensation and the gender of a board member (Table 3: model 6–7). The independent variables *Exit*, *CEO*, *Size$_{LN}$* and *FreeFloat* are significantly and positively (negatively for *Exit*) related to the dependent variable *ShortVComp$_{LN}$*. Regarding long-term compensation, the independent variables *Exit*, *Tenure*, *CEO*, *Size$_{LN}$* and *FreeFloat* are positively and significantly correlated with *LongVComp$_{LN}$*. The results are thus predominantly in line to the aforementioned findings.

In the following, I vary the control variables. Therefore, I replace the variables *Tenure* with the dummy variable *TenureDummy* that indicates whether the executive manager serves at the board for more than five years and thus more than average

Table 3 Robustness check multilevel models 6–7

Dependent var	Model 6 ShortVComp$_{LN}$	Model 7 LongVComp$_{LN}$
Intercept	79.926 (103.99)	505.432)*** (212.10)
Year	− 0.039 (0.052)	− 0.251** (0.106)
Gender	0.115 (0.151)	− 0.007 (0.222)
UniversityDegree	− 0.852 (0.371)	0.430 (0.386)
DoctoralDegree	− 0.457 (0.411)	0.088 (0.417)
Economics	0.229 (0.326)	− 0.342 (0.300)
Law	0.021 (0.489)	− 0.283 (0.431)
Science	0.003 (0.315)	− 0.183 (0.312)
External	0.081 (0.139)	− 0.018 (0.163)
Exit	− 1.207*** (0.488)	− 1.868*** (0.498)
Tenure	− 0.001 (0.029)	0.072** (0.032)
Age	0.017 (0.018)	− 0.008 (0.013)
CEO	0.394*** (0.116)	0.460*** (0.181)
CFO	0.088 (0.114)	0.197 (0.224)
DAX	− 0.103 (0.977)	1.258 (1.259)
MDAX	− 0.617 (0.533)	0.630 (0.714)
DiversityCommittee	0.682 (0.575)	− 0.382 (0.922)
EPS	− 0.000 (0.022)	− 0.018 (0.025)
ROCE	− 0.022 (0.016)	0.004 (0.026)
Size$_{LN}$	0.628*** (0.262)	0.576* (0.334)
FreeFloat	0.017** (0.009)	0.032** (0.016)
Leverage	− 0.004 (0.010)	− 0.008 (0.016)
Industry	Yes	Yes
Wald chi^2	249.700***	227.690***
Random-effects parameters		
$\sigma^2_{Company}$	6.020	7.015
$\sigma^2_{Boardmember}$	0.906	0.056
$\sigma^2_{Resiudal}$	2.350	6.555
ICC		
$\rho_{Company}$	0.649	0.515
$\rho_{Boardmember \, I \, Company}$	0.747	0.519
No. of groups		
Company	104	104
Boardmember	585	585

time. I also replace the variable *DiversityCommittee* with the variable *DiversityS-Board* that captures the proportion of women on the supervisory board, the variable *EPS* with the variable *TotalReturn*, which measures total return. Finally, I substitute the variable *ROCE* with the variable *EBIT* that captures Earnings before Interests and Taxes. Using these control variables, I estimate the relationship with

Table 4 Robustness check multilevel models 8–10

Dependent var	Model 8 TotalComp$_{LN}$	Model 9 ShortVComp$_{LN}$	Model 10 LongVComp$_{LN}$
Intercept	31.712 (28.659)	53.535 (104.666)	616.411*** (218.265)
Year	− 0.011 (0.014)	− 0.026 (0.053)	− 0.306*** (0.109)
Gender	0.070* (0.043)	0.094 (0.147)	− 0.005 (0.222)
UniversityDegree	− 0.020 (0.108)	− 0.605 (0.385)	0.306 (0.359)
DoctoralDegree	− 0.020 (0.109)	− 0.486 (0.434)	− 0.015 (0.410)
Economics	0.017 (0.080)	0.249 (0.335)	− 0.308 (0.286)
Law	− 0.051 (0.093)	0.053 (0.494)	− 0.273 (0.433)
Science	0.013 (0.082)	0.027 (0.325)	− 0.156 (0.308)
External	0.072)** (0.035)	0.105 (0.166)	− 0.101 (0.177)
Exit	0.157)* (0.086)	− 1.229)*** (0.509)	− 1.827*** (0.487)
TenureDummy	0.274)*** (0.038)	0.241)** (0.127)	0.462** (0.219)
Age	0.009)*** (0.003)	0.009 (0.032)	0.002 (0.013)
CEO	0.556)*** (0.033)	0.351)** (0.155)	0.568*** (0.186)
CFO	0.049 (0.039)	0.067 (0.112)	0.215 (0.232)
DAX	0.252 (0.189)	− 0.083 (0.967)	0.233 (0.199)
MDAX	0.134 (0.113)	− 0.559 (0.519)	0.459 (0.711)
DiversitySBoard	− 0.240 (0.297)	0.291 (0.670)	1.562 (0.693)
TotalReturn	− 0.001)*** (0.001)	− 0.007)*** (0.002)	− 0.001 (0.004)
EBIT	0.000)** (0.000)	0.000 (0.000)	− 0.000* (0.000)
Size$_{LN}$	0.231)*** (0.056)	0.597*** (0.245)	0.620* (0.339)
FreeFloat	− 0.000 (0.002)	0.018** (0.008)	0.033** (0.015)
Leverage	− 0.004 (0.003)	− 0.001 (0.007)	− 0.012 (0.016)
Industry	Yes	Yes	Yes
Wald chi^2	1,524.030***	292,470***	231.450***
Random-effects parameters			
σ$^2_{Company}$	1.131	6.005	6.834
σ$^2_{Boardmember}$	0.055	0.902	0.172
σ$^2_{Resiudal}$	0.184	2.348	6.487
ICC			
ρ$_{Company}$	0.354	0.649	0.506
ρ$_{Boardmember\ I\ Company}$	0.502	0.746	0.519
No. of groups			
Company	104	104	104
Boardmember	585	585	585

TotalComp$_{LN}$, *ShortVComp$_{LN}$* and *LongVComp$_{LN}$*. Regarding the relationship with total board compensation, there is a weakly significant and positive correlation between *Gender* and *TotalComp$_{LN}$* (Table 4: model 8). This indicates that the compensation of male members of the TMT is 7% higher (p = 0.098). However, this finding cannot be confirmed with regard to the variable compensation granted

(Table 4: model 9–10). Furthermore, the coefficients of the variables *External*, *Exit*, *TenureDummy*, *Age*, *CEO*, *TotalReturn* (negative)*, EBIT*, and *Size$_{LN}$* are significant and positive associated to *TotalComp$_{LN}$*. *Tenure*, *CEO*, Size and *FreeFloat* are positively and significantly related to both variables of performance-related compensation. Leaving the executive board has a negative impact on these. In addition, the β-coefficients of the variables *TotalReturn* regarding short-term compensation and *EBIT* regarding long-term compensation are negative and significant. In summary, the length of service on the executive board, the position of the CEO and the size of the company have a positive effect on compensation. In contrast, the academic background, the position of the CFO and the degree of diversity on the supervisory board or compensation committee have no influence on remuneration.

In a third step, I use the basic model, apply the three forms of compensation and run a linear panel regression with firm fixed effects (Beck et al. 2020). To avoid distortions due to heteroscedasticity, all regression analyses are estimated with robust standard errors. Once again, all three analyses (not tabulated) show that there is no statistically significant relationship between gender and board compensation (*TotalComp$_{LN}$*: $p = 0.873$; *ShortVComp$_{LN}$*: $p = 0.285$; *LongVComp$_{LN}$*: $p = 0.326$). Likewise, the hypothesis cannot be confirmed that gender and compensation are empirically related.

6 Discussion of the results

Based on the multilevel estimation results, it cannot be confirmed that there is a significant association between gender and board compensation. Initially, the descriptive statistics and the empirical estimation of model 3, which do not contain any individual and company-specific control variables, suggest a relationship between the gender of executive managers and their compensation. Model 3, which consists of only the independent variable *Gender*, reveals a difference in pay of female and male executive managers of 23%. However, the association between gender and executive pay is annihilated, with the addition of individual and firm-specific characteristics in models 4 and 5. These findings are confirmed by several robustness tests. Thus, the results are consistent with Bugeja et al. (2012) and Alcalde and Acero (2020). Nevertheless, the predominant research findings demonstrating an adjusted gender pay gap are not supported in the present context of the dualistic corporate governance system (Bell 2005; Elkinawy and Stater 2011; Perryman et al. 2016; Maume et al. 2019; Beck et al. 2020). Some of these studies postulate that if there is a higher representation of female executive managers, the pay gap will decline (Bell 2005; Elkinawy and Stater 2011; Perryman et al. 2016). Compared with the proportion of women in these prior studies ($\approx 5\%$), the present dataset shows a higher representation of women on executive boards ($\approx 10\%$ in 2016–2019). Thus, the divergent results can be partly explained by the slightly higher representation of female executive managers in the present study. Country-specific differences and the divergent framework conditions of the monistic and dualistic board systems could be another reason for the diverging results. In Germany, the compensation of board members is determined by the supervisory boards. These are represented by a

significantly higher proportion of women.[5] If unexplained pay differences are due to acceptance problems, the more women have a say in pay setting, the smaller the pay gap. The proportion of women on the supervisory board could have a moderating effect on the relationship between gender and executive board compensation. This hypothesis should be the subject of future research projects.

Furthermore, executive managers' individual characteristics influence their compensation. This includes above all the chairman's position, which is associated with around 65% higher payment than regular board members. In 2019, female executive managers have a probability of 7% and male executive managers a probability of 25% holding the chairman's position. In contrast, 66% of female members served on the executive board of another company prior to their appointment in 2019, while only 42% of male board members were externally appointed. This characteristic, in turn, increase compensation by about 10%. Furthermore, executive compensation increases by about 3% per year in tenure. Since women serve on the executive board for an average of almost two and a half years shorter than men, this is another driver of compensation that is indirectly attributable to the gender of the board member (Bertrand and Hallock 2001; Bell 2005). The results thus show that gender does not have a direct influence on executive board compensation. However, several factors can be identified that directly influence compensation and how female and male executive managers differ.

7 Conclusion and future perspectives

This paper provides a more in-depth sight into the compensation of German listed companies' executive managers as well as female executive managers' representation. The examined dataset presents that the proportion of women on executive boards has increased in recent years (2016–2019). However, it remains at a low level of 8% in 2019. Particularly regarding the position of the chairman of the board, which is rarely occupied by women, there is a need for further development. For the acceptance of female board members, I examined—based on human capital theory as well as agency theory and using multilevel estimates—executive board compensation for gender-specific differences. Considering the theoretical approaches and empirical evidence, no unexplained gender pay gap manifested itself. Instead, other factors were uncovered that explain the (adjusted) pay gap between men and women. Executive managers exhibit individual and company-specific differences, which are reflected in their compensation. This confirms that the individual level payment can be explained by the length of service and position on the executive board and at the company level by firm size. In contrast, academic degrees, for example, have no effect on remuneration (Acero and Alcalde 2020). Hence, the present results are inconsistent with previous studies that postulate an adjusted gender pay gap (Bell 2005; Elkinawy and Stater 2011; Maume et al. 2019). This may be due to the divergent research methodology and frameworks of the corporate governance systems.

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[5] The proportion of women on the supervisory board in 2019 is 32% and on the compensation committee of the supervisory board is 20%.

Likewise, the higher proportion of women on the executive board in the present study compared to other studies, which can be explained by the actuality of the dataset, may be related to the non-significant results. As well as the determination of the remuneration by the supervisory board. Against this background, it should be noted that this study is also limited by the still low proportion of women on executive boards. Thus, future research remains to investigate whether the gender pay gap will finally close with increasing female representation and whether the *glass ceiling* can be broken. In view of the introduction of the gender quota for executive boards of German listed companies in 2021, an increase in women's proportion on the TMT is to be expected. In this context, it remains to be seen for the time being whether the statutory obligation to fill vacant board positions with female members will lead to an increase in representation at the expense of the acceptance of female executive managers and whether this, in turn, will manifest itself in higher gender-specific divergences in compensation.

Appendix

See Table 5

Table 5 Sources of data collection

Variable	Definition	Source
TotalComp$_{LN}$	Logarithmised individual received total compensation (fixed remuneration, fringe benefits, variable remuneration, and pension expenses)	Annual report (remuneration tables recommended by the GCGC 2015/2017)
ShortVComp$_{LN}$	Logarithmised individual granted short-term variable compensation	Annual report (remuneration tables recommended by the GCGC 2015/2017)
LongVComp$_{LN}$	Logarithmised individual granted long-term variable compensation	Annual report (remuneration tables recommended by the GCGC 2015/2017)
Gender	Dummy variable indicating whether a board member is male ($=1$) or female ($=0$)	Biographical information from the annual report
NoAcademicDegree	Dummy variable indicating whether a board member does not have an academic degree ($=1$) or does ($=0$)	Biographical information from the annual report, company home-page or other internet sources
UniversityDegree	Dummy variable indicating whether a board member has an academic degree ($=1$) or not ($=0$)	Biographical information from the annual report, company home-page or other internet sources
DoctoralDegree	Dummy variable indicating whether a board member holds a doctorate ($=1$) or not ($=0$)	Biographical information from the annual report, company home-page or other internet sources
Economics	Dummy variable indicating whether a board member has a degree in economics ($=1$) or not ($=0$)	Biographical information from the annual report, company home-page or other internet sources

Table 5 (continued)

Variable	Definition	Source
Law	Dummy variable indicating whether a board member has a degree in law ($=1$) or not ($=0$)	Biographical information from the annual report, company home-page or other internet sources
Science	Dummy variable indicating whether a board member has a degree in science ($=1$) or not ($=0$)	Biographical information from the annual report, company home-page or other internet sources
Humanities	Dummy variable indicating whether a board member has a degree in humani-ties ($=1$) or not ($=0$)	Biographical information from the annual report, company home-page or other internet sources
External	Dummy variable indicating whether a board member was appointed to this board externally ($=1$) or internally ($=0$)	Biographical information from the annual report, company home-page or other internet sources
Exit	Dummy variable indicating whether a board member left the executive board ($=1$) or not ($=0$) in the year under review	Biographical information from the annual report, company home-page or other internet sources
Tenure	Number of years a board member has been a member of the board up to the current observation year	Own calculation, based on the entry and eventual exit date stated in the annual report
Age	Age of the board member in the current observation year	Biographical information from the annual report, company home-page or other internet sources
CEO	Dummy variable indicating whether a board member is the CEO ($=1$) or not ($=0$)	Annual report
CFO	Dummy variable indicating whether a board member is the CFO ($=1$) or not ($=0$)	Annual report
DiversityCommittee	Proportion of women on the remuneration committee of the supervisory board	Annual report
EPS	Earnings per share of the consolidated companies	Datastream
ROCE	Return on the capital employed of the consolidated companies	Datastream
$Size_{LN}$	Logarithmised total assets of the consoli-dated companies	Datastream
FreeFloat	Proportion of shares in free float	Datastream
Leverage	Degree of debt	Datastream

Declarations

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