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Three Essays on Top Management Team Compensation

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LIST OF ABBREVIATIONS

2SLS	2 Stage Least Squares
AG	Aktiengesellschaft
BaFin	Bundesanstalt für Finanzdienstleistungsaufsicht
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CHRO	Chief Human Resource Officer
CTO	Chief Technology Officer
DAX	Deutscher Aktienindex
IFRS	International Financial Reporting Standards
LN	Natural Logarithm
M&A	Merger & Acquisition
MDAX	Mid-Cap-DAX
OLS	Ordinary Least Squares
ROA	Return on Assets
S&P 500	Standard & Poor's 500
TMT	Top Management Team
US	United States
VIF	Variance Inflation Factor
VP	Vice President

1 INTRODUCTION

1.1 Motivation

Top executive compensation is a topic of compelling interest to both the public media and the world of academia. The roots of this fascination are the widely-publicized amounts and increases of the remuneration packages top executives have received in recent years. For US companies the most intensive growth in pay occurred during the 1990s when share-based remuneration became a common way to compensate managers (Hall & Murphy, 2003). The work of Hall and Murphy shows that the average total pay of an S&P firm's CEO increased from 3.5 million USD in 1992 to 14.7 million USD in 2000. In Germany, the average total compensation of a DAX CEO in 2009 was 3.8 million EUR (Friedl et al., 2010). This same study reports an annual growth rate of cash compensation of an average non-CEO Vice President (VP) from 2001 to 2007 of 10.6 %. These dramatic increases are the basis of controversial debates in the media about the appropriateness of the prevalent compensation levels. Academics are also intrigued by those phenomena and aim to understand the antecedents and consequences of top executive pay. Consequently, the amount of research on associated topics has increased significantly over the last few decades (for an overview see Gomez-Mejia & Wiseman, 1997 and Devers et al., 2007).

The persistent trend of regulations that requires transparency and reporting of executive level pay has further focused attention on the issue. While this new and detailed information has highlighted the issue in the media, improved data accessibility has also resulted in the possibility of several new streams in empirical research. One of these streams is the widening of the scope of analysis. While the large majority of past research concentrated on CEO compensation, there is a recent trend towards incorporating the entire Top Management Team (TMT) and the relationships within the team. The following four arguments demonstrate why it is essential to take the entire team into account¹ and thus, the motivation for this dissertation.

¹ A similar line of argumentation can be found in Finkelstein & Peteraf, 2007.

First, the Top Management Team is the apex of an organization (Mintzberg, 1973). The managers in this group are responsible for the firm's strategy and its performance. Previous research has shown that decision-making at the top of the organization does not occur by a single individual, but is a process that involves the members of the Top Management Team (for instance, Roberto, 2003). In support of this Thompson, 1967, (p. 143) states: "Although the pyramid headed by an all-powerful individual has been a symbol of organizations, such omnipotence is possible only in simple situations where perfected technologies and bland task environments make computational decision processes feasible. Where technology is incomplete or the task environment heterogeneous, the judgmental decision strategy is required and control is vested in a dominant coalition". Second, the members of the TMT are individuals with different preferences and goals. The goals derived from the divisional or functional responsibilities of one team member are often not in line with the goals of his or her colleagues (Cyert & March, 1963). Therefore, decision-making is significantly affected by the composition and the characteristics of the team. Third, the TMT is confronted with making many decisions under conditions of uncertainty that requires the input of the different experts within the team. Coordination and collaboration within the team is a crucial aspect of the firm's strategy and its performance (Henderson & Fredrickson, 2001). Therefore, the interactions of the team, such as social comparison, are assumed to have a significant impact on the organizational outcomes. Support for the first three arguments is demonstrated in the fourth: previous research has found evidence that analyzing TMTs – instead of studying CEOs exclusively – is a better predictor of organizational outcomes. For instance, Bertrand & Schoar, 2003 found that the investment, financial and organizational practices of a firm can be explained to a large degree by the attributes of C-level managers beyond the CEO.

Armed with this understanding of the importance of the TMT, it becomes obvious that exclusively studying CEO's pay ignores several mechanisms that might help to understand the overarching research questions: what is the logic behind top executive pay, and how does top executive pay impact organizational outcomes? Thus, I follow the argument of Finkelstein & Hambrick & Cannella, 2009 (p. 123) who state that, "... we believe there is substantial evidence [...] that scholarly attention to TMTs has been and will be fruitful" and conclude that the research on TMT's pay is a promising path in future research. This research hopes to

reveal the underlying factors surrounding the complex and confusing issue of top executive pay.

1.2 Research overview and positioning of this dissertation

According to Gomez-Mejia, 1994 executive compensation is the variable that has received the most attention in empirical research in the social sciences. Fostered by higher levels of transparency this trend has continued to this day. This is illustrated in several noteworthy overviews that present and discuss the major findings on top executive compensation. Gomez-Mejia & Wiseman, 1997 summarize the existing research on executive compensation until the mid-1990s and identified promising directions for future research. By analyzing the years from 1997 to present Devers et al., 2007 follow the work of Gomez-Mejia & Wiseman, 1997. In the noteworthy work of Finkelstein & Hambrick & Cannella, 2009 the authors dedicate one chapter to “The Determinants of Executive Compensation” (chapter 10) and one to “Executive Compensation: Consequences and Distributions” (chapter 11).

Both overarching research questions, the questions of “What is the logic behind top executive pay?” and “What are the consequences of top executive pay?” can be analyzed through a variety of theoretical lenses. As a result, the disciplines of management, psychology, finance, economics, and accounting are all contributors to investigating the remuneration packages of the apex of the organization (Devers et al., 2007).²

In order to gain a better overview and reduce complexity Table 1 classifies the research on executive compensation along the dimensions *unit of analysis*, *object of research*, and *direction of causality*.³

² Devers et al., 2007 reports which discipline have which proportion of the overall top executive compensation research. They show that 44% are from management journals, 34% from finance journals, 12% are from accounting journals, and the remaining studies come from the fields of economics, psychology or other journals. It is noteworthy that these proportions are calculated based on the sample of the 99 investigated papers and thus, the values should rather be interpreted as a brief approximation, rather than as representative numbers.

³ The concept of structuring the literature about executive compensation along these lines is partly based on the framework of Finkelstein & Hambrick & Cannella, 2009.

Figure 1: Classification of Research on Top Executive Compensation

Unit of analysis	Object of Research		Direction of Causality	
	Level of Pay	Structure of Pay	Antecedents	Consequences
<p><i>Unrelated</i> individual or group</p> <p>Examples:</p> <ul style="list-style-type: none"> - CEO - CFO - Entire TMT 	<ul style="list-style-type: none"> • Total Compensation • Cash Compensation • Share-based Compensation 	<ul style="list-style-type: none"> • Fixed vs. Variable Pay • Cash vs. share-based Pay • Design of the bonus systems • Shares vs. Options • Relative Performance Evaluation 	<ul style="list-style-type: none"> • Performance, Complexity, Risk, Managerial discretion, Managerial Labor Market, Stewardship Theory • Social comparison, Isomorphic Pressure, Compensation consultants • Ownership Power, Structural Power, Tenure Power, Network Power, Credibility Power 	<ul style="list-style-type: none"> • Performance • Dividend Payments • Share Repurchases • Managerial Retention • Riskiness of Investments • M&A Actions • Earnings Management • Turnover
<p><i>Relations</i> between individuals or the group</p> <p>Examples:</p> <ul style="list-style-type: none"> - relation between CEO and TMT - relations between the non-CEO VPs 	<ul style="list-style-type: none"> • Pay Spread between CEO and TMT • Pay Dispersion within the TMT 		<ul style="list-style-type: none"> • Tournament Incentives • Social Comparison • Equity Theory 	<ul style="list-style-type: none"> • Performance • Turnover • Riskiness of Investments

The dimension *unit of analysis* divides the existing literature into streams. The first stream focuses on the investigation of individuals of the TMT or the entire team. In those studies the individual herself / himself is the point of interest. The second stream focuses on the relation between individuals. In combination with the second dimension – the *object of interest* with respect to executive compensation – this distinction becomes more comprehensible. While the unrelated / individual unit of analysis focuses on the level or the structure of an executive (such as the total level of CEO's compensation), the second stream centers on the differences / relationships within the team (such as the total pay spread between the CEO and the remaining officers). Commonly analyzed measures for the level of pay are the CEO total compensation (Murphy, 1985; Buck et al., 2003), the CEO cash compensation (Coughlan & Schmidt, 1985; Murphy, 1999), the share-based compensation (Sanders & Tuschke, 2007) and the resulting ownership (Morck & Shleifer & Vishny, 1988).

Another vast stream of research focuses on the structure and design of the remuneration packages. Several studies have investigated the pay mix (Carpenter & Sanders, 2002) and the proportion of long-term (Gerhart & Milkovich, 1990) or share-based incentives (Mehran, 1995; Frye, 2004). Additionally, the design of single remuneration components has been analyzed intensively. For instance, the different alternatives for designing bonus payments and the resulting consequences are analyzed theoretically (Reichelstein, 1997; Friedl, 2005; for an overview see Pfeiffer & Velthuis, 2009) as well as empirically (Wallace, 1997; Balachandran, 2006). Share-based compensation, its design, and the associated consequences are further topics that have received special attention (Feltham & Wu, 2001; Dittmann & Maug, 2007; Fahlenbrach & Stulz, 2011; for an overview see Arnold & Gillenkirch, 2007). In this area, the research on relative performance evaluation is noteworthy. Following the basic agency theory and the idea that top executives should be compensated based on their own performance, rather than on market movements, several researchers have analyzed the prevalence and the consequences of relative performance evaluation (Antle & Smith, 1986; Gibbons & Murphy, 1990; Hall & Liebman, 1998). An interesting discussion that argues against the indexation of TMT compensation is provided in Maug & Albrecht, 2011. Based on empirical and theoretical literature (Gopalan & Milbourn & Song, 2010; Aggarwal & Samwick, 1999; Maug, 2000) they argue that indexed contracts are not effective, irrelevant or even disadvantageous from the firm's perspective.

Two major topics of research for authors who focus on the relationships between TMT members are pay differentials and pay dispersion. Pay differentials, as the spreads between the CEO and the remaining TMT, have been the subject of several studies from different disciplines (for instance, Lazear & Rosen, 1981; Bognanno, 2001; Main & O'Reilly III & Wade, 1993). Pay dispersion is defined as the allocation of pay within the same hierarchy level. In the context of TMT research, pay dispersion measures the distribution of pay among the non-CEO VPs (for instance, Siegel & Hambrick, 2005; Shaw & Gupta & Delery, 2002).

Direction of causality clarifies whether executive compensation is the dependent or the independent variable. This is a crucial dimension that structures the existing research that probe two overarching research questions:

- What are the antecedents of top executive pay?
- What are the consequences of top executive pay?

The majority of research in this field has tried to identify the determinants of pay, while, although there has been an increased interest in recent years, the questions concerning the consequences of pay have been less investigated. In the various social science disciplines different antecedents of pay have been identified. Among the economic explanations⁴ the most investigated determinant is performance. Based on agency theory rationales (Berle & Means, 1932; Jensen & Meckling, 1976) the sensitive relationship between pay and performance – a measure that should capture the agency cost reduction – has been highlighted in several studies (Murphy, 1985; Coughlan & Schmidt, 1985; Lippert & Moore, 1994; Hall & Liebman, 1998; Murphy, 1999; Buck et al., 2003). In addition to this extensive stream of literature other economic antecedents of pay that have been analyzed are complexity (Rose & Shepard, 1997; Fatemi & Desai & Katz, 2003), risk (Bloom & Milkovich, 1998); Prendergast, 2002), managerial discretion (Hambrick & Finkelstein, 1987; Finkelstein & Boyd, 1998), managerial labor market (Fama, 1980; Murphy & Zábajník, 2004), and the stewardship theory (Donaldson & Davis, 1991; Kidder & Buchholtz, 2002).

⁴ Finkelstein & Hambrick & Cannella, 2009 use the “theoretical perspective” as a further dimension to structure the top executive compensation research. They divide the existing research into three sections: Economic, Socio-Psychological, and Political.

Based on socio-psychological theories several predictors of top executive compensation have been developed. In the vein of the fundamental work of Festinger, 1954, those in charge of the compensation design, namely the compensation committee, incorporate comparisons to similar executives (O'Reilly III & Main & Crystal, 1988) when determining remuneration packages. Based on similar underlying rationales, the idea that isomorphic pressure is typically in line with "pay norms" is supported in several empirical studies (Rajagopalan & Prescott, 1990). Compensation consultants are supposed to encourage this process as this association has been demonstrated in previous work (for instance, (Baker & Jensen & Murphy, 1988; Bebchuk & Fried, 2003; Conyon & Peck & Sadler, 2006).

Through a political lens, power plays an important role in explaining top executive compensation. There is a plurality of different powers⁵ that has been shown to significantly impact the level and structure of executive compensation. Executive ownership (Toyne & Millar & Dixon, 2000) as well as the existence of large shareholders (Shleifer & Vishny, 1986) are drivers for the design of the remuneration contracts. In addition to those types of ownership power, the impact of structural power such as the independence of directors (Conyon & Peck, 1998), CEO duality (Brickley & Coles & Jarrell, 1997), the composition of the compensation committee (Bebchuk & Fried, 2004, and board size (Yermack, 1997) have been examined. Additionally, tenure (for instance, Westphal & Zajac, 1994) is often analyzed as a source of power. Finally, two other sources of power are investigated as predictors of pay. Network power describes the power an executive or a director has that is based on different interlocks. Credibility power such as celebrity status is another source that has been proven to influence compensation (Tosi et al., 2004).

The underlying assertion from the literature stream that focuses on the interactions among the TMT members is that single compensation contracts are not assigned in a vacuum. Those in charge of designing managerial pay are aware of the fact that the top executives tend to compare their pay with their peers (horizontal comparison) as well as with other levels of the hierarchal ladder (vertical comparison). Based on the basic model of tournament theory (Lazear & Rosen, 1981) and its further developments (for instance, Lazear, 1989) different

⁵ For a more detailed overview, see Hengartner, (2006) who developed a comprehensive framework of executive power and compensation. Additionally, Bebchuk & Fried, 2004 provide a bright overview of the different types of power.

predictions for the pay spreads between the TMT members have been tested empirically (O'Reilly III & Main & Crystal, 1988; Kale & Reis & Venkateswaran, 2009). Additionally, the allocation patterns within the team can be analyzed from a socio-psychological view. Relevant studies have tested whether explanations from social comparison and equity theory are prevalent (for instance, Henderson & Fredrickson, 2001).

Turning to the other side of the *direction of causality*, research has concentrated on the crucial question of how executive compensation affects managerial decisions and organizational outcomes. In addition to the most heavily investigated – and probably most interesting – question about the impact of pay on firm performance (for instance, Mehran, 1995; Core & Guay & Larcker, 2003) several other effects of executive pay have been analyzed. Empirical researchers have analyzed the impact of pay packages on dividend payments (Lewellen & Loderer & Martin, 1987), share repurchases (Fenn & Liang, 2001), manager's retention (Fee & Hadlock, 2003), the riskiness of investments (Rajgopal & Shevlin, 2002), M&A decisions (Bliss & Rosen, 2001), earnings management (Peng & Röell, 2004), and more.

Similar to the determinants, the consequences of the differences between the TMT members' pay can be rationalized through socio-psychological theory. In this stream of empirical literature, again, firm performance is the most commonly analyzed variable (for instance, Bebchuk & Cremers & Peyer, 2011). Other consequences that have been investigated are turnover (Pfeffer & Davis-Blake, 1992) and risk-taking behavior (Devers et al., 2006).

The structured overview of research on Top Executive Compensation developed in this chapter is used by the following paragraph to classify the three essays of this dissertation in the wide range of compensation literature.⁶ Table 2 illustrates the positioning of each essay along the discussed dimensions. All essays concentrate on the relationships between the TMT members as a *unit of analysis*.

⁶ The motivation for each essay and the illustration of the associated literature gap is provided in particular essays.

The *object of research* in the first essay is the CEO pay spread – the difference between CEO’s pay and the average pay of the remaining team members (total, fixed, variable and stock-based compensation). The aim of this work is to gain a deeper understanding of how those in charge of compensation design incorporate the inner workings of the team by framing the remuneration contracts. Tournament theory builds the theoretical foundation of this paper. By comparing the basic and further developed models we construct/develop competing hypotheses to contribute to the literature that investigates the antecedents (*direction of causality*) of TMT pay.

The second essay focuses on the effectiveness of different monetary incentive sources. This paper reveals insights into how TMT Alignment, TMT Total Pay, Pay Differentials and Pay Dispersion (*object of research*) influence firm performance (*direction of causality*).

The third essay sheds light on the role of the CFO within the team. The *object of research* is the CFO Pay Spread, defined as pay difference between the CFO and the remaining team. This work addresses both potential sides of the *direction of causality*. First, it identifies the determinants of the superior role and position of the CFO within the team. Second, the impact of the CFO’s role on firm performance is investigated.

Figure 2: Positioning of the essays of this dissertation

Unit of analysis	Object of Research		Direction of Causality	
	Level of Pay	Structure of Pay	Antecedents	Consequences
<p><i>Unrelated</i> individual or group</p> <p>Examples:</p> <ul style="list-style-type: none"> - CEO - CFO - Entire TMT 	<p>Essay II: TMT Alignment TMT Total Pay</p>		<p>Essay II: firm performance</p>	
<p><i>Relations</i> between individuals or group</p> <p>Examples:</p> <ul style="list-style-type: none"> - relation between CEO and TMT - relations between the non-CEO VPs 	<p>Essay I: CEO pay spread (total, fixed, variable, and stock-based compensation)</p>	<p>Essay I: Tournament Incentives</p>	<p>Essay II: firm performance</p>	<p>Essay II: firm performance</p>
	<p>Essay III: CFO pay spread (total compensation)</p>		<p>Essay III: firm, team, and governance characteristics</p>	<p>Essay III: firm performance</p>

1.3 Structure, key findings, and contribution

This dissertation consists of three essays. Each essay is presented in one chapter (chapter 2 – chapter 4). As each of these works represents a scholarly contribution on its own, the individual essays are treated as independent studies with their own introductions, literature reviews, and methodology sections.

Essay I (chapter 2) examines the impact of firm complexity on pay differentials. The theoretical underpinning of this work is tournament theory, particularly its research evolution. The basic model argues that complexity results in monitoring difficulties. Those are diminished by tournament incentives. Thus, a positive relationship between complexity and the CEO pay spread is predicted. Integrating behavioral consequences, such as inhibited teamwork or sabotage that can accompany tournament incentives, model extensions posit that there is a negative relationship between complexity and pay differentials. Past research has argued that collaboration becomes more important with increasing complexity and therefore, those in charge of compensation design will establish more egalitarian compensation structures to foster cohesiveness. The existing literature gap of a study that incorporates both perspectives in one analysis is addressed in this essay. Competing hypotheses are developed using the basic economic model of Lazear & Rosen, 1981 for the one side and the further developments that have incorporated behavioral aspects (for instance, Lazear, 1989) for the other side. Contrary to initial intuition, the results support the basic model that omits behavioral aspects. The essay in this dissertation contributes to the literature as, to my knowledge, it is one of the first studies that examines the association between complexity and pay differentials.⁷ The analysis sheds light on the rationales of those in charge of designing the TMT compensation and presents valuable insights that help to solve the confusing remuneration puzzle. Furthermore, this study gives insights in the German practices of TMT compensation design as the analyses are accomplished with German data.

Essay II (chapter 3) analyzes the effectiveness of different managerial pay incentive sources on firm performance. Focusing on alignment incentives, incentives through pay differentials, incentives due to pay dispersion, and incentives through the level of TMT

⁷ A noteworthy exception is the work Henderson & Fredrickson, 2001 that makes similar analyzes based on a different theoretical foundation and focused on coordination needs.

compensation, the impact of those compensation patterns on performance is tested. The results show that alignment and the level of compensation are positively related to firm performance, and that pay dispersion is negatively associated with performance. This study contributes to existing literature as, to my knowledge, it is the first study that analyzes these different incentive sources simultaneously. This holistic approach shows differing results from previous studies that neglect to incorporate the interactions between the incentive sources. Thus, the study reveals valuable insight into form of executive pay motivates managers. In addition to academic relevance, the results from this work suggest interesting implications for practitioners, as for instance the positive effect of alignment incentives on performance or the negative relation between pay dispersion and performance. Again, caused by the usage of German data this study reveals special insights of the German compensation practices as well as the attitude of the management teams of German companies. This contribution is noteworthy as analyses that investigate the impact of pay on performance with state-of-the-art methods for German data are rare.

Essay III (chapter 4) focuses on the role of the CFO within the TMT. In particular, the work investigates the antecedents and consequences of the CFO pay spread, measured as the difference between the CFO pay and that of the remaining team members. Potential determinants of this measure are classified by firm, team, and governance characteristics. The results show that CFOs are awarded with a superior compensation when firm characteristics require a high-ability CFO, when a powerful CEO is in place, and when a hierarchical-dominated pay culture exists. Furthermore, the results show performance implications of the CFO pay spread under certain conditions. In a highly-levered firm the privileged role of the CFO – in terms of a higher compensation compared to the remaining team – is positively correlated to firm performance; a negative relationship is revealed when the firm has high investment levels and acts in a volatile environment. This essay contributes to current literature as – to my knowledge – this is the first study that examines the relative importance of the CFO within the TMT. The study reveals further insights into the rationales behind the compensation packages of the team. Additionally, the results show performance implications – especially under certain conditions – of the CFO's position within the team. To reiterate, in addition to the academic contribution of this research, the practical implications for compensation designers are substantial. Chapter 5 concludes by summarizing the results.

2 ESSAY 1

TOURNAMENTS, TOP MANAGEMENT TEAM COMPENSATION, AND THE IMPACT OF COMPLEXITY – TWO SIDES OF ONE STORY

Abstract

This study examines the impact of firm's complexity on pay differentials within the top management team. Using the basic model of tournament theory and its extensions, we suggest competing hypotheses. The basic model predicts a positive relation between complexity and the pay spread between CEO and TMT, as monitoring difficulties caused by complexity are diminished by tournaments. Model extensions incorporate behavioral consequences of tournament-like compensation structures, like inhibited teamwork or sabotage. As collaboration gains importance with complexity, these models predict a negative relation between complexity and pay spreads. Against our initial intuition, the results show stronger support for the basic model. Hence, firms suffering from high levels of complexity tend to implement tournament solutions thereby neglecting their potential pitfalls.

Keywords: Complexity; Executive Compensation; Tournaments; Top Management Team

This essay is based on a common working paper with Prof. Dr. Anja Tuschke and Prof. Dr. Gunther Friedl. I have developed the idea, collected and prepared most of the data, designed and run the analyses and worked out the first draft of the paper. As we submitted this paper together, I switch from using the singular first-person narrative to the plural one.

2.1 Introduction

Over the last two decades, executive compensation has received enormous attention (for an overview see Devers et al., 2007). Starting with a mainly economic perspective on executive pay packages (for instance, Jensen & Murphy, 1990; Hall & Liebman, 1998), recent work often challenges prior results by focusing on behavioral aspects of pay (Cowherd & Levine, 1992; Martin, 1982; Fredrickson & Davis-Blake & Sanders, 2010). Although there is a large body of research on the economic and behavioral consequences of executive compensation, we still know little about which perspective guides those who are in charge of determining compensation packages (for a notable exception see Henderson & Fredrickson, 2001).

Tournament theory provides a unique opportunity to analyze both sides of the picture. Whereas early tournament models propose an economic view of compensation, recent extensions to these models follow a more behavioral-oriented approach. By analyzing whether executive compensation packages follow the recommendations of early tournament models or incorporate suggestions of later extensions to tournament theory, we are able to gain valuable insights on the rationale behind the design of current compensation structures. The basic tournament model – as suggested by Lazear & Rosen, 1981 – relies on increasing pay spreads across hierarchies. These pay spreads serve as incentive for executives to compete for the prize of the tournament, i.e. a higher compensation on the next hierarchical level. As the winner is determined through relative performance evaluation, the tournament further helps to reduce the difficulties of monitoring executives.

The basic model of Lazear & Rosen, 1981 shows advantages of tournaments in a simple setting with equal players without interaction. Several model extensions relax those narrow assumptions and find new equilibria that incorporate behavioral and interpersonal effects like sabotage, collusion, or teamwork (Rosen, 1986; Drago & Turnbull, 1988a; 1988b; Lazear, 1989).

Interestingly, the basic tournament model and its extensions lead to conflicting predictions for firms characterized by high levels of complexity. For a large number of firms, complexity is mounting due to international expansion, increasing firm size, diversification,

and the rising uncertainty of markets. Following the spirit of Lazear & Rosen, 1981, tournaments are especially helpful under high levels of complexity, as they substitute the difficult choice of appropriate performance measures with a more reliable relative performance evaluation. Accordingly, the basic idea of tournament theory predicts increasing pay spreads with increasing complexity. Model extensions (Nalebuff & Stiglitz, 1983; Dye, 1984; Lazear, 1989) point to the opposite conclusion: These extensions show several pitfalls of tournaments, like sabotage or decreasing collaboration. As the pitfalls of tournaments should gain in importance with increasing complexity, firms are advised to use alternative forms of performance evaluation. Therefore, following the extensions of the tournament model a negative relation between complexity and pay spreads is predicted.

Based on a German data sample we test empirically which of these opposing rationales is predominant in the minds of those in charge of designing executive compensation. Despite our intuitive assumption that we should find support for the predictions of the more sophisticated behavioral extensions of tournament theory, our results provide stronger support for the basic model. Hence, we conclude that firms suffering from high levels of complexity tend to implement tournament solutions thereby neglecting their potential pitfalls.

This study extends the existing literature in several ways. First, to our knowledge, this is one of the first studies to examine the link between complexity and pay distribution among the top management team. Hence, we add to the small number of papers examining the attractiveness of tournaments but go beyond a mere test of the predominance of tournament-like structures (O'Reilly III & Main & Crystal, 1988; Eriksson, 1999). Second, by contrasting the basic tournament model with its more sophisticated extensions, we shed light on how far current pay structures are influenced by behavioral considerations. We do not claim that one compensation design is superior to another. Rather, we want to detect whether those in charge of setting compensation favor one rational over the other. Third, our analyses are backed-up by fine-grained results. Apart from providing information on total compensation, we report the association between complexity and individual compensation components (i.e. fixed pay, variable pay, stock-based pay). In addition, we include all TMT members (and not only the five-best paid as in most US studies) and use fixed effects regressions to fulfill the requirements of panel data. Fourth, among the few related studies with European data

(Eriksson, 1999; Conyon & Peck & Sadler, 2001) we are the first investigation using a German data sample.

2.2 Conceptual Development

2.2.1 The basic tournament model and its relation to complexity

Tournament theory analyzes the effects of compensation schemes that create promotion based incentives. According to the basic model of Lazear & Rosen, 1981, tournament-like structures for executive compensation address moral hazard. These structures lead to the same efficiency levels – in terms of effort – as compensating in line with marginal product theory (McLaughlin, 1988). According to tournament theory several agents compete for a promotion to the same job and for the compensation associated with it, i.e. the first prize for winning the tournament. To determine the winner, it is not necessary to measure the absolute performance of the players. Ranking them on an ordinal scale is sufficient and implies lower costs of measuring and monitoring.

The incentives attached to winning the competition elicit additional effort and reduce shirking. Due to managers' disutility of effort (Lazear & Rosen, 1981),⁸ the firm needs to increase the wage spread up to the point where the marginal cost of effort equals its marginal benefit. To induce a constant effort level, the wage spread has to be higher with increasing levels of uncertainty (Lazear & Rosen, 1981) and with an increasing number of contestants (McLaughlin, 1988; Prendergast, 1999). Expanding the tournament framework across the entire corporate ladder shows a convex pattern of pay spreads, i.e. the difference between the CEO's pay and the average TMT's pay is the highest among all hierarchical levels (Rosen, 1986; Leonard, 1990).

The predictions of tournament theory are tested in several studies. Main & O'Reilly III & Wade, 1993 and Bognanno, 2001 support the prediction of a convex pay spread pattern for US firms, whereas Eriksson, 1999 and Conyon & Peck & Sadler, 2001 come to the same

⁸ The basic model assumes a convex pattern of the agent's disutility of effort. Therefore the firm has to increase the wage spread disproportionately high to generate stronger incentives.

results based on European data. As increasing pay spreads are also consistent with alternative compensation theories (Gibbs, 1994), like marginal productivity, these studies also focus on the impact of the number of contestants to verify the existence of tournaments. While O'Reilly III & Main & Crystal, 1988 find a negative relation between the pay spread and the number of executives Main & O'Reilly III & Wade, 1993, Eriksson, 1999 and Conyon & Peck & Sadler, 2001 show supportive results for tournament theory.

Formal models reveal that output-based compensation and tournaments provide the same efficiency level. However, the latter has two important advantages: First, output-based compensation requires an exact measurement of performance. In contrast, the information needed for tournaments is less demanding, because ranking the contestants on an ordinal scale is sufficient to determine the winner (Lazear & Rosen, 1981; Malcomson, 1984). Second, agency-theory shows that managers should only be remunerated on the basis of performance measures they are able to control. External, non-controllable influences should be eliminated from the performance indicator to induce a higher effort level (Antle & Smith, 1986; Holmström, 1979; Lambert & Larcker, 1987; Aggarwal & Samwick, 1999). However, it is often impossible to eliminate factors like a common economic shock while measuring performance. Similarly, evaluating performance relative to a peer group is difficult due to high information requirements (for instance, finding the 'right' peer companies). The situation is different for tournaments. Since all contestants work in the same firm, they are exposed to the same, or at least highly correlated, risk factors. Based on this rationale Green & Stokey, 1982 and Nalebuff & Stiglitz, 1983 show the superiority of tournaments compared to individual contracts, when common external shocks might occur.

The predominance of tournaments increases with the cost of performance measurement and the difficulty of designing appropriate performance measures. We argue that the level of an organization's complexity is an important driver of both factors. As complexity increases – caused for instance by higher levels of internationalization, diversification, or by sheer firm size – the tasks of TMT members become more and more interdependent. In addition, to run a complex firm successfully, there is more need for collaboration and cooperation among the TMT. Task interdependence and joint decision making render the monitoring process more complicated (Eisenhardt, 1989; Konrad & Pfeffer, 1990; Bushman et al., 2004). Furthermore,

complexity hampers the design of appropriate performance measures, because interdependencies involve uncertainties that are only partly controllable by individual members of the TMT. As a result, increasing complexity should facilitate tournament solutions and lead to respectively large pay spreads.

2.2.2 Tournament model extensions and their relation to complexity

Extensions of the basic model of Lazear & Rosen, 1981 relax some assumptions and incorporate influences not considered in the original paper. A very intuitive notion is that tournaments work against teamwork. Drago & Turnbull, 1988a incorporated the effects of teamwork into tournaments by relaxing the assumption that one player's action has no direct effect on another player's output. They model teamwork as "team externalities"; the effort of an individual affects team performance, but total team performance is not completely separable from the contribution of individual players. From a contestant's point of view, the disutility of additional effort is not compensated through an increase of remuneration. On the contrary, as team performance becomes better, it benefits all contestants. This model as well as other theoretical work (Nalebuff & Stiglitz, 1983; Drago & Turnbull, 1991; Baker, 1992) demonstrates analytically that incentives for free-riding and shirking arise as teamwork gains in importance. We further extend this line of argumentation by linking it to a firm's complexity. In line with Carpenter & Sanders, 2002 (p.368) we argue that the importance of teamwork is positively correlated with complexity and "moreover, the complexity of managing today's large organizations often requires chief executives to delegate critical responsibilities to functional or division heads, and to otherwise rely on the substantive contributions of the executives comprising the TMT". For exemplary purposes consider a TMT of a highly diversified company. These executives are confronted with an environment of significantly more dimensions and higher complexity than managers of a single product business. To achieve company-wide success, it is fundamental to collaborate across business units. Hence, increasing complexity reduces the attractiveness of tournament solutions and predicts a negative relation between pay spreads and complexity.

In the light of decision-making under increasing complexity, top executives should strive for an atmosphere based on teamwork that allows for advice seeking and supports the

willingness to engage in mutual help. Hambrick, 1995 (p.120) describes the impact of complexity on cooperative behavior as follows: “Competitive arenas are turbulent; strategies must be promptly adaptive; and the recent thrust of many companies has been to re-focus on a core set of businesses and competences, requiring more, not less, interdependence of action. Today, the fragmented team is usually maladaptive”.

From a tournament contestant’s perspective helping a competitor implies two effects. First, supporting another tournament contestant leads to additional effort, which induces disutility. Second, it increases the other contestant’s chances to win the competition. The question of reciprocity – i.e. whether the other contestant will return the favor – remains unanswered (Drago & Turnbull, 1988a; 1988b; 1991). Thus, contestants weaken their position in a tournament by choosing to help or to provide advice. In addition, large pay spreads reflect power differentials (Barnard, 1938). As power differentials work against seeking and providing advice (Westphal, 1999; McDonald & Westphal, 2003), they further impede collaboration between members of the TMT and the CEO. With increasing complexity, the negative effects of tournaments become more and more apparent. Therefore, we expect a respective elimination of tournament structures and a decrease in pay spreads.

Another problem of tournaments is sabotage. A number of studies analyze sabotage in tournaments theoretically (Lazear, 1989; Dye, 1984; McLaughlin, 1988; Chen, 2003; Kräkel, 2005; Münster, 2007) as well as in experiments (Harbring et al., 2007; Harbring & Irlenbusch, 2011). Studies of both types support the existence of sabotage in tournament-like structures. Due to the ‘winner takes it all’ character of tournaments it might be efficient / effort minimizing for a contestant to seek advantage through thwarting an opponent’s performance instead of increasing his own effort level. Retaining important information, transferring false information or spreading rumors are only few of many ways of sabotage among members of a TMT. Incentives for sabotage – as provided by tournaments – are especially detrimental in situations in which increased complexity calls for collaboration and cooperation among the TMT. Consequently, we expect a negative association between complexity and tournament-like pay spreads.

Tournaments are furthermore examined under the prevalence of the threat of collusion and with heterogeneous contestants. In both settings tournaments lose attractiveness in terms

of lower induced effort levels. If contestants collude, they will probably agree upon an equilibrium of low collective effort levels. Such a behavior annuls or reduces the desired incentive of tournaments (McLaughlin, 1988; Kräkel, 1998). A tournament between heterogeneous contestants also induces lower effort levels when contestants are aware of the different managerial capabilities (Lazear & Rosen, 1981). A TMT member with high abilities knows that he will probably win the race, even if he lowers the pace, while a TMT member with lower abilities realizes that he only has a realistic chance to win the tournament by drastically increasing his effort. Due to the increasing disutility of effort, the latter TMT member will capitulate and reduce his effort level (O'Keeffe & Viscusi & Zeckhauser, 1984). Both, collusion and the knowledge of the competitor's abilities become more likely the more TMT members collaborate. Again, we regard complexity as a driver for cooperation and collaboration. Hence, complexity fosters conditions that counteract the advantages of tournaments. Thus, we expect decreasing pay spreads as complexity increases.

Although we focus on theoretical analyses of tournaments to flesh out our hypotheses on the negative effects of complexity on pay spreads, we also want to acknowledge alternative explanations. Henderson & Fredrickson, 2001 argue, for instance, that tournaments lose attractiveness as coordination needs increase based on behavioral theories. They apply relative deprivation theory (Crosby, 1984; Cowherd & Levine, 1992; Martin, 1982) and allocation preference theory (Greenberg, 1987; Leventhal, 1976) to support the prediction of decreasing pay spreads with increasing coordination needs. Interestingly, the majority of the behavioral hypotheses are rejected.

To summarize this section, increasing levels of complexity add to the need for designing compensation structures in a way that fosters collaboration and advice and reduces incentives to engage in sabotage or collusion. Hence, we expect increasing complexity to be associated with decreasing pay spreads.

2.2.3 Hypotheses

As indicated above, tournament theory arrives at competing hypotheses concerning the relation between an organization's complexity and pay spreads. In the following section, we

develop competing hypotheses in order to test in how far firms with high levels of complexity lean towards economic aspects (i.e. the original tournament model) or behavioral aspects (i.e. extensions to tournament theory) in designing executive compensation. To empirically verify one of these alternatives as comprehensively as possible we identify several indicators for complexity: Firm size, TMT size, capital investment, diversification, internationalization, and market uncertainty.

In line with Ungson & Steers, 1984; Finkelstein & Hambrick, 1989; Gomez-Mejia & Wiseman, 1997, we regard firm size as indicator for complexity. **Firm size** reflects structural complexity because hierarchical levels need to be added and additional specialized subunits are established as firms become larger. A larger, more-dimensional company is more difficult to manage (Baker & Hall, 2004) and to monitor, making tournaments more attractive. However, reiterating the relation of complexity and coordination, teamwork gains in importance as well (Chandler, 1962). Thereby potential advantages of tournament-based compensation structures diminish. These opposing rationales lead to the following competing hypotheses:

Hypotheses 1-1: Based on the original idea of tournament theory, we predict a positive relationship between firm size and the pay spread among a firm's CEO and TMT.

Hypotheses 1-2: Based on the model extensions of tournament theory, we predict a negative relationship between firm size and the pay spread among a firm's CEO and TMT

TMT size is another indicator for complexity. As TMT size increases, a growing amount of information must be shared among a larger number of executives. In addition, a larger TMT indicates a more complex information environment (Williamson, 1975; Henderson & Fredrickson, 1996). The consequences are increased coordination needs and joint decision making (Henderson & Fredrickson, 2001). Furthermore, the size of the TMT reflects the intensity of competition within tournaments. An increasing number of contestants reduces the likelihood of a single player to win the tournament. Hence, a higher prize is required to maintain the same incentives and effort levels (McLaughlin, 1988; Prendergast, 1999). Again, the competing notions of increased monitoring difficulties and collaboration needs lead to opposing predictions:

Hypotheses 2-1: Based on the original idea of tournament theory, we predict a positive relationship between TMT size and the pay spread among a firm's CEO and TMT.

Hypotheses 2-2: Based on the model extensions of tournament theory, we predict a negative relationship between TMT size and the pay spread among a firm's CEO and TMT

Investing in future projects, especially in technology projects, is associated with high uncertainty. Numerous factors that may affect the prospects of an investment project have to be taken into account and integrated in the decision making process. As outcomes are hard to predict, monitoring managerial decisions becomes increasingly difficult. Managers have not only to model the uncertainties of one project, but rather need to compare and choose among several competing investment opportunities. A single executive is often overstrained with these complex tasks or needs at least another manager to challenge the decision (Hayes & Abernathy, 1980). Second, a glut of information is needed to evaluate a potential project in a comprehensive manner (Henderson & Fredrickson, 1996). Besides capital requirements, a new investment comes with demands like additional personnel capacity, requiring further informational exchange among members of the TMT. As a result, investment activities necessitate coordination and hence, following the same line of argumentation as above, we obtain competing hypotheses:

Hypotheses 3-1: Based on the original idea of tournament theory, we predict a positive relationship between capital investment and the pay spread among a firm's CEO and TMT

Hypotheses 3-2: Based on the model extensions of tournament theory, we predict a negative relationship between capital investment and the pay spread among a firm's CEO and TMT

Managing a diversified company is a difficult task, as **diversification** increases the complexity of an executive's job (Finkelstein & Hambrick, 1989; Nagar & Nanda & Wysocki, 2003). The raise of complexity is intuitive when the TMT is organized in a functional manner. Each executive is forced to understand all business lines and the associated markets in order to fulfill her functional tasks successfully. A Chief Human Resources Officer of a firm with two business lines, for instance, has to have insights on the labor market conditions of both businesses. Otherwise he will not be capable to meet the

needs of job applicants and hence, fails to attract talented employees. In case of a divisional organization of the TMT a joint understanding of each business is still vital. Realizing potential synergies – as one main advantage of diversified companies – requires managers to understand the diversified businesses with their customers, suppliers, industry peculiarities, competitors, etc. Independently of the organizational structure, adding additional business segments increases the complexity of a manager's task (Rose & Shepard, 1997). The resource allocation process also becomes increasingly complicated with increasing levels of diversification. Multi-industry firms are more likely to allocate capital inefficiently among their businesses (Stein, 1997). Reiterating our reasoning, diversification predicts higher pay differentials to solve monitoring difficulties whereas the increased need for communication and coordination across businesses predicts a more equally distributed pay to foster cohesiveness. This results in the following two hypotheses:

Hypotheses 4-1: Based on the original idea of tournament theory, we predict a positive relationship between the level of diversification and the pay spread among a firm's CEO and TMT.

Hypotheses 4-2: Based on the model extensions of tournament theory, we predict a negative relationship between the level of diversification and the pay spread among a firm's CEO and TMT

It seems to be consensus that the level of **internationalization** hugely influences the complexity of a firm. TMTs of multinational firms need to understand and cope with heterogeneous conditions of multiple countries at a time (Redding & Fries & Alexis, 1995). Different government systems, national regulations, and cultural characteristics affect managerial decision-making and ultimately the success of the firm. Hence, the coordination of geographically dispersed resources becomes a challenging and important managerial task (Roth, 1995). Additional exchange risks arise when a company produces and distributes its products around the world. A rising complexity of decision-making environments as well as mounting communication barriers – like different languages, geographical dispersion, and different time zones – cause an increase in information-processing demands (Tushman & Nadler, 1978; Henderson & Fredrickson, 1996) which result in interdependencies and joint decision making (Egelhoff, 1982). Combining the complex environment of highly

internationalized firms with the tournament theory and its model extensions leads to the fifth set of competing hypotheses:

Hypotheses 5-1: Based on the original idea of tournament theory, we predict a positive relationship between the degree of internationalization and the pay spread among a firm's CEO and TMT.

Hypotheses 5-2: Based on the model extensions of tournament theory, we predict a negative relationship between the degree of internationalization and the pay spread among a firm's CEO and TMT

Market uncertainty is a main driver of complexity from a manager's point of view (Mintzberg, 1973; Finkelstein & Boyd, 1998). Operating in highly volatile markets is associated with a lack of planning reliability. Therefore, managers have to be capable of dealing with unstable environments in several ways. First, they are confronted with more demanding decision choices and have to account for a number of alternative planning scenarios. Second, they need to establish a flexible organization in order to be able to quickly adapt to changing conditions. Third, they are forced to evaluate new strategic opportunities that hedge the risk of market uncertainties. A demand downturn, for instance, challenges the manager in terms of personnel overcapacity or cash scarcity. Only innovative and flexible organizations can deal with the overcapacity in one field by e.g. reallocating employees to another division. Furthermore, banks will only grant additional credits if a sophisticated and long-term risk and hedging strategy is in effect. Regarding the effects of market uncertainty from the perspective of the basic tournament model and its extensions yields the following set of hypotheses:

Hypotheses 6-1: Based on the original idea of tournament theory, we predict a positive relationship between market uncertainty and the pay spread among a firm's CEO and TMT

Hypotheses 6-2: Based on the model extensions of tournament theory, we predict a negative relationship between market uncertainty and the pay spread among a firm's CEO and TMT.

2.3 Methods

2.3.1 Data and Sample

For our analysis we focus on all companies that were listed in one of the two German stock indices DAX and MDAX in 2008. We collected data on 80 firms and their executives for the years 2006 through 2009. Hence, our initial sample consists of 320 observations. We finally ended up with an unbalanced panel of 65 groups and 239 firm-year observations due to the following reasons: First, 15 companies have not reported information on individual compensation. Given the approval of a two-third majority of votes at the annual stockholders' meeting, the TMT is released from disclosing individual compensation data for every executive. 15 firms have chosen this opting out option, at least for one year. 13 of these 15 firms were listed in the smaller MDAX. The comparison of means with respect to the *firm size* verifies the assumption that smaller firms tend to choose the opting out option more often. Second, some companies were not forced to disclose their compensation on an individual basis due to their legal form in any of the observed years. Third, a few companies were founded after 2006. Fourth, we drop firm-years in which the firm was acquired, merged or filed for bankruptcy. Finally, we drop one firm-year from a company that changed its name due to extraordinary numbers that results from the amortization of the old brand name.

Nevertheless, we argue that our sample has a high level of representativeness for German listed companies. The market capitalization of the DAX and MDAX represents approximately 95 % of the total German market capitalization. Furthermore, we have a high variation in terms of size. The smallest company listed in our sample has about the half of the market capitalization of the smallest S&P 500 company.⁹ Since there is no German pendant to the ExecuComp database for compensation data in the United States we hand-collected the compensation data for each executive under study as well as several independent and control variables on the basis of annual reports. A second independent reviewer verified the accuracy of the collected data. Furthermore, the collected data was published every year in a descriptive study in the public press. We received no claims from the companies we reported

⁹ This relation is based on the market capitalizations of Oct., 30th 2010. Praktiker Holding, the smallest company in the sample, has a market capitalization of 395 Mil. EUR. The NY Times shows a value of \$ 798 m.

about and hence, assume this as a further indicator for the accuracy of our data. For the financial data, we used Thomson Worldscope and Datastream.

2.3.2 Measures

Dependent variables

Pay spread, as the dependent variable of all our hypotheses, is measured as the difference between CEO compensation and the average compensation of the remaining TMT members (Bognanno, 2001; Eriksson, 1999). Since we are able to distinguish between the different components of compensation, we define four different types of pay spreads. Our first endogenous variable refers to the *Total Compensation Spread* which is the sum of the following three variables (fixed compensation spread + variable compensation spread + stock-based compensation spread). The second variable, *Fixed Compensation Spread* measures the difference of fixed pay including fixed salary and monetary benefits. The third measure determines the pay spread with respect to all variable cash remuneration components. It includes annual bonuses as well as bonus payments that are based on the performance of several years (labeled *Variable Compensation Spread*). The fourth measure *Stock-based Compensation Spread* reports all components that are based on the firm's stock, like shares, phantom stocks, or options. To reduce heteroskedasticity in our regression models we use the natural logarithm of the four compensation components. For a small number of firm years, we observe negative spreads. We follow previous studies (Hartman, 1984; Cassou, 1997) and transform all observations by adding the minimum absolute pay spread value plus one to all observations.¹⁰

Compared to existing empirical literature on tournaments, our data allows for more fine-grained results: First, we include all executives of the TMT, not only the five best paid. Comparable analyses of US samples (for instance, Main & O'Reilly III & Wade, 1993) usually focus on the five best paid top executives as information on those executives is reported in US proxy statements. Although we are aware of the fact that we ignore potential

¹⁰ To check the robustness, we also run our regression without the observations with negative spreads (Diamond & Hausman, 1984). The results do not change significantly.

tournament contestants from outside the firm (Henderson & Fredrickson, 2001), we think that all TMT members need to be included in an analysis of a tournament for the position as CEO. Second, all stock-based compensation components included in our analyses are assessed with great care. Stock options or any other form of stock-based compensation components are used to incentivize executives to work hard on behalf of the company. Since the remuneration of an executive depends on an ex-ante uncertain company performance, stock-based compensation is difficult to assess. Related research (Lambert & Larcker & Weigelt, 1993; Henderson & Fredrickson, 2001) use different types of proxies to value stock plans, stock options or performance shares. For instance, Henderson & Fredrickson, 2001 use 25 percent of the exercise price of stock options and valued performance shares by multiplying the performance units with the target value. Stock-based remuneration has gained importance in the last decades (Hall & Liebman, 1998; Sanders & Tuschke, 2007) and the design of those compensation measures has become more complex. Individual hurdle rates that are for instance based on the company's share price development or an index of peer group performance need to be taken into consideration. Hence, simple proxies are no longer capable of reflecting a realistic value of the respective stock-based compensation components. As all firms under study apply International Financial Accounting Standards (IFRS) and need to report the fair value of all stock-based compensation components, we have great trust in the accuracy of the data.

Independent variables

Following the main stream of empirical compensation literature we measure *Firm Size* as the natural logarithm of employees (Shaw & Gupta & Delery, 2002). In line with prior literature (O'Reilly III & Main & Crystal, 1988) we operationalize *TMT Size* as the number of TMT members. To reflect the complexity caused by intensive *Investment Behavior* – typically in technology – we follow Henderson & Fredrickson, 2001 and measure the respective variable as annual capital expenditures divided by annual sales.

To measure complexity caused by the level of *Diversification* we calculate the Herfindahl index for the firm's business segments and subtract the result from 1 (for instance, Rose & Shepard, 1997):

$$1 - \sum_{i=1}^{Num\ Seg} \left[\frac{segment\ sales_i}{firm\ sales} \right]^2$$

The Herfindahl index measures not only the number of segments but also the degree of dissimilarity of segment sales. The Herfindahl index decreases with the number of segments, but it increases with a higher degree of dissimilarity of segment sales. If there is one major segment that accounts for the entire firm sales, the index would be 1 (and, hence, one minus the index would be 0). Both, the number of segments and their dissimilarity add to the firm's complexity.

The degree of *Internationalization* is measured as the proportion of sales generated from operations in foreign countries (Carpenter & Sanders, 2002). To measure *Market Uncertainty* we calculate the 4-year volatility of sales growth (Finkelstein & Boyd, 1998).

Control variables

In addition, we control for several variables that might affect CEO compensation. In line with agency theory (for instance, Holmström, 1979; Jensen & Murphy, 1990) we regard CEO compensation as highly dependent on firm performance. Hence, we control firm performance by measuring the return on assets, *ROA*. The compensation of a CEO is further influenced by *CEO Tenure* (for instance, Finkelstein & Hambrick, 1989), measured as the years of a CEO in office. We also include a dummy to account for the status as *CEO Outsider* (Hambrick & Finkelstein, 1995). A CEO is declared to be an outsider if she had worked less than one year in the firm prior to becoming CEO.

As we measure the CEO pay spread in absolute terms, differences in levels of executive pay have to be considered. Otherwise a higher level of TMT pay would automatically induce higher spreads. To isolate this effect, we include a control for *Average TMT Compensation* – for all four pay measures – in our analyses (not including the CEO). A simple approach to explain the pay spreads would be an assumed constant ratio. We do not see a necessity to integrate a further variable for this effect, since our fixed effects regression models would eliminate those company-specific patterns. Pfeffer & Langton, 1993 show a significant

relation between the collaboration of pay attribution of non-CEO executives. We follow Henderson & Fredrickson, 2001 and control for this effect, measured as the *Coefficient of Variation* (Allison, 1978).

2.3.3 Analyses

The wide range of literature on executive compensation illustrates that there are numerous theories and explanation approaches. The “one approach” that perfectly explains the prevalent compensation designs has not been identified yet. The existing plurality of company-specific compensation patterns is hardly observable or testable (Murphy, 1985). Following this assumption, it is essential to eliminate the particularities of each firm. For instance, Greene, 2003 shows that omitting unobserved heterogeneity might lead to biased and inconsistent results. Thus, for our broad range of firms over the span of four years we apply linear models that allow for firm heterogeneity. The two-way firm-fixed effects model can be written as follows:

$$y_{it} = \alpha_i + \gamma_i + x_{it} \beta + \varepsilon_{it}$$

where y_{it} is the endogenous variable, $i = 1, \dots, N$ is a firm index, $t = 1, \dots, T$ is a year index, α_i is a firm time-invariant effect, γ_i is a time-variant, firm-invariant effect, x_{it} are the observable variables that can vary across i and t and ε_{it} is an idiosyncratic error. In our model we assume α_i to be a firm specific dummy variable. In a random-effects model this effect is presumed to be random and not correlated with other explanatory variables. Our choice to apply a fixed-effects alternative is supported by the results of a Hausman test. To address problems of heteroskedasticity we choose robust estimators.

2.4 Results

2.4.1 Summary Statistics

Table 1 presents the summary statistics. Correlations between independent and dependent variables are modest. Please note that we focus on the impact of individual remuneration components (*Fixed Compensation Spreads*, *Variable Compensation Spreads*, *Stock-based Compensation Spreads*) as well as on *Total Compensation Spreads*. Consequently, Table 1 shows correlations between variables that are not used in the same analysis. For instance, the seemingly high correlations between the five different measures for *Average TMT Compensation* do not imply multicollinearity problems as each measure is included in a separate model. To further account for potential problems of multicollinearity, we calculate the variance inflation factors (VIF). The highest VIF (firm size) reaches a value of 2.11 and is well below the conventional critical levels (Chatterjee, 1977).

Table 1: Means, Standard Deviations, and Correlations of all Variables

This table shows pairwise correlations for all variables used in our analyses. The sample period is from 2006 to 2009 and has 239 firm years. All correlations with $r > 0.13$ are significantly different from zero at the 95% confidence level; all correlations with $r > 0.17$ are significantly different from zero at the 99% confidence level. Compensation spreads equal the natural log of the difference between CEO's and average TMT's pay. Size equals the natural logarithm of the number of employees. Average TMT compensation is measured in 100,000 EUR units.

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10
1 Total Compensation Spread	6.98	0.77	1									
2 Fixed Compensation Spread	6.35	1.23	0.25	1								
3 Variable Compensation Spread	6.42	0.91	0.81	0.31	1							
4 Stock-based Compensation Spread	6.81	0.59	0.24	-0.09	0.06	1						
5 Diversification	0.24	0.24	0.06	0.02	0.07	0.07	1					
6 Market Uncertainty	8.59	8.00	0.01	0.05	-0.01	0.06	0.03	1				
7 Internationalization	52.23	24.94	0.20	-0.07	0.08	0.20	0.25	-0.11	1			
8 Investment Behavior	10.14	32.15	-0.14	-0.04	-0.08	-0.05	-0.12	0.10	-0.18	1		
9 Firm Size	10.13	1.85	0.45	0.03	0.36	0.14	0.25	-0.16	0.28	-0.33	1	
10 TMT size	4.40	2.09	0.38	0.10	0.26	0.14	0.05	-0.08	-0.06	-0.12	0.54	1
11 ROA	5.03	5.68	0.05	-0.01	0.22	0.03	0.03	-0.04	0.05	0.00	-0.09	-0.16
12 CEO Outsider	0.23	0.42	-0.11	-0.12	-0.12	-0.21	-0.08	0.02	-0.34	0.27	-0.34	-0.11
13 CEO Tenure	5.20	5.66	0.06	0.08	0.08	0.02	-0.05	-0.02	-0.17	-0.05	-0.05	-0.10
14 Average Total Compensation	12.74	10.85	0.47	-0.01	0.40	0.28	0.16	0.02	0.14	-0.03	0.41	0.34
15 Average Fixed Compensation	5.37	2.24	0.52	-0.04	0.34	0.12	0.17	-0.03	0.18	-0.18	0.65	0.45
16 Average Variable Compensation	7.81	5.55	0.57	0.09	0.60	0.11	0.13	0.00	0.16	-0.03	0.50	0.40
17 Average Share-based Compensation	3.02	4.20	0.52	0.03	0.28	0.39	0.03	0.05	0.24	-0.06	0.37	0.34
18 Variation Total Compensation	0.14	0.14	0.15	0.08	0.04	0.07	-0.03	0.15	-0.20	-0.06	0.10	0.23
19 Variation Fixed Compensation	0.13	0.12	0.28	0.09	0.09	0.12	-0.05	-0.01	-0.06	-0.06	0.18	0.31
20 Variation Variable Compensation	0.18	0.22	0.07	-0.01	-0.07	0.05	-0.04	0.18	-0.15	-0.07	0.10	0.16
21 Variation Share-based Compensation	0.15	0.28	0.03	-0.07	-0.10	0.11	0.01	0.03	0.10	-0.05	-0.05	0.03
22 Year 2007	0.26	0.44	0.08	0.03	0.14	0.03	0.04	0.07	-0.02	0.08	0.01	-0.02
23 Year 2008	0.26	0.44	-0.07	0.03	-0.06	-0.03	-0.03	-0.07	0.01	0.00	-0.02	-0.03
24 Year 2009	0.24	0.43	-0.03	0.06	-0.05	-0.10	-0.11	-0.08	0.03	-0.06	-0.02	0.00

Table 1: Means, Standard Deviations, and Correlations of all Variables (continued)

This table shows pairwise correlations for all variables used in our analyses. The sample period is from 2006 to 2009 and has 239 firm years. All correlations with $r > 0.13$ are significantly different from zero at the 95% confidence level; all correlations with $r > 0.17$ are significantly different from zero at the 99% confidence level. Compensation spreads equal the natural log of the difference between CEO's and average TMT's pay. Size equals the natural logarithm of the number of employees. Average TMT compensation is measured in 100,000 EUR units.

Variable	Mean	s.d.	11	12	13	14	15	16	17	18	19	20	21	22	23	24
11 ROA	5.03	5.68	1													
12 CEO Outsider	0.23	0.42	-0.03	1												
13 CEO Tenure	5.20	5.66	0.21	0.17	1											
14 Average Total Compensation	12.74	10.85	0.12	-0.19	-0.10	1										
15 Average Fixed Compensation	5.37	2.24	-0.25	-0.14	-0.10	0.45	1									
16 Average Variable Compensation	7.81	5.55	0.13	-0.22	-0.10	0.67	0.55	1								
17 Average Share-based Compensation	3.02	4.20	-0.02	-0.19	-0.08	0.49	0.38	0.38	1							
18 Variation Total Compensation	0.14	0.14	-0.14	0.18	0.06	-0.02	0.14	0.04	-0.05	1						
19 Variation Fixed Compensation	0.13	0.12	-0.18	0.06	0.00	0.08	0.34	0.12	0.01	0.58	1					
20 Variation Variable Compensation	0.18	0.22	-0.13	0.18	0.01	-0.07	0.07	-0.04	-0.10	0.80	0.38	1				
21 Variation Share-based Compensation	0.15	0.28	0.02	0.06	0.22	-0.05	0.02	-0.13	0.04	0.27	0.14	0.17	1			
22 Year 2007	0.26	0.44	0.13	-0.06	-0.01	0.27	-0.01	0.14	0.02	-0.02	-0.02	-0.08	-0.07	1		
23 Year 2008	0.26	0.44	0.04	0.00	-0.01	0.15	-0.01	-0.04	-0.05	-0.01	0.00	-0.03	0.01	-0.35	1	
24 Year 2009	0.24	0.43	-0.26	0.05	0.04	-0.65	0.03	-0.16	0.00	0.03	0.02	0.02	0.01	-0.33	-0.32	1

2.4.2 Hypotheses Tests

Table 2 presents the results of the fixed-effects regressions of complexity on the total compensation spreads. In Model 1 we enter the controls to show the additional explanation power of the complexity parameters in Model 2.

Table 2: Fixed Effects Regressions on Total Compensation Spread

This table shows Firm Fixed Effects Regressions on Total Compensation Spread; The annexes ***, **, and * symbolize statistical significance at the 1%, 5%, and 10% levels, respectively. All tests are two-tailed. All models are significant ($p < .001$). N = 239.

	Total Compensation Spread	
	Model 1	Model 2
Firm Size		-0.542*
TMT size		0.086**
Investment Behavior		0.002***
Diversification		-0.708**
Internationalization		0.013***
Market Uncertainty		0.006**
ROA	0.029***	0.030***
CEO Tenure	0.019*	0.019**
CEO Outsider	0.457***	0.442***
Average Total Compensation	0.025***	0.020***
Variation Total Compensation	0.347	-0.246
Year 2007	0.119**	0.142**
Year 2008	-0.010	0.030
Year 2009	0.411***	0.306**
Constant	6.130***	10.821***
R ²	0.31	0.41

As argued before, a positive coefficient supports the basic model of tournament theory since an increase in complexity leads to increasing pay spreads. Negative relationships

support the implications of the model extensions. Although we cannot identify a clear and consistent winner across all hypotheses sets, the rationale of the basic model seems predominant. Focusing on *Total Compensation Spreads* we find support for the basic model in four of six variables. *Market Uncertainty*, *Internationalization*, *Investment Behavior* and *TMT Size* support the basic model. *Firm Size* and *Diversification* are the only indicators for complexity with a negative impact on *Total Compensation Spread*.

Hypothesis 1-1 and 1-2 concern *Firm Size*. The result supports implications of the extended tournament models ($p < 0.1$). With increasing *Firm Size* the need for collaboration is perceived as more important than the incentives provided through relative performance measurement (as suggested by the original idea of tournament theory). The next indicator for complexity, *TMT Size*, points to the original idea of tournament theory. We find a positive and significant influence of the number of TMT members on *Total Compensation Spreads* ($p < 0.05$). *Investment Behavior* supports the same relation: the monitoring difficulties make tournaments more attractive and hence are used by the responsible incentive designers ($p < 0.01$). The highly significant effect has a small magnitude. An increase in the ratio of capital expenditures to annual sales by one unit leads to a pay spreads increase of 0.002 %. *Diversification* supports the implications of the extended tournament models ($p < 0.05$). The prediction of hypothesis 5-1 that the degree of *Internationalization* is a driver of pay spreads is verified on a highly significant level for total compensation ($p < 0.001$). For hypothesis 6-1, again, the basic models gain support as *Market Uncertainty* is found to be a driver for pay spreads ($p < 0.05$).

Table 3 presents the impact of complexity on pay spreads for the three single remunerations components that sum up to the *Total Compensation Spread*. Analogous to the regression for the *Total Compensation Spreads*, we first run the analyses for the controls – Model 3, Model 5, and Model 7 – before we add independent variables in Model 4, Model 6, and Model 8.

Table 3: Fixed Effects Regressions on Fixed, Variable, and Stock-based Compensation Spreads

This table shows Firm Fixed Effects Regressions on Fixed, Variable, and Share-based Compensation Spreads. The annexes ***, **, and * symbolize statistical significance at the 1%, 5%, and 10% levels, respectively. All tests are two-tailed. All models are significant ($p < .001$). N = 239.

	Fixed Compensation Spread		Variable Compensation Spread		Stock-based Compensation Spread	
	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Firm Size		-0.159		-1.576**		0.236
TMT size		-0.05		0.124**		-0.083
Investment Behavior		-0.001		0.002**		0
Diversification		-0.029		-0.133		2.439
Internationalization		-0.006		0.007**		0.01*
Market Uncertainty		0.002		0.005		0.004
ROA	-0.001	-0.005	0.026**	0.025**	-0.009	0.001
CEO Tenure	0.014	0.013	0.011	0.01	0.03*	0.045*
CEO Outsider	0.394***	0.364***	0.268	0.375	-0.75	-0.599
Average Compensation	-0.034	-0.042	0.09***	0.083***	0.062***	0.064***
Variation of Compensation	-0.187	-0.027	-0.7	-0.908	0.086	-0.01
Year 2007	0.365	0.37	0.186*	0.272***	-0.125*	-0.129*
Year 2008	0.247	0.26	0.039	0.201	-0.116	-0.109
Year 2009	0.241	0.253	0.152	0.241	-0.22	-0.17
Constant	6.178***	8.353***	5.488***	20.525***	6.787***	3.435
R ²	0.03	0.04	0.40	0.47	0.20	0.31

The regression for the *Fixed Compensation Spread* does not yield any significant results. With respect to the *Variable Compensation Spread*, we find significant results for *Firm Size* ($p < 0.05$), *TMT Size* ($p < 0.05$), *Investment Behavior* ($p < 0.05$), and *Internationalization* ($p < 0.05$). The relations are analog to the patterns observed in the *Total Compensation Spread* analyses. *Firm Size* supports the model extensions while *TMT Size*, *Investment Behavior*, and *Internationalization* confirm the hypotheses of the basic model. Model 8 shows a significant and positive relation between the level of *Internationalization* and the pay spreads from stock-based components ($p < 0.05$). The coefficient of *Internationalization* is 0.01 and hence, the impact on *Stock-based Compensation Spreads* is five times higher than the impact on *Total Compensation Spreads*.

2.5 Discussion

The goal of this study was to obtain a deeper insight into tournament incentives predominant in executive compensation. We started with an analysis of the impact of complexity on the pay spread among the firm's upper echelons. On the one side, the basic tournament model predicts a positive relation between complexity and pay differentials, because the increasing monitoring difficulties can be addressed efficiently by the relative performance measurement of tournaments (Lazear & Rosen, 1981). On the other side, model extensions incorporate interpersonal activities and hence, identify pitfalls of tournaments. Extended models argue that those pitfalls gain in importance with increasing complexity as collaboration becomes essential to manage the firm successfully (for instance, Dye, 1984; Drago & Turnbull, 1988a; McLaughlin, 1988). Hence, we test empirically which of these opposing rationales is predominant in the minds of those in charge of executive compensation. Table 4 summarizes the results of our findings for the impact of complexity on *Total Compensation Spreads* and its components. Recall that a negative relation supports the model extensions and positive relations confirm the implications of the basic model. Blank cells indicate non-significant results.

Figure 1: Overview of Results

This table summarizes the results of the analyses. “Extensions” support the hypothesis of the model extensions: A negative relationship between complexity and pay spreads. “Basic” supports a positive relationship and hence, the basic model. Blank cells indicate non-significant results.

Indicators for Complexity	Total Compensation Spread	Fixed Compensation Spread	Variable Compensation Spread	Stock-based Compensation Spread
Firm Size	Extensions (-)		Extensions (-)	
TMT Size	Basic (+)		Basic (+)	
Investment Behavior	Basic (+)		Basic (+)	
Diversification	Extensions (-)			
Internationalization	Basic (+)		Basic (+)	Basic (+)
Market Uncertainty	Basic (+)			

Our theory and empirical findings suggest that research should examine more carefully in how far behavioral aspects – as represented in the extensions to the original idea of tournament theory – are actually reflected in executive pay packages. Against our initial intuition, four of six indicators for complexity support the original tournament model. The model extensions confirm a negative association between pay spreads and complexity only for two variables, i.e. *Firm Size* and *Diversification*.

We analyzed both variables in more detail to better understand why the impacts of *Firm Size* and *Diversification* are not in line with the direction of the other independent variables. With respect to *Diversification* a post hoc test reveals an inverse u-shaped pattern. At low levels of diversification, advantages of tournaments seem to outweigh respective downsides. However, this relation reverses for high levels of diversification. We do not find any similar relation for *Firm Size*.

The results of the post hoc tests suggest that diversification is an especially strong trigger of complexity. Whereas other factors like increases in TMT size, *Investment Behavior*, internationalization, and market uncertainty still seem to render tournaments advantageous, increases in diversification change the picture. As the complexity predominant at high levels

of diversification intensifies the necessity of coordination and team-oriented behavior, the disadvantages of large pay spreads start to exceed the monitoring advantages of tournaments. The marginally significant negative association between firm size and the CEO-TMT pay spread is in contrast to prior findings in the US context (Bloom & Michel, 2002; Henderson & Fredrickson, 2001). We can only speculate about the reasons behind this contradictory finding. A possible explanation is that larger German firms are older and more deeply rooted in a traditional stakeholder value-oriented view. It can be expected that an egalitarian stakeholder-oriented view leads to lower pay gaps across hierarchies, including the CEO and TMT. To verify this thought, future research could analyze whether firms with links to the US context (i.e. listings on a US stock market, executives with US education) show results similar to those found in the US. In addition, this finding points to the importance of testing hypotheses in different corporate governance settings.

Reiterating the basic idea of tournament incentives points out that variable or stock-based remuneration component is not necessary to induce incentives in order to reach an efficient effort level (Lazear & Rosen, 1981). This raises the question why tournament incentives are not enforced through the fixed component, but through variable and stock-based elements (see Table 3). The mere existence of variable and stock-based components shows that those in charge of executive compensation do not only rely on tournament models but provide the firm's upper echelons with additional output- and performance incentives. We argue that designers of executive compensation do not solely pursue the goal of motivating TMT members, but also, or in particular, aim to create compensation packages that push the CEO to create value for the company. Hence, expanding the pay spread for components that are contingent on past or future performance creates two incentive effects. First, tournament incentives for the TMT: the members of the TMT are willing to work hard in order to become promoted. Second, output-based incentives for the CEO: in the sense of optimal contracting she only becomes rewarded if performing appropriately.

One result in our control models deserves mentioning as well. The status of being a *CEO outsider* leads to a significant increase in the *Fixed Compensation Spread* but does not affect the spread of variable compensation and stock-based compensation (see Table 3). New CEOs from outside the firm seem to have the power vis-a-vis the board to negotiate higher

pay spreads than CEOs who move up the ladder within the firm. This indicates that it is more expensive for the firm to hire a *CEO outsider* than promoting a TMT member from within. Interestingly, these CEOs from outside use their power to increase their fixed pay spreads, indicating that they value performance-insensitive compensation components. To make things worse, hiring a *CEO outsider* endangers the advantages of tournament models. As the TMT members realize that they are not the only contestants for the position of the firm's CEO, they may capitulate and reduce their effort (O'Keefe & Viscusi & Zeckhauser, 1984).

After we have discussed the relation of complexity on pay differentials and have further analyzed why those incentives are enforced by variable and stock-based components, we finally challenge our theory by discussing other explanations that might produce similar results. Hence, the following question arises: Are those in charge of designing executive pay really confronted with the tradeoff of monitoring difficulties and collaboration or do any other mechanisms lead to the observed relations? Marginal productivity theory assumes that an individual should be paid commensurate to his incremental value to an organization (Fama, 1980). As the return to executive talents increases with complexity, highly complex companies look for executives with the highest marginal products. Under the assumption of an efficient market for managerial talents this leads to a higher remuneration for the more talented managers in more complex firms (Rosen, 1982). However, high levels of complexity do not only call for an extremely talented CEO but also affect the members of her TMT. Therefore, we argue that an increase in complexity may justify higher absolute levels of pay but not larger pay spreads.

An alternative interpretation of our findings can be deduced from the extensive stream of literature dealing with "managerial power". This approach relaxes the assumption that compensation packages reflect the needs of an organization. Instead, it is argued that the higher the power of the CEO the more she can dictate pay (Bebchuk & Fried, 2004; Döscher & Friedl, 2011). Among others, the level of managerial entrenchment is a factor that influences CEO's power. A more complex business environment renders the experiences and the firm-specific knowledge of a CEO more valuable. Hence, the probability of replacing a CEO decreases (Shleifer & Vishny, 1989). Highly entrenched CEOs can use their power to boost pay. Again, the question arises why the pay of – similarly entrenched – TMT members

shouldn't increase as well. The key to the solution may be that a CEO's self-importance does not so much depend on absolute pay levels than on relative pay gaps (Hayward & Hambrick, 1997). Future research is needed to include variables that measure the CEO's power in order to separate the impact of complexity on pay spreads into its two parts. On the one side the effect based on the rationale of pay setters that have to cope with monitoring problems and on the other side the pay spread resulting from CEO's power and the associated actions.

Like all empirical research, our study has some limitations. For instance, our study focuses on executive compensation spreads in large, publicly listed firms in Germany. Future research is needed to show whether firms of different sizes and in different corporate governance contexts exhibit similar pay spreads among the CEO and the TMT. Although we control for firm-fixed effects and time effects, we do not capture the ability of the CEO or the TMT in cases where the CEO is replaced or the TMT composition changed. It might be fruitful to incorporate the characteristics of all TMT members in more detail. The age, educational background and working positions might be factors that impact tournaments and the associated incentives. Again, a need for further research is indicated.

2.6 Concluding Remarks

The objective of our study is to understand the influence of complexity on the pay spreads between the CEO and the other members of the TMT. The conceptual development of our hypotheses is based on tournament theory. Reconsidering the theoretical work on tournament incentives we find two opposing effects concerning the impact of complexity. On the one side, the basic model of tournament theory shows that tournament-like compensation structures alleviate monitoring difficulties due to their relative performance character. Since those monitoring difficulties increase with increasing complexity a higher pay spread as measure for tournament incentives is expected. On the other side, several model extensions that incorporate interpersonal actions identify drawbacks of tournaments as the pay spreads foster competition and harm teamwork, collaboration and cohesiveness. Since these aspects gain in importance with more complex business environments, a negative relation between complexity and pay spreads can be assumed.

We observe significant relations between six indicators for complexity and the *Total Compensation Spread*. However, the results are surprising in the sense that we find partial support for both versions of tournament theory with a seemingly stronger evidence for the theory's original idea of using pay spreads as monitoring device. With respect to the drivers of these pay spreads we see an impact of complexity on the spread of variable compensation and, to some extent, also on stock-based compensation.

An important avenue for future research will be a more detailed analysis of the interactions between tournament and performance-based incentives. Questions like "What determines the choice of a company to use promotion of performance-based incentives or both?" or "How do these two types of incentives interact?" desire a detailed understanding.

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3 ESSAY 2

TOP MANAGEMENT TEAM PAY, INCENTIVES AND FIRM PERFORMANCE – A COMPREHENSIVE ANALYSIS

Abstract

This study examines the effect of managerial pay on firm performance. We analyze four incentives sources that are induced by the compensation of the Top Management Team (TMT). Namely, we analyze the impact on firm performance of the degree the team's interests are aligned with those of the shareholders, the pay spread between the CEO and the remaining team, the pay dispersion among the non-CEO executives, and the level of TMT compensation simultaneously. Our model controls for the relevant variables and addresses potential problems of endogeneity with an instrument variable approach. We show that alignment and TMT compensation are positively related to firm performance, and that pay dispersion is negatively associated with performance. For our results that are not in line with former studies, we demonstrate that the differences are caused by methodological shortcomings of the related investigations.

Keywords: Executive Compensation; Top Management Team; Pay Incentives; Tournaments

This essay is based on a common working paper with Peyam Marefati. I have developed the idea, collected and prepared large parts of the data, designed and partly run the analyses and written the paper. As we have planned to submit this paper together, I, again, use the plural narrative.

3.1 Introduction

Top management pay is a compelling topic of interest in the current economic climate. The public media, politicians, practitioners, and researchers are fascinated by the high and steadily-increasing salaries top executives receive annually. While the question of appropriateness is a widely-discussed topic in the media (for a valuable discussion, see Maug & Albrecht, 2011), research has mainly focused on two aspects: the antecedents and the consequences of CEO and team pay (for an overview, see Devers et al., 2007). Motivated by the statement “[...] the consequences of executive compensation [...] are in some ways more central to the concerns of organizational and strategy scholars. In fact, top executive pay may potentially impact firm performance [...]” Finkelstein & Hambrick & Cannella, 2009 (p.330), this study focuses on the relation between executive pay and firm performance. Insights in this relation are not only relevant for scholars; practitioners are especially interested in the mechanisms that are induced by pay and lead to different performance levels. This study aims to clarify the effects of different monetary incentives on firm performance and thereby addresses the overarching research question of how TMT compensation affects firm performance. More precisely, we build our study on four different pay-induced incentive mechanisms that are independently analyzed in previous research. First, we refer to the principal agent theory and the resulting optimal contracting approach that requires the alignment of manager’s and owner’s interests (Berle & Means, 1932; Jensen & Meckling, 1976; Core & Guay & Larcker, 2003). Namely, we follow previous research (for instance, Kale & Reis & Venkateswaran, 2009) and test the impact of the level of the management team alignment through equity incentives on firm performance. The second and third incentive sources incorporate the allocation patterns within the team that are shown to significantly impact a firm’s output (for instance, Bognanno, 2001; Shaw & Gupta & Delery, 2002). On the one hand, the pay spread between the CEO and the remaining TMT might either induce a motivational effect based on tournament structures between the TMT members (Lazear & Rosen, 1981) or diminish teamwork (Henderson & Fredrickson, 2001) and hence, impact firm performance. On the other hand, the compensation pattern among the non-CEO team members is shown to impact firm performance. Based on theories from the field of psychology, such as the social comparison from Festinger, 1954, previous research has shown that managers tend to be inequity-adverse and as a consequence, pay dispersion results in

declined firm performance (for instance, Siegel & Hambrick, 2005). Fourth, we argue that the absolute pay levels of the TMT motivate the team members and thus, impact firm performance (Sharma & Huang, 2010).

For each of those incentive sources there exist various studies that analyze the effect on performance. As demonstrated more detailed in the following chapter, previous research has revealed contrary results in all of the four investigation areas. This study aims to shed light on the interactions between the incentive effects. We claim that isolated analyses of single incentive components might lead to misleading results. The new and distinctive approach of our analysis is of conceptual nature on the one side and of methodical nature on the other side. By comprehensively testing the effects of different incentive sources, we scale down the potential pitfall that an underlying relation between an influencing and the dependent variable is assigned to another variable or not separated clearly. We argue, for instance, that an exclusive analysis of tournament incentives (for instance, Kale & Reis & Venkateswaran, 2009) might lead to wrong results. The control of the level of compensation is indispensable. Otherwise the effect that stems from the pay level is assigned to the tournament incentive.¹¹ The methodical differentiation is the use of state-of-the-art regression types. As analysis with performance as dependent variable are faced an endogenous problem, we have chosen an instrument variable approach to address this issue.

This study contributes to the existing literature in several ways. First, to our knowledge, this is the first study that analyzes these different incentive sources simultaneously. We posit that this more holistic approach contributes to a deeper understanding of the effectiveness of different incentive sources. We show that omitting of one of these variables leads to biased results, as the variation caused by the omitted variables is assigned to another incentive source and thereby, cast a different light on the results of several previous studies. Second, we show that use of the sophisticated empirical methods coping with endogeneity lead to different results. Again, this challenges the results of former research. Third, in contrast with studies

¹¹ The following example is meant to illustrate this effect. In firm A the CEO has an annual compensation of 10 Mil. EUR, the average TMT member earns 8 Mil. EUR. Firm B's CEO receives 2 Mil. EUR a year, while the average pay of the remaining team members is 1 Mil. EUR. An investigation analyzing tournament incentives without controlling for the level of compensation would treat the pay difference in firm A as higher tournament incentive than in firm B. The effect that the level of compensation might influence the performance is mixed with the tournament incentive itself.

using US data, we cover the entire TMT – instead of the five best paid managers – and argue that the team as the strategic apex of an organization (Mintzberg, 1973) is responsible for firm performance. Thus, we posit that through the incorporation of all relevant decisions makers and their interactions our results are more accurate. Finally, we are one of the first investigations that focus on the impact of pay-based incentives on performance in Germany. Therefore, the results deliver valuable insights for German compensation designers and are of further interest as all firms in the sample have a two-tier board system. As a consequence, this study provides a foundation for comparing different mechanisms in different board systems.

3.2 Theory and Hypotheses

Although the antecedents of top executive pay are analyzed in detail in several academic disciplines and from many perspectives¹², understanding the consequences of executive remuneration is central to the concerns of practitioner and researchers. Both, anecdotal evidence (for instance, Tichy & Sherman, 1993) as well as previous research show that the top executives of a firm significantly influence firm performance (for a discussion about impact of executives, see Finkelstein & Hambrick & Cannella, 2009). A well-cited example of the importance of talented executives for successful companies was the role of Steve Jobs at Apple. Announcements about his state of health and his resignation led to dramatic changes to the company's stock price.¹³ In contrast with Lieberman & O'Connor, 1972 whose research demonstrates the small effects of executives on organizational outcomes, subsequent research has proven the relevance of executives (for instance, see Gupta & Govindarajan, 1984; Nguyen & Nielsen).

That said, the question what drives the manager to work hard and in a way that leads to higher performance levels is central to this paper. There is no doubt that numerous other aspects other than pay affect the manager's motivation and their impact on firm performance. For instance, previous research has proven the extent to which managers are self-driven

¹² The work of Berle & Means, 1932 was the starting point of research on this topic from an economic perspective. The studies on executive compensation from a social-psychological perspective go back to Barnard, 1938. For a political view on executive remuneration, see Finkelstein & Hambrick, 1988 or Bebchuk & Fried, 2004.

¹³ The announcement of Jobs' resignation led to a stock price drop of over five percent in one day.

(Donaldson & Lorsch, 1983; Finkelstein & Hambrick, 1988), the need for power (Ungson & Steers, 1984), and the desire to build a good reputation (Fama, 1980) to be determinants of manager motivation. In addition to those causes, we posit that the design of the compensation contracts, as well as the pay allocations within the team are predictors of firm performance.

The analysis of the wealth of literature that addresses this relationship reveals neither a theoretical nor an empirical consensus. Agency theory assumes that remuneration contracts with performance-contingent components provide incentives to maximize shareholder wealth (Fama & Jensen, 1983; Holmström, 1979).¹⁴ Numerous empirical studies have tested this relationship and report mixed results. For instance, Kale & Reis & Venkateswaran, 2009 shows that firm performance is positively associated with alignment – as a result of share-based compensation. Contradictory and more differentiated results are shown in several studies that relax the generalized underlying incentive assumption and instead examine under which circumstances alignment incentives lead to the desired effect of increased performance (Leonard, 1990; Carpenter, 2000).

Other streams of literature broaden their view by exploring the top manager's role as part of a team. The perception of each team member about his remuneration compared to the CEO and to his peers undoubtedly has an impact on the pay-performance relationship. On the one hand, the pay spread between the CEO and the remaining team members – which we call pay differentials in the remainder – has been analyzed from different perspectives. Based on tournament theory (Lazear & Rosen, 1981) a higher spread motivates the team members to outperform their peers in order to win the competition for CEO succession. Other studies have analyzed pay differentials from a behavioral view – based on equity theory (Adams, 1966) and distributive justice (for instance, Kulik & Ambrose, 1992) – and predict negative relationships between pay gap and performance. Again, empirical results are mixed (Bebchuk & Cremers & Peyer, 2011; Main & O'Reilly III & Wade, 1993); for an interesting study with competing hypotheses see Henderson & Fredrickson, 2001). On the other hand, pay dispersion, defined as the horizontal pay spreads within the non-CEO TMT members, has

¹⁴ While the basic models of agency theory assume the motivation of the managers to be one-dimensional and simple, the evolution of this research stream has revealed more fine-grained and differentiated results (for instance, Edmans & Gabaix & Landier, 2009). Although there is a large debate of how the performance-contingent components should be designed, advocates of agency theory agree about the general superiority of interest-aligned compensation packages.

been investigated in several studies. Although the intensity of variances in pay is contingent on certain circumstances, all studies have found that social comparison processes seem to take place in TMTs. Consequently, unequally distributed pay structures within the team have negative impacts on motivation and collaboration, resulting in decreased firm performance (Shaw & Gupta & Delery, 2002; Siegel & Hambrick, 2005).

In addition, the absolute pay levels of executives also seem to play an important role with respect to their motivation. Donaldson & Lorsch, 1983 (p. 23) argues that “the desire to win or excel takes the form of an almost personal comparison with peers and friends who are the CEOs of other companies”. As the total compensation of an executive presents the scorecard for managerial success (Lawler, 1966), the total pay motivates the manager.

Armed with these different theoretical and empirical foundations, we believe that it is promising to analyze the different effects of pay simultaneously for two reasons. First, this addresses empirical issues, as isolated tests of one incentive effect might be biased through other underlying mechanisms. A well-known example is a test that solely analyzes the consequences of pay differentials on performance. By measuring the differences in pay, the effects of the absolute level and the composition of pay are totally ignored. Nevertheless these two effects might influence the performance. The resulting variance of performance is entirely assigned to the tournament mechanisms therefore results might be biased. Prendergast, 1999 and Gibbs, 1994 argue that empirical tournament results tend to be biased when the incentives from total pay are neglected and controlled for. Sharma & Huang, 2010 show that the consideration of this effect could turn significant positive results to significant negative ones. Second, the simultaneous analysis helps to explain the rationale of those responsible for the compensation design. Assuming that the different incentives mechanisms are taken into account, there are several hypotheses for how the different incentives are suited to be combined or not. As a result, in the following section we provide hypotheses for each incentive – alignment, pay differentials, pay dispersion, and level of compensation.

Alignment Incentives

The theoretical foundation that motivates the use of alignment incentives goes back to agency theory. Based on the separation of an organization's shareholding and management (first discussed by Berle & Means, 1932), the congruence of management and shareholder goals is no longer guaranteed (for an overview of non-congruent behaviors see Shleifer & Vishny, 1997). In addition, information asymmetries arise as the management is better informed than the owners. The problems caused by the delegation of management can be addressed in two ways – monitoring and alignment. The rationale behind the concept of alignment is to tie the remuneration of the management to the goal of the owner, which is assumed to be the maximization of firm performance. As a consequence, the manager gets incentives in the manner that decisions that maximize his own wealth simultaneously maximize shareholder's wealth. Murphy presents two ways of “explicitly” tying compensation to firm performance. The first option is bonus payments that are based on firm performance – either any share-based measurement or any accounting return that is highly correlated with current and future stock development. Second, share-based remunerations are used to increase the executive's ownership. In general, managers receive a part of their annual compensation in form of stocks or stock options. As a consequence, the manager's wealth is related to the shareholder's wealth as the manager experiences stock-price appreciations through their own portfolio of stocks and options. In the remainder of this paper, we use the nomenclature of previous studies and call this incentive type “Alignment” (Kale & Reis & Venkateswaran, 2009), although “Interest Alignment” would describe this incentive more precisely.

In accordance with previous literature, we focus on the alignment incentives that are caused by the sensitivity of a manager's equity ownership to stock price changes (Kale & Reis

& Venkateswaran, 2009). We do not include bonuses in our analysis.^{15,16} We do not expand on the existing literature that analyzes the diverse mechanisms and incentive effects of the several instruments such as phantom stocks, restricted stock plans, stock appreciation rights or stock option plans (for instance, Feltham & Wu, 2001; Hall & Murphy, 2003). We instead wish to add to the literature stream that analyzes whether there is a positive association between managerial stockholdings and firm performance. We include all kinds of equity instruments. The composition of the manager's portfolio in terms of the proportion of options, shares, and other instruments is of lower importance for our analysis. As we measure the total change in wealth in absolute values¹⁷ the different incentive effects as the leverage effect of options is implicitly included (Hall & Liebman, 1998). As of yet there is no empirical consensus on the impact of ownership and firm performance (Core & Guay & Larcker, 2003). We therefore venture to hypothesize that:

H01: Alignment is positively related to firm performance.

Incentives from Pay Differentials

Besides the individual incentives that are induced by individual contracts and the resulting equity alignment of the manager, we assert that the pay allocation within the team have substantial influence on a managers' motivation and resulting firm performance. Pay differentials, a measure that expresses the compensation distance between the CEO and the remaining team¹⁸, can be a double-edged sword (for a more detailed analysis of pay spreads

¹⁵ The rationale behind this decision is somehow related to an issue of measurement. Bonuses intend to reward the managers for his past performance. Shared-based components should rather motivate the manager to work hard in the following periods in order to achieve a high performance level. Hence, manager's equity is assumed to be a good proxy for subsequent performance. In opposition, the bonus paid is not connected to future performance. It is rather the underlying contract that guarantees a bonus when a target performance is met. As the exact details of the underlying bonus function are not publicly available, it difficult to measure the motivation effect of the bonuses. One approach is to calculate a pay-for-performance sensitivity on manager level (Aggarwal & Samwick, 2003). This is not possible for this study due to two reasons. First, long time periods are necessary (for instance, Janakiraman & Lambert & Larcker, 1992). Second, the results are non-time variant coefficients for every executive. Those would be omitted in a fixed-effects regression.

¹⁶ Although a vast body of evidence documents that the incentive effect equity is higher than the incentives of bonuses (Murphy, 1985; Jensen & Murphy, 1990; Hall & Liebman, 1998) in the German landscape the use of share-based remuneration has not reached the same extent as in the US. Hence, the incentives stemming from annual bonus contracts might play a more important role than expected by explaining the performance.

¹⁷ For the detailed operationalization, see chapter Measures.

¹⁸ The plurality of potential operationalizations and the exact definition in this paper are presented in more detail in the following chapter.

from different perspectives, see Henderson & Fredrickson, 2001). On the one hand, the basic implications from tournament theory show that pay spreads motivate the team members to increase their effort. In the work of Lazear & Rosen, 1981 managers are assumed to be contestants in the tournament of CEO succession; the CEO pay can be interpreted as the prize of competition. In this intriguing paper Lazear and Rosen argue that tournament-induced incentives elicit additional effort, reduce shirking and as a result, increase the output. The incentives increase with an increasing pay spread. Empirical studies have proven this positive relationship between pay spread and firm performance over the last decades. In addition to support from this theory in the field of sports (Ehrenberg & Bognanno, 1990; Becker & Huselid, 1992; Dietl et al., 2011), this association has also been demonstrated for TMTs in different geographic environments (for US studies, Main & O'Reilly III & Wade, 1993; Lee & Lev & Yeo, 2008; Kale & Reis & Venkateswaran, 2009; Pissaris & Jeffus & Gleason, 2010; for a Chinese study, see Qingfeng & Jiao & Zhirui, 2010, for European studies, see Eriksson, 1999; Bingley & Eriksson, 2001; Heyman, 2005).

On the other hand, several research streams predict negative performance implications from higher pay differentials. First, model extensions have incorporated behavioral aspects and found several pitfalls of tournaments, such as sabotage or decreased collaboration (Nalebuff & Stiglitz, 1983; Dye, 1984; Lazear, 1989). Second, behavioral theories such as equity theory (Adams, 1966) and relative deprivation theory (Crosby, 1984; Cowherd & Levine, 1992; Martin, 1982) predict a negative relationship between the pay differentials and firm performance. This is also verified in both empirical (Carpenter & Sanders, 2004; Bebchuk & Cremers & Peyer, 2011; Sharma & Huang, 2010) and experimental studies (Harbring & Irlenbusch, 2011). Based on these contradictory argumentations, we put present the following pair of hypotheses:

H02: The higher the pay differentials, the higher the firm performance.

H03: The higher the pay differentials, the lower the firm performance.

Incentives from Pay Dispersion

The horizontal pay spread among the non-CEO team members - pay dispersion - is another factor of pay allocation within the team that affects performance. The mechanism that relates pay dispersion and team performance can be explained by the concept of social comparison (Festinger, 1954). Based on this fundamental work a plurality of research in the field of sociology has found evidence that egalitarian pay distributions are superior to pay inequality. Equality fosters social integration within the group, establishes stability and facilitates teamwork and collaboration (Deutsch, 1975; Leventhal, 1976, Harder, 1992). All these studies have concluded that there is a negative relationship between pay dispersion and performance. Several empirical studies have transferred those rationales from field of sociology to TMT research. Again, the results are mixed. In line with the above argumentation Shaw & Gupta & Delery, 2002 and Siegel & Hambrick, 2005 show that pay dispersion is negatively related to performance, especially when the work of the team members necessitates coordination within the team. In contrast, Kale & Reis & Venkateswaran, 2009 found a positive relationship between pay dispersion and performance, measured as Tobin's Q. Following the existing criticism of this work (Sharma & Huang, 2010), we claim that the incentive effects could be biased in Kale's study as the absolute level of pay is not controlled for. We therefore conclude that investigating all incentives mechanisms comprehensively confirms the intuitive mechanisms of social comparison and therefore present the following hypothesis:

H04: The higher the pay dispersion, the lower the firm performance.

Incentives from Individual Compensation Levels

The absolute individual level of pay is the fourth incentive effect we shed light on in our analysis. Current experimental research shows that an intentionally chosen high pay level – even non-performance-contingent – results in a higher effort level (Harbring & Irlenbusch, 2011). Additionally, the total pay package of a manager acts as his scorecard for managerial success (Lawler, 1966). Assuming an efficient labor market for managers, a high pay level indicates a high-ability manager. Those enjoying this reputation are even more willing to keep

this standing and thus, increase their effort. Of particular importance is the fact that the total remuneration consisting of performance-contingent pay underpins the relationship that high pay is a signal for a capable manager and therefore, allows the prediction of high performance. This incentive source is important for investigating the effects of pay on performance for two reasons. First, previous research has shown that a significant impact of this individual effect exists (Ehrenberg & Bognanno, 1990; Becker & Huselid, 1992). Second, Sharma & Huang, 2010 have shown that ignoring the size effect by investigating tournament incentives could lead to incorrect results as the parts of the relation between the pay level and performance are assigned to the tournament effect. We go a step further and argue that besides a potential falsification of tournament results, one also runs the risk of calculating biased results for the other incentive sources. An intuitive example is the relationship of pay dispersion and the individual incentive effects. Assume two identical firms, A and B. The highest paid VP at firm A (B) has a total compensation of 5 Mil. EUR (1 Mil. EUR). The worst paid VP at firm A (B) has a total pay of 4.5 Mil. EUR (0.5 Mil. EUR). Measuring the pay dispersion as absolute horizontal pay spread completely ignores the relative difference in pay. The consideration of the individual levels of pay controls for this problem. In addition to the importance as control variable, we follow the above argumentation and come up with the following hypothesis:

H05: The higher the absolute pay levels, the higher the firm performance.

3.3 Methods

3.3.1 Data and Sample

The data comprise of firms from the two German indices DAX and MDAX over the years 2006-2009. Due to missing individual compensation data the number of unique firms is reduced from 80 to 67. Due to other reason of missing compensation data¹⁹, a total of 257 firm-year observations have been included in the majority of regression analyses. As a result,

¹⁹ There are three reasons for missing compensation data. First, the firm has taken the 'opting out' option. This means that the firm is released to disclose individual compensation data for every executive based on a two-third majority of votes at the annual stockholders' meeting. Second, some companies were not forced to disclose their compensation on an individual basis due to their legal form in any of the observed years. Third, a few companies were founded after 2006.

63 firm-year observations were incomplete and have therefore been excluded. The final data set covered 93 CEOs as well as 445 VPs.

Due to a missing database with compensation data, the individual compensation as well as several independent and control variables of the executives were hand-collected from the annual reports. To guarantee accuracy an independent reviewer checked the collected data. In addition, a descriptive study of the hand-collected data is published annually in the public press and thereby, a review of the associated companies takes place. In order to use the right pay-for-performance measure, we enriched the compensation data with director's dealings for each individual based on a comprehensive table of the Federal Agency for Financial Market Supervision (BaFin). The interest data required to calculate the alignment measure was provided by the German Federal Bank (Deutsche Bundesbank). For the financial data, we used Thomson Worldscope and Datastream.

Although our sample does not seem very large at a first glance, we maintain that we have a high level of representation for German public companies. The market capitalization of the DAX and MDAX represents approximately 95% of the total German market capitalization. Furthermore, we have a high variation in terms of size. The smallest company listed in our sample has about half of the market capitalization of the smallest S&P 500 company.

3.3.2 Measures

Dependent variables

Following the precedent set by previous research we use *ROA* (for instance, Gerhart & Milkovich, 1990) as an accounting performance measure and *Tobin's Q* (for instance, Morck & Shleifer & Vishny, 1988) as a market performance measure for our analyses. *ROA* is

defined as net income divided by total assets; *Tobin's Q* is defined as the sum of market value of equity and book value of debt divided by total assets.²⁰

Independent variables

To measure the pay-performance sensitivity we refer to existing research (Kale & Reis & Venkateswaran, 2009) and calculate the *Alignment* of the average TMT member as follows:

$$\text{Alignment} = \frac{\text{No. of shares held} + \text{Option delta} * \text{No. of options held}}{\text{Shares outstanding}} * \text{€ 100}$$

Thus, *Alignment* shows the average TMT members' change in wealth to a 100 EUR change in shareholder wealth induced by the manager's portfolio of shares and options.²¹ In most annual reports the amount of shares held by an executive is not disclosed. We therefore sum all shares that the managers have received during the time as TMT member and correct those amounts by the director's dealings.²² The induced alignment incentives from options are contingent on the delta of an option and the amount of options in the portfolio of the manager. The option delta represents the amount of change in the option value if the price of the underlying changes by 1 EUR. We build on previous research (Canyon & Murphy, 2000) by calculating this value with the modified Black-Scholes option pricing.²³ Although the determination of the amount of options at the beginning of the year is straightforward²⁴, some further assumptions have to be made. First, regarding the number of options attained before 2006, we assume the average amount of stock options granted during 2006 to 2009. Second,

²⁰ With this definition, we follow previous research that deviates from the original definition of Tobin's Q which uses the replacement cost instead of the total assets as the denominator. Current research shows that this adjustment might have a significant impact as the accounting rules in place are conservative. For an interesting study see McNichols & Rajan & Reichelstein, 2010.

²¹ In line with previous research, we ignore the conditions of restricted share-based compensation.

²² Due to the disclosure regulation in Germany, data for share-based compensation can only be accessed from 2006 onwards. For all years before 2006 we assume that the executive has received the average amount of shares attained during 2006-2009 in all years after the firm's IPO in which he was a managing board member.

²³ We used the actual annual interest rate of a five-year German Government Bond as a risk-free rate, the annualized standard deviation of 60 monthly total stock returns (Kale & Reis & Venkateswaran, 2009) as volatility and the actual maturity, strike price and vesting period of each single option to calculate the option delta. For all options granted before 2006 we assumed the average maturity of all options granted in 2006-2009.

²⁴ The number of options at the beginning of the year consists of the amount of option at time t-1 plus the options granted during the fiscal year plus the net amount of options bought / sold.

we assume those options to be “at the money” with spot prices at the end of the fiscal year as strike prices and thereby refer to Hall & Liebman, 1998. Third, in line with previous research (Carpenter, 1998; Hall & Murphy, 2002) we assume that the option is exercised if it is in the money after the blocking period, as the managers are typically less diversified than outside investors. Fourth, options allocated before 2006 are only considered from 2000 onwards. Other than a few exceptions all options mature in less than six years. We therefore argue that stock options allocated in 1999 would have matured in 2004 and therefore would not have induced any alignment incentives in the sample period.

Among the several operationalizations of *Pay Differentials*, we follow Kale & Reis & Venkateswaran, 2009 and define the CEO pay spread as the difference between CEO total compensation and the median of the total compensation of the remaining team. Total compensation includes fixed salary, annual bonus, and share-based compensation valued with its fair value at the time granted. We use the second common definition – the difference between the CEO compensation and the mean of the total compensation of the remaining team – for robustness checks (Bognanno, 2001; Eriksson, 1999).

Pay Dispersion is measured as the coefficient of variation of the non-CEO executives. This operationalization is a common way to measure the allocation within the team (for instance, Henderson & Fredrickson, 2001). The most simplistic way to provide a proxy for the inequality of the compensation among the non-CEO executives – the horizontal spread – is used for robustness checks.

To measure the individual incentives from compensation we refer to Sharma & Huang, 2010 and measure the *TMT Compensation*, defined as:

$$TMT\ compensation = \frac{Total\ Management\ Compensation}{Total\ assets}$$

This measure presents the cost of management (Roberts, 1956). To control for different firm sizes and the corresponding high correlation with the firm’s compensation level, the variable Total Management Compensation is normalized by total assets.

Control variables

We account for the controls that have been proven in the past to have a significant influence on firm performance. Our measure for *Industry Homogeneity* is in line with Parrino, 1997, as it is the partial correlation between the firm's stock returns and the returns of a virtually replicated industry index after controlling for market effects. We use the nine super-sectors of Deutsche Börse AG to regress each firm's monthly return on a particular industry index as well as on market returns. The average of each sample year's partial correlations within the particular super-sector is defined as *Industry Homogeneity*. The *Capital Sales Ratio* describes the relationship between the firm's total assets and its sales. *Leverage* is the ratio of a firm's book value of total debt divided by its book value of equity. *Dividend Yield* and *CEO Age* are self-explanatory. For a similar set of controls and its operationalizations, see Kale & Reis & Venkateswaran, 2009. As the measure for TMT compensation is already scaled by the size of the company, an additional control for size is not necessary (Sharma & Huang, 2010).

3.3.3 Analyses

Analysis of the relationship between pay and performance can suffer from the problem of endogeneity (Palia, 2001). In methodological words, endogeneity is present when the error term of a regression is correlated with any independent variable (Albers, 2009). Out of the several sources for this phenomenon in the executive compensation literature, two common underlying structures can cause this problem. First, omitted variables might lead to biased and inconsistent results (Greene, 2003). As stated by Murphy, 1985, firms design their compensation packages contingent upon rationales that are unknown and not observable. An example of an unobservable but constant firm heterogeneity that might have a significant influence on pay is the philosophy and culture of the compensation committee. The omission of those potential determinants can lead to biased results. Second, the direction of causality or simultaneity between dependent and independent variables might be the root of endogeneity. An annual bonus illustrates this relationship. On the one hand, the annual bonus is dependent on the annual performance. On the other hand, the chance of receiving a bonus motivates the manager to reach a higher performance level. Besides this obvious endogenous relationship, previous literature has shown other interrelated connections between pay and performance.

For instance, Core & Guay & Larcker, 2003 discuss whether the incentives induced by share-based compensation lead to an improved performance, or whether the companies with higher performance expectations use more share-based compensation.

The choices of our econometric models address both issues. Besides controlling for all relevant and observable variables, we use a two-way firm-fixed effects model that controls for firm-specific characteristics. In a methodological context, this means that we assume homogenous coefficients across the firms, but heterogeneous constants.²⁵ In the first set of analyses we use a model with the following form:

$$y_{it} = \alpha_i + \gamma_i + x_{it} \beta + \varepsilon_{it}$$

where y_{it} is the endogenous variable, $i = 1, \dots, N$ is a firm index, $t = 1, \dots, T$ is a year index, α_i is a firm time-invariant effect, γ_i is a time-variant, firm-invariant effect, x_{it} are the observable variables that can vary across i and t and ε_{it} is an idiosyncratic error. In our model we assumed α_i to be the firm-specific dummy variable. To address problems of heteroskedasticity we chose robust estimators. In a second set of analyses, we treated the relationship of pay and performance as endogenous and therefore, implemented a two-stage least squares (2SLS) approach. In the first stage we determined the instruments to use those instead of the original endogenous variables for the second regression. The rationale behind this approach is to replace the endogenous variable with another variable that is correlated with the endogenous variable, but is orthogonal to the residuals (Wooldridge, 2007). The right choice of instruments is essential to address the endogeneity adequately (Albers, 2009). A detailed discussion of instruments for all endogenous variables as well as the relevant assumption tests are provided in the following section.

²⁵ Our choice of the fixed-effects model was confirmed by a Hausman test that showed that the error terms were correlated with the independent variables.

3.4 Results

3.4.1 Summary Statistics

Table 1 presents the means, standard deviations and pair-wise correlations between all dependent and independent variables. To assess potential problems of multicollinearity we observed pair-wise correlations and variance inflation factors (VIF) for each independent variable. According to Cohen, 1992, correlation coefficients higher than 0.3 might indicate multicollinearity. The only correlation coefficient between independent variables that exceeds this critical level is the one between *Alignment* and *TMT Compensation* ($p = 0.52$). By calculating the VIFs, we check for multiple correlation, in opposition to the pair-wise correlation coefficients that analyze the relationship between two variables. The results show the non-existence of multicollinearity problems. The highest VIF (*TMT Compensation*) reaches a value of 2.37 and is well below the conventional critical levels (Chatterjee, 1977). The average VIF is 1.48. The pairwise correlation between *Tobin's Q* and *TMT Compensation* is noteworthy, as the high value of 0.57 is the first indicator that *TMT Compensation* is a driver for firm performance and should not be ignored in this analysis.

Table 1: Means, Standard Deviations, and Correlations of all Variables

This table shows pairwise correlations for all variables used in our analyses. The sample period is from 2006 to 2009 and has 256 firm years. All correlations with $r > 0.13$ are significantly different from zero at the 95% confidence level; all correlations with $r > 0.15$ are significantly different from zero at the 99% confidence level. Pay Differentials equal the natural log of the difference between CEO's and median TMT's pay. TMT Compensation is Total Management Compensation / Total Assets. CEO age is the log of CEO age in the reference year. The variables for each year are dummy variables.

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Tobin's Q	1.43	0.67	1													
2 ROA	0.05	0.06	0.54	1												
3 Alignment	0.06	0.11	0.21	0.17	1											
4 Pay Differentials	6.85	0.89	0.09	0.08	0.02	1										
5 Pay Dispersion	0.14	0.14	-0.06	-0.14	0.01	0.25	1									
6 TMT Compensation	0.002	0.002	0.57	0.32	0.52	-0.09	0.07	1								
7 Industry Homogeneity	0.71	0.23	-0.04	-0.07	-0.01	0.03	0.06	0.10	1							
8 Capital Sales Ratio	3.86	8.71	-0.20	-0.18	-0.13	-0.03	0.05	-0.26	-0.01	1						
9 Volatility	0.33	0.11	-0.05	-0.33	0.26	-0.07	0.06	0.12	0.09	-0.07	1					
10 Dividend Yield	0.02	0.02	-0.13	0.19	-0.11	0.08	-0.15	-0.09	0.01	0.01	-0.23	1				
11 CEO age	1.74	0.05	0.06	0.14	-0.04	0.24	-0.06	-0.04	-0.01	-0.06	-0.10	0.00	1			
12 Year 2007	0.25	0.43	0.06	0.09	0.04	-0.02	0.04	0.04	-0.05	0.03	0.01	0.00	0.00	1		
13 Year 2008	0.25	0.43	0.00	-0.04	0.03	0.07	-0.04	0.01	-0.02	-0.02	0.02	0.08	-0.02	-0.33	1	
14 Year 2009	0.25	0.44	-0.04	-0.01	-0.03	-0.05	0.06	-0.01	0.04	-0.01	0.04	-0.06	0.01	-0.34	-0.34	1

3.4.2 Hypotheses Tests

Table 2 presents the results of the fixed-effects regressions on firm performance. In Model 1 and Model 2 firm performance is defined as *ROA*. *Tobin's Q* is the dependent variable in Model 3 and Model 4. In order to determine the additional explanatory power of our independent variables we first run regressions in Model 1 and Model 3 that separately investigate the impact of our controls.

Table 2: Firm Fixed Regressions on Firm Performance

This table shows Firm Fixed Effects Regressions on Firm Performance. The annexes ***, **, and * symbolize statistical significance at the 1%, 5%, and 10% levels, respectively. All tests are two-tailed. All models are significant ($p < .001$). N = 255.

	<i>ROA</i>		<i>Tobin's Q</i>	
	Model 1	Model 2	Model 3	Model 4
Alignment		0.186*		0.522*
Pay Differentials		0.013		0.048
Pay Dispersion		-0.08**		-0.301*
TMT Compensation		8.454		177.698***
Industry Homogeneity	0.068***	0.053***	0.525***	0.34***
Capital Sales Ratio	0	0.001	-0.005	-0.001
Volatility	-0.154	-0.187*	0.594	0.427
Dividend Yield	0.884***	0.759***	-2.353**	-3.488**
CEO Age	-0.048	-0.117	-1.518**	-2.058**
Year 2007	0.016*	0.017*	0.072	0.054
Year 2008	-0.002	-0.003	-0.023	-0.024
Year 2009	0.007	0.01	-0.03	-0.034
Constant	0.105	0.145	3.575***	4.122**
R ²	0.212	0.3	0.146	0.294

By entering the independent variables we observe an increase of explanatory power from 21.2% to 30% for the ROA analysis; the R² doubled from 14.6% in Model 3 to 29.4% in

Model 4. The positive association of *Alignment* and firm performance (H01) is supported for both variables, *ROA* and *Tobin's Q*. In coefficient in model 2 ($c = 0.19$; $p < 0.1$) indicates an increase of *ROA* of 18.6% with an alignment increase by 1%. The impact of *Alignment* on *Tobin's Q* is at the same significance level ($p < 0.1$) and of a higher magnitude ($c = 0.52$). H02 and H03 are neither supported in Model 2 nor in Model 4. As we have argued before, the inclusion of *TMT Compensation* is essential to measure the separate impact of *Pay Differentials* on firm performance. We therefore rerun Model 2 and Model 4 without including *TMT Compensation*. Both, the regression on *ROA* as well as the regression on *Tobin's Q* support our argument that ignoring the impact of *TMT Compensation* biases the results, in particular the coefficients of *Pay Differentials*. In both models the *Pay Differentials* have a positive significant impact on firm performance (Model 2: $c = 0.02$; $p < 0.1$; Model 4: $c = 0.14$; $p < 0.05$). The hypothesis that posits a negative relationship between *Pay Dispersion* and firm performance (H04) is supported. An increase of the coefficient of variation by 1% leads to a *ROA* decrease of 0.08% ($p < 0.05$) and a *Tobin's Q* decrease of 0.3% ($p < 0.10$). *TMT Compensation* seems to have a highly significant positive impact on *Tobin's Q* ($c = 177.70$; $p < 0.001$), while the association between *TMT compensation* and *ROA* is not significant ($c = 8.45$; $p < 0.21$).

In the following set of analyses the relationship between the three managerial pay variables *Alignment*, *Pay Differentials*, *TMT Compensation* and the performance variables *ROA* and *Tobin's Q* is assumed to be endogenous. Previous work has already investigated these endogenous relationships. Core & Guay & Larcker, 2003 discusses the endogeneity between *Alignment* and performance. Heyman, 2005 analyzes this relationship between *Pay Differentials* and performance. The endogeneity due to simultaneous effects between *TMT Compensation* and performance is discussed in the previous chapter. To account for the potential endogeneity we use two-stage least squares (2SLS) regressions. As finding an appropriate instrument that is valid and relevant is often very difficult (Angrist & Pischke, 2009), we follow the operationalization of previous researchers who identified proper instruments. Analogously to Kale & Reis & Venkateswaran, 2009, we use the *Median Ind. Alignment* as instrument for *Alignment* and *Median Ind. Spread* as an instrument for *Pay Differentials*. Our third variable that is assumed to be endogenous is *TMT Compensation*. Again, the instrument used is the *Median Ind. TMT Compensation*. The rationale behind those

choices stems from Murphy, 1999 who argues that industry is one main determinant of the level and structure of managerial compensation. Table 3 shows the results of the 2SLS regressions. The first three columns present the results and test statistics of the first stage regressions on the potential endogenous variables. The last two columns report second stage results and test statistics of the relationship between our different incentive sources and the performance measures *ROA* and *Tobin's Q* using the fitted values of our first stage regressions instead of the potential endogenous variables.

In order to support our choice of regression method and instruments, we first look at the test statistics. The hypothesis that the estimated specifications for *Alignment*, *Pay Differentials*, and *TMT compensation* are jointly exogenous to firm performance can be rejected with the χ^2 at a 5% level for *Tobin's Q* while the p-value for *ROA* is 0.13. We therefore conclude that the choices of instrumental variables regressions are appropriate. Furthermore, we analyze the relevance of each instrument. The high significance level of *Median Ind. Spread* and *Median Ind. TMT Compensation* in the corresponding first stage regression supports the individual relevance of these instruments. *Median Ind. Alignment* is only significant at the 20% level. In contrast to Kale & Reis & Venkateswaran, 2009 we find that this measure is a weak instrument for *Alignment*. Besides the individual relevance our values of Shea partial R^2 and F-statistics support the joint relevance of our instruments.²⁶ In contrast to the tests that investigate the relevance – the first requirement of instruments – there is no test that can confirm or reject the orthogonality of the instruments and the error term – the second requirement in an exactly identified model²⁷, as the error term is by definition not observable (Wooldridge, 2007).

²⁶ Again, *Median Ind. Alignment* seems to be the weakest instrument variable.

²⁷ An exactly identified model has the same number of instruments as endogenous variables. For the case of an over-identified model (# instruments > # endogenous variables) tests exist. Those tests, for instance the Hansen J-statistics, assume that at least one instrument is valid and then test for the validity of all other instruments. The results of those tests have to be interpreted with caution (Angrist & Pischke, 2009).

Table 3: 2SLS Regressions on Firm Performance

This table shows 2SLS Regressions on Firm Performance. The annexes ***, **, and * symbolize statistical significance at the 1%, 5%, and 10% levels, respectively. All tests are two-tailed. The coefficients of TMT Compensation are multiplied by 100 for better readability. N = 255.

	First Stage			Second Stage	
	Team Alignment	Pay Differentials	TMT Compensation	ROA	Tobin's Q
Alignment				0.419	23.287**
Pay Differentials				0.001	1.363
TMT Compensation				36.674*	91.544
Pay Dispersion	-0.086*	0.909**	0.14**	-0.092**	0.532
Industry Homogeneity	-0.005	0.025	0.016	0.034*	0.186
Capital Sales Ratio	0	-0.018	0	0.001	0.025
Volatility	0.095	0.424	0.035	-0.214*	-2.438
Dividend Yield	0.088	4.552	-0.058	0.745**	-11.468
CEO Age	0.028	1.663	0.131	-0.125	-5.08
Year 2007	0.004	-0.043	0.011	0.012	-0.001
Year 2008	0.002	0.06	0.007	-0.002	-0.116
Year 2009	0.004	-0.095	0.009	0.006	0.032
Constant	0.095	1.483	-0.388	-0.128	-17.714
Median Ind. Alignment	1.048	3.509	-2.101		
Median Ind. Spread	-0.04*	0.704***	0.076**		
Median Ind. TMT Compensation	0.077	1.058	0.822***		
R ²	0.058	0.202	0.234	0.606	₋₂₈
Chi2 (p-value)				5.56 (0.13)	8.03 (0.045)
Shea partial R2	0.008	0.0193	0.0543		
F-statistics	1.81*	2.6***	2.87***		

²⁸ Stata does not report an R² for the regression on Tobin's Q. This is a typical issue for 2SLS analysis, but it is not crucial as the meaning of R² is limited in in the context of 2SLS regressions (Sribney & Wiggins & Drukker, 2011).

Controlling for endogeneity through our instrument variable approach leads to results that differ from the fixed effects regressions in Table 2. The regression on *ROA* supports H04 and H05. An increase of *TMT Compensation* by 1% results in a *ROA* increase of 0.36% ($p > 0.1$). An increase of the coefficient of variation by 1% leads to a *ROA* decrease of 0.09% ($p < 0.05$). H01 is only hypothesis we find support for when using *Tobin's Q* as a performance measure. The *Alignment* coefficient of 23.29 is significant at a 5% level.

3.5 Discussion

Our approach to analyze the different incentives induced by pay reveals interesting insights in the effectiveness of predominant compensation structures. We discuss the results in three parts. First, the variations in the results due to the model specifications are discussed. Second, the results are interpreted economically. Third, the limitations of this work are presented.

Results variation based on methodological specifications. Using the German data panel, we find support for our claim that the right model specifications are essential to understanding the underlying relationships between pay and performance. The endogeneity inherent to this relationship has to be addressed through the right methodology. In Table 4 we show the different results from three different regressions: regular OLS regressions, fixed-effect regressions, and 2SLS regressions.

The three different methodologies address potential endogeneity problems in different ways. The regular OLS regression assumes every observation to be independent from all other observations (Wooldridge, 2007) and thus ignores that several observations of the panel stem from the same entity. As specific firm characteristics might have a significant impact on the pay-performance relationship, omitted variables in the regular OLS might lead to biased results (Greene, 2003). By taking firm fixed effects into account, we control for omitted variables of the firm that are time invariant.

Figure 1: Overview of Results

This table summarizes the results of the OLS, Fixed Effects and 2SLS regressions. “+” indicates a positive relationship; “-“ indicates a negative relationship. Blank cells indicate non-significant results

	OLS		Fixed Effects		2SLS	
	ROA	Tobin's Q	ROA	Tobin's Q	ROA	Tobin's Q
Alignment			+	+		+
Pay Differentials		+				
Pay Dispersion	-	-	-	-	-	
TMT Compensation	+	+		+	+	

The comparison of the OLS and the Fixed Effects results demonstrates that several results turn from significant to non-significant and vice versa.²⁹ Additionally, the pay-performance relationship is characterized by a certain degree of simultaneity as described in previous chapters. The instrument variable approach, namely the 2SLS regressions, captures this problem by reducing / eliminating the endogeneity through the inclusion of instrument variables that fulfill the discussed requirements. Again, the results of these more sophisticated analyses differ from those of the fixed effects regressions as illustrated in Table 4. For instance, H04 and H05 are supported in the regression on Tobin's Q in the fixed effects model, while no support is found in the 2SLS model.

The second crucial aspect of model specifications that we have focused on in this work is the inclusion of all relevant measures. We suggest that the omission of important variables might lead to misinterpreted results and our findings support this. Our comprehensive approach therefore contributes to existing literature as we show that relationships found in previous works do not hold after including these important measures. The specific focus on the *Pay Differentials* illustrates this point. In addition to the fact that *TMT Compensation* itself induces incentives, we refer to the basic argumentation of Prendergast, 1999 and Gibbs, 1994 to undermine the importance of this measure as a control variable for *Pay Differentials*.

²⁹ Besides the change in significance levels, significant changes in the magnitude are observable that are not reported in Table 4.

As described before, the omission of this measure results in inaccurate tournament results, since an effect induced by *TMT Compensation* is assigned to a tournament mechanism. Armed with this rationale, we rerun the fixed effects and 2SLS regressions ignoring the *TMT Compensation* measure – as former researchers have done in the past (Kale & Reis & Venkateswaran, 2009). The results support our conjecture. In contrast to the reported results (the coefficient of *Pay Differentials* is never significant), in three of the four regressions the *Pay Differentials* seem to have a significant positive influence on performance (Fixed Effects regression on ROA: $p = 0.086$; Fixed Effects regression on Tobin's Q: $p = 0.027$; 2SLS regression on ROA: $p = 0.152$; 2SLS regression on Tobin's Q: $p = 0.022$).

Economic interpretation. Focusing on the results of the 2SLS regressions we find support for three of our hypotheses. *Alignment* and *TMT Compensation* positively affect firm performance and *Pay Dispersion* is negatively associated with firm performance. We cannot support one of the competing hypotheses concerning the *Pay Differentials* and its implications on firm performance. We intentionally used one accounting-based and one measure that also incorporates market values to analyze the results. The *Alignment* of the TMT is the only incentive source that affects Tobin's Q. This is in line with the fundamental theory of optimal incentive contracts (Harris & Raviv, 1979). As the name of the incentive source suggests, the manager's and shareholder's interests are aligned via the market value of the firm. The manager is motivated to take actions that are valued by the stock market. Through the change in the market value of the firm the *Tobin's Q* is affected.³⁰

The firm's *ROA* as accounting-based measure is affected by *Pay Dispersion* and *TMT Compensation*. The positive association between the *TMT compensation* and the *ROA* could be explained by the prevalent typical contract design in German companies. The annual bonuses are mostly dependent on annual accounting measures such as net income. Higher remuneration is typically caused by higher bonuses. Armed with this understanding, the positive impact is again, in line with agency theory. The prospect of a high annual bonus motivates the manager to take actions that influence the accounting performance of the current year, knowing that an improved performance result leads to a desired bonus level.

³⁰ The results of the regression analyses not only show that firms with more aligned management teams have higher values of the Tobin's Q, but it especially proves that an alignment increase within one company leads to an increase of the Tobin's Q.

Compared to similar US studies our results are in line with the adage ‘you get what you measure and reward’ (Wallace, 1997). US companies typically have bonus systems that are more focused on stock price performance than on accounting metrics. In this vein, previous studies have found support for the idea that a higher level of *TMT Compensation* leads to a higher *Tobin’s Q* for US companies (Sharma & Huang, 2010). Reversing these arguments raises the possibility that in Germany, more accounting-based systems motivate the TMT to optimize accounting figures that are by nature more short-term. In contrast, the typical US remuneration system induces effective incentives for creating long-run decisions that lead to a market value increase.

Our results concerning *Pay Dispersion* are in accordance with previous research. The fact that the allocations pattern within the team is related to firm performance undermines the baseline hypothesis that psychological effects of the single team members play an important role in motivation and thus, the resulting performance. Based on the concept of social comparison (Festinger, 1954) we find support for previous research results (Shaw & Gupta & Delery, 2002; Siegel & Hambrick, 2005) that show that *Pay Dispersion* is negatively associated to firm performance. We argue that, particularly in TMTs, the design of remunerations contracts should not follow the fundamental idea of “marginal utility” compensation but rather incorporate potential negative performance implications due to the inner workings and psychological effects within the team.

Limitations. This study finds promising results about the effectiveness of the different incentive sources induced by managerial pay, but it also has some limitations. First, our sample is relatively small. In future research both a larger number of firms as well as a longer time horizon would be desirable to verify the robustness of the findings. Second, we follow Leonard, 1990 and his assertion that “an incentive system that ameliorates the principal-agent problem creates greater incentives for executives to maximize profits, and so increases profits”. By doing so, we assume simplistic mechanisms that translate certain pay characteristics to firm performance. On the one hand, we do neglect individual executive and group characteristics. For instance, the incentive effect resulting from an alignment through stocks and options is probably contingent on the absolute private wealth of an executive and the proportion of equity of their own firm. On the other hand, we do not shed light on the

mechanism of how highly motivated managers are translating their behavior to firm performance. We agree with Finkelstein & Hambrick & Cannella, 2009 that numerous intervening mechanisms might impact the investigated relationship. Nevertheless, our findings support the idea that there is an underlying systematic relationship between the pay and the performance. It is an avenue of future research, especially field research, to gain a deeper understanding about under which circumstances the different incentive sources are effective. Third, as in all studies that use instrument variable regressions, the choice of the instruments is questionable. In particular, our instrument for alignment does not fulfill one of the desired properties. Future work should concentrate on finding more instruments to check the results for their robustness.

3.6 Concluding Remarks

In the wide field of research on managerial pay we focus on the probably most interesting part – the consequences of pay. In detail, we analyze a question that both practitioners and researchers are interested in: How does managerial pay affect performance? In this vein, we investigate the effect of four different incentive sources that lead to different pay levels and allocation schemes within the TMT on firm performance. Namely, we analyze the alignment incentives, the CEO pay spread, dispersion within the team, and the total TMT compensation. With our regressions we contribute to existing literature in several ways. We extend existing literature in this area by using novel methodologies and a more holistic model that promises better results. We show that these alterations render some previous research results as invalid (Kale & Reis & Venkateswaran, 2009). We hope that the results of these analyses will help provide a better understanding of the effectiveness of different incentive sources. We find that TMT compensation and alignment positively affect firm performance, while pay dispersion is negatively associated with firm performance. Furthermore, to our knowledge, we are the first study that analyzes these relationships with German data. As German remuneration contracts systematically differ from the compensation structures in the US, we have the chance to analyze the motivational effects on the TMT in this context. We find support for the well-known credo ‘you get what you measure and reward’ (Wallace, 1997).

3.7 References

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4 **ESSAY 3**

ANTECEDENTS AND CONSEQUENCES OF THE CFO'S ROLE IN THE TOP MANAGEMENT TEAM

Abstract

This study examines the relative importance of CFOs within Top Management Teams, measured by the pay spread between the CFO and the remaining team members. On the one side, this paper sheds light on the antecedents of this pay spread by identifying the determinants. On the other side, the impact of this pay difference on firm performance is investigated. We find evidence that those responsible for the TMT compensation packages tend to award the CFO with a superior position compared to his peers when firm characteristics require a high-ability CFO, when a powerful CEO is in place, and when a hierarchical-dominated pay culture is existent. The impact of the CFO pay spread on firm performance is contingent on firm characteristics. We reveal under which conditions the CFO pay spread is positively/ negatively associated with firm performance. The results have substantial practical implications for compensation designers, in addition to having potentially theoretical relevance to the understanding of the inner workings of the TMT.

Keywords: Chief Financial Officer; Executive Compensation; Top Management Team

This essay is based on a common working paper with Prof. Dr. Anja Tuschke and Prof. Dr. Gunther Friedl. I have collected and prepared most of the data, designed and run the analyses and worked out the first draft of the paper. As we submitted this paper together, I, again, use the plural narrative.

4.1 Introduction

Over the last few decades, executive compensation has received enormous attention (for an overview see (Devers et al., 2007). Although the Chief Executive Officer (CEO) was the key point of interest in most of these studies, the compensation of Top Management Teams (TMT) has more often been examined in recent work (for instance, Carpenter & Sanders, 2004). We expand on this stream of literature by analyzing the role of the Chief Financial Officer (CFO) – measured by the compensation compared to his peers – within the team. An increased interest in the CFO in recent years has resulted in several remarkable studies dealing with this C-level executive. Besides the popular research stream about CFO turnover – with its causes (Mian, 2001; Matsumura & Shin & Wu, 2009; Zander et al., 2009) and its consequences (Geiger & North, 2006) – current studies shed light on CFO's compensation. In a series of analyses the development of the CFO's remuneration and the associated incentives effects are analyzed (Carter & Lynch & Zechman, 2009; Indjejikian & Matejka, 2009).³¹ For instance, Gore & Matsunaga & Yeung, 2011 find that CFOs get fewer incentives when the remaining managing team and the CEO in particular have more financial expertise. Another stream addresses the impact of CFO's compensation incentives on earning management (Petroni & Jiang & Yanyan Wang, 2010; Feng et al., 2011); on future company crashes Kim & Li & Zhang, 2011 and corporate policies (Chava & Purnanandam, 2010). For instance, Chava & Purnanandam, 2010 find that risk incentives induced by stock option packages lead to a riskier financial firm policy.

There is no study that analyzes the CFO's role within the team. Motivated by the increased popularity of the CFO in world of academia, through anecdotal evidence³², and special attention from the public media with headlines like “Have chief financial officers ever mattered more?” (The Economist, 10/30/2008) or “CFOs are enjoying larger pay gains than other C-level executives, for good reason” (CFO-Magazine, 11/01/2008), we analyze the antecedents and the consequences of the CFO's position within the TMT. We measure his relative position as pay spread between his remuneration and the average of the remaining non-CEO executives. We first address the questions under which circumstances the CFO is

³¹ Most of the analyses are for US companies and are motivated by the Sarbanes Oxley Acts of 2002.

³² Many companies in our sample have a three-hierarchy pay allocation within the team. The first rank holds the CEO, followed by the CFO. The remaining team members – the third level – receive identical packages.

rewarded with a superior position. Second, we analyze whether firms benefit from setting the CFO apart from the remaining team. This combination of analyses provides the unique opportunity to deepen the understanding of the rationales of the compensation designers that reward CFOs with a special role and to evaluate those rationales based on the results of the actual CFO's impact on firm performance under certain conditions.

Our analyses reveal new insights with respect to CFO's pay. First, we show that a CFO is rewarded with a higher compensation compared to his colleagues when certain firm, team, and governance characteristics are predominant. The CFO pay spread is greater in highly levered firms, in firms with a high level of financial transactions, and firms that have to deal with foreign currency adjustments. In addition, the power of the CEO and the CFO's relative tenure as team characteristics are associated with his compensation difference to the remaining team. The pay differential between CEO and the team – as an indicator for tournament incentives – is also associated with the relative position of the CFO. Additionally, we find performance implications of the CFO pay spread. In highly levered firms a superior role of the CFO is associated with increased firm performance. In contrast, the privileged position of the CFO has a negative impact on performance when a high level of investment activities and a volatile environment is predominant. Combining the results of the analyses, we show that the underlying rationales of those in charge of compensation design have different effectiveness'. For instance, firm's tendency to reward CFOs in highly levered firms leads to improved performance. In opposition, the predominant structure of providing the CFO a superior role within the TMT when the level of investment activities is high results in a decreased performance.

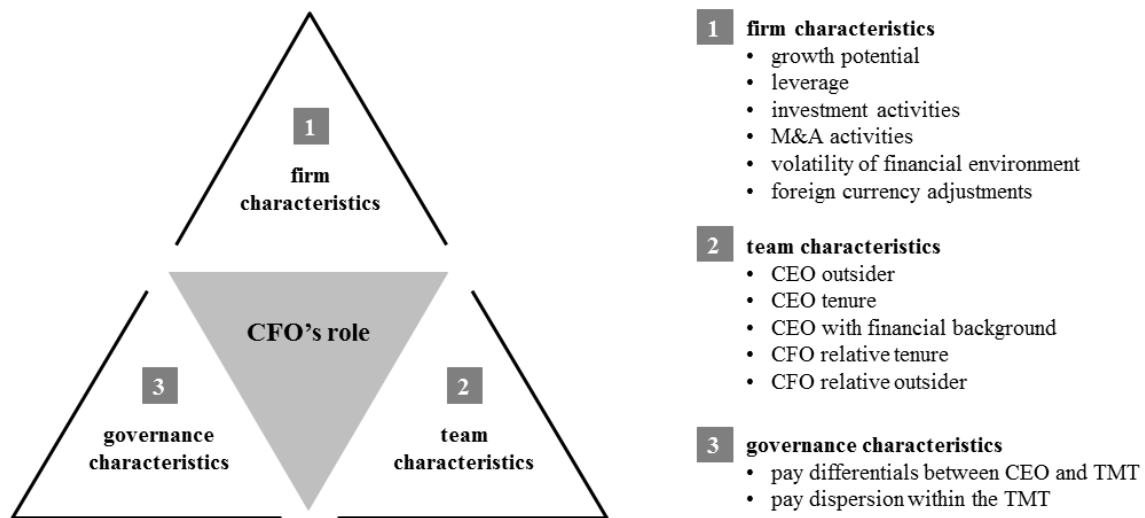
This study extends the existing literature in several ways. First, to our knowledge, this is the first study to examine the determinants of the relative importance of the CFO – measured by his compensation – within the group of top executives. Hence, we contribute to existing literature by providing further insights of the mechanisms that influence the pay allocation within the TMT. Second, we find that the CFO's role – especially under certain conditions – has an impact on firm performance. In this context, we broaden the vast stream of literature that focuses on the question: How does TMT compensation affect performance? Consequently, this study has important implications for those in charge of designing the

compensation packages of the TMT by revealing the effectiveness' of a superior role under certain conditions. Third, our German sample differentiates our work from existing studies about TMT compensation. As we include all TMT members in our analyses and are not restricted to the five best-paid managers (as in most US studies, like e.g. Bognanno, 2001; Main & O'Reilly III & Wade, 1993); we gain a deeper insight in the inner workings of the team.

4.2 Theory and Hypotheses

4.2.1 Antecedents of CFO's role

As we want to shed light on the relative role of the CFO within the TMT, this study focuses on the pay gap between the CFO and the average remaining TMT members (CEO excluded). We aim to identify those determinants that explain this spread. We do not attempt to expand on the large body of literature that analyzes absolute pay levels of top executives (for instance, Andreas & Rapp & Wolff, 2010 for the German market); rather we investigate the inner workings of the team by explaining the factors that affect the relative position of the CFO. This position is a result of a complex function that incorporates multiple dimensions. As shown in Figure 1, we divide the determinants in three types. First, firm characteristics and the impact of the environment result in different challenges of diverse complexities for the CFO and the remaining TMT. Second, the characteristics of the team members impact the compensation differences within the team. Besides the characteristics of the CFO herself, the remaining team, and the CEO in particular should be analyzed to deepen the understanding of the distribution of power and the associated pay allocation among the executives. Third, governance structures have been shown to have a significant impact on the compensation of executives (Canyon & Peck, 1998; Kraft & Niederprüm, 1999). In this section we focus on former literature that analyzes different incentive schemes that are induced by the pay distribution within the TMT, such as e.g. tournament incentives (Canyon & Peck & Sadler, 2001; Qingfeng & Jiao & Zhirui, 2010; Kale & Reis & Venkateswaran, 2009). We assume that the existence of those structures influence the position of the CFO.

Figure 1: Overview of the antecedents of the CFO's role

Firm characteristics

Since the impact of firm characteristics on CEO compensation has been extensively investigated, we rely on the rationale behind previous studies. We argue that the CFO becomes more important – reflected in higher compensation compared to the remaining team – as her position is increasingly characterized by high levels of managerial discretion, defined by Finkelstein & Boyd, 1998 as “latitude of action in making strategic choices”. This argument is three-fold. First, a wider range of options increases the potential marginal product of the CFO and requires a manager with higher cognitive abilities. As high marginal products of executives are compensated by the labor market, it seems likely that CFO’s importance increases with the discretion (Fama, 1980; Frank, 1984; Finkelstein & Hambrick, 1989). Second, the manager’s job is riskier if the organizational outcomes are more contingent on his actions. This is in line with agency theory which states that the higher the uncertainty of a position, the higher the remuneration for the job (Prendergast, 2002; Antle & Smith, 1986). Third, managerial discretion has been shown to be a moderator of the pay-for-performance relationship (Hambrick & Finkelstein, 1987). Those in charge of compensation design tend to make the pay of executives more contingent on performance when managers have a potential impact on firm performance (Boyd & Salamin, 2001; Cho & Shen, 2007). A higher proportion of performance-contingent pay leads to higher compensations in times of good

performance.³³ As a consequence, a CFO coping with higher managerial discretion than his team members should receive a higher compensation. Furthermore, we suggest that the complexity of the CFO's tasks is a driver for his position. This argument differs from the managerial discretion argument as it does not focus on the range of options, but on how challenging the job is. Nevertheless, the consequence is similar: a more demanding position requires a more capable manager. To hire and retain a CFO with adequate abilities, a firm's higher willingness to pay leads to a higher compensation of the CFO. Based on these lines of argumentation that managerial discretion and the need for ability are drivers of the CFO's relative importance within the team, we hypothesize positive relationships between indicators for CFO's discretion or skill demands and the CFO's role within the team in the following abstracts.

Growth Potential refers to the set of investment opportunities available to a firm and is analyzed as an approximation for the CEO's ability (Gaver & Gaver, 1995; Smith & Watts, 1992) and her managerial discretion (Finkelstein & Boyd, 1998). We posit that besides a high-ability CEO, growth potential also requires a talented CFO. He is the one in charge of processing the glut of information about the different investment opportunities. It is her responsibility to evaluate the potential future investments and to choose the most fruitful among the opportunities. The dependence of future organizational outcomes on the CFO's decisions forces those in charge of the composition of the TMT to attract a high-ability CFO and to compensate him adequately. In this context, we hypothesize:

H01: The higher the growth potential of a firm, the greater the relative importance of the CFO and his compensation, respectively.

Leverage is the next indicator that predicts an increased importance of the CFO compared to his peers. Managing the financial transactions of a highly-leveraged firm necessitates a high level of technical knowledge and experience. A CFO's skill of communicating with investors, shareholders, and rating agencies becomes more essential for highly levered firms since disappointing reports have a higher impact on the valuation of

³³ By measuring the compensation by including all stock-based compensations with the value of the time there were granted, this argument only holds for bonuses.

those stakeholders. As a result, we assume a relationship between the firm's leverage and the relative importance of the CFO.

H02: The higher the degree of leverage of a firm, the greater the relative importance of the CFO and his compensation, respectively.

The major challenges of the CFO are associated with the financial decisions and transactions. We split those activities in two types. On the one side we capture *Investment Activity* that represents the scope of investments that the CFO is faced with. In contrast to growth potential and associated investment opportunities, in this hypothesis we focus on the current scope of investment activities that need to be coordinated. The CFO plays a crucial role in terms of evaluating, choosing, and processing new investments. Both the argument of a higher managerial discretion, as well as the increased job demand, predict a positive relationship between the level of investment activities and the relative position of the CFO. We also investigate *M&A Activity* – investments that reach beyond the regular scope of investments. The success of those financial transactions requires an outstanding skillset of the CFO for several reasons. First, he is responsible for the negotiations of the deal. As the final deal is determined by the negotiation skills of the involved parties (Uhlenbruck & de Castro, 1998), a CFO's discretion is large and consequently, calls for a high-ability manager. Second, the accounting treatment of mergers and acquisitions are highly complex. A CFO, as head of these transactions, has to have a comprehensive and highly sophisticated knowledge of the corresponding accounting rules (Gore et al, 2011). Third, managing the financial integration of the acquired company or the merger, respectively, is a demanding task. By executing the integration the CFO is faced with a range of possible options. As a smooth processing was shown to be essential to the firm (Shrivastava, 1993), the CFO needs coordinative skills as well as the relevant accounting knowledge. Hence, we hypothesize the following pair of relations:

H03: The higher the investment activities, the greater the relative importance of the CFO and his compensation, respectively.

H04: The more the firm is involved in M&A activities, the greater the relative importance of the CFO and his compensation, respectively.

Volatility of the financial environment is shown to positively influence director's pay (Brick & Palmon & Wald, 2006). Besides the usual line of argumentation that risk-averse managers need to be compensated for additional risk (for a detailed discussion, see Prendergast, 2002), we argue that stock volatility is an indicator for the complexity of a CFO's position. The CFO is the responsible executive who communicates with the financial markets. Therefore, we claim that the volatility of the financial environment is a driver for the internal importance of the CFO and hypothesize:

H05: The higher the volatility of the financial environment, the greater the relative importance of the CFO and his compensation, respectively.

Foreign currency adjustments seem to be another indicator for the complexity of the CFO's position. As soon as financial activities take place in foreign currencies, companies bear the risk of changing exchange rates. The hedging of this risk necessitates a CFO with proper knowledge of the different hedging instruments. Forwards, swaps, options and more exotic derivatives are used to minimize the exchange rate risk or rather to speculate on a certain development of those rates. It is shown that several CFOs in place are not familiar with the plurality of hedging instruments (Loderer & Pichler, 2000). Hence, a firm that has to cope with currency risks is reliant on a CFO with the necessary expertise. For this reason, we follow the analog line of argumentation that increased job complexity of the CFO results in a superior CFO position.

H06: The more foreign currency adjustments take place, the greater the relative importance of the CFO and his compensation, respectively.

Team characteristics

The CEO as head of the TMT is highly involved in the decisions about appointments and dismissals of TMT member and furthermore, shapes the culture (Finkelstein, 1992) and the allocation of power by his leadership (Finkelstein & Hambrick & Cannella, 2009). Due to the CEO's extraordinary position within the TMT we posit that her characteristics influence the relative importance of the CFO and his relative compensation, respectively.

We assume two characteristics of the CEO to have an impact on the CFO's role. First, the power of the CEO has an impact on the TMT (Hambrick & D'Aveni, 1992). Based on existing literature, a negative impact of CEO's power on CFO's position is deducible. Implications of the upper echelon research in the field of hubris and narcissism (Hayward & Hambrick, 1997; Chatterjee & Hambrick, 2007) suggest that a powerful CEO tends to inhibit the raise of the CFO. As it has been proven that outsider CEOs (*CEO Outsider*) and CEOs with higher tenure (*CEO Tenure*) are more powerful (Shen & Cannella, 2002; Hill & Phan, 1991), we conclude the following pair of hypotheses:

H07: The presence of a CEO outsider is negatively related to the relative importance of the CFO and his compensation, respectively.

H08: The higher the CEO tenure, the lower the relative importance of the CFO and his compensation, respectively.

Second, we cast light on the educational background of the CEO (*CEO Educational Background*) and its impact on the CFO's compensation within the TMT. Based on two opposing rationales we have competing hypotheses. On the one side, the upper echelon theory (Hambrick & Mason, 1984) posits a CEO with a background to run the company with a focus on financial figures. A CEO that attaches importance to those financials also emphasizes the CFO position compared to the remaining team. Hence, an educational background in business of the CEO leads to a higher CFO compensation.

From an agency theory perspective, a CEO or those in charge of the composition of the TMT are aware that a CEO without educational background lacks the ability to monitor the actions appropriately due to his lack of specialized education (Gore & Matsunaga & Yeung, 2011). The work of Gore & Matsunaga & Yeung, 2011 provides evidence that the CFO incentives are higher, if the CEO in place lacks an educational background in business. Beyond that, we argue that the lack of proper monitoring of the CFO's actions strengthens the need of the firm to attract a high-ability manager as head of finance. Again, this results in a higher relative compensation for the CFO. Armed with those opposing rationales, we develop the following competing hypotheses:

H09-a: The presence of a CEO with educational background in business is positively related to the relative importance of the CFO and his compensation, respectively.

H09-b: The presence of a CEO with educational background in business is negatively related to the relative importance of the CFO and his compensation, respectively.

In order to deepen the understanding of the determinants of the CFO's role – expressed by his relative importance – it is imperative to include the characteristics of the CFO himself as well as those of the remaining team. Past research has shown that manager's tenure (Waldman et al., 2001) has crucial impact on pay. Based on several underlying rationales like entrenchment (Bebchuk & Fried, 2004), learning (Murphy, 1986) or career concerns (Gibbons & Murphy, 1992) a positive relation between tenure and pay has been proven. In addition, the presence of an outsider manager is positively related to the director's pay (for instance, Sridharan, 1996). As our emphasis is on the standing of the CFO within the team, we argue that the relative relationships of those measures predict the CFO's role. Hence, our indicators for the relative performance are no longer the CFO's tenure or the method of his appointment, but rather whether he has been with the company (*CFO Relative Tenure*) longer than his peers and whether the method of his appointment differs from that of the remaining team members (*CFO Relative Outsider*). Those rationales result in the following hypotheses:

H10: The higher the CFO's tenure compared to the average tenure of the TMT, the greater the relative importance of the CFO and his compensation, respectively.

H11: The presence of a TMT that largely consists of outsider/insider and a CFO insider/outsider is negatively/positively related to the relative importance of the CFO and his compensation, respectively.

Governance characteristics

We also posit that the governance structures of a company impact the CFO's compensation, measured relative to his peers. We analyze the rationales of those in charge of designing the TMT compensation. Previous research reveals that the pay pattern among the

TMT members is taken into account by the compensation designers and furthermore, shaped intentionally (for instance, Bognanno, 2001, Kale & Reis & Venkateswaran, 2009). An observed pay pattern is strict two-level pay pattern. The CEO receives the highest salary while all other TMT members are compensated with the same amount. This phenomenon cannot be fully explained by the typical drivers such as tenure, age or ability, as those typically vary within the TMT members. This implies that pay allocation within the group is taken into consideration when the single compensation contract is designed.

Referring to Finkelstein & Hambrick & Cannella, 2009 we distinguish between two types of distributions: pay differentials as the gap between the CEO and the remaining team (*CEO Pay Spread*) and *Pay Dispersion* as the variation within the group - excluding the CEO. Those companies that prioritize establishing an atmosphere that facilitates collaboration and comprehensiveness tend to avoid pay differentials (for a good overview of several underlying theories, see Henderson & Fredrickson, 2001) as well as pay dispersion (Bloom, 1999). Referring to tournament theory (Lazear & Rosen, 1981) pay gaps lead to an increased competition among the team members. This might foster improved effort induced by the “competition” but this environment in which peers are regarded as opponents also diminishes teamwork (Lazear, 1989). Hence, a company that considers the interactions of the team as a crucial component of their success chooses the gap between the CEO and his executive colleagues to be moderate. Additionally, previous research has shown that *Pay Dispersion* negatively impacts the performance of a firm (Siegel & Hambrick, 2005). We argue in line with Hambrick & Finkelstein, 1995 that those in charge of the compensation of a company whose success is reliant on the social integration of the group will reduce the variance of the TMT compensation. As the distribution of the team's compensation is designed to foster teamwork, the CFO is less likely to be awarded through a superior role – in terms of compensation – within the team. This leads us to the following hypotheses:

H12: The higher the pay gap between the CEO and the remaining TMT, the higher the relative importance of the CFO and his compensation, respectively.

H13: The higher the pay dispersion within the TMT, the higher the relative importance of the CFO and his compensation, respectively.

4.2.2 Consequences of CFO's role on firm performance

Does the superior role of the CFO have any implications on the performance of a firm? A review of past research on executive turnover suggests a positive relationship between the CFO position and firm performance. Numerous other studies have shown that firm performance has no or a very small effect on the dismissal of the non-CEO TMT members (Fee & Hadlock, 2004). Studies that analyze the relationship between firm performance and the dismissal of CFOs provide evidence that the extent of the company's success has a significant influence on the likelihood of the CFO's dismissal (Zander et al., 2009; Mian, 2001). In reverse, we argue that companies seem to be aware of the CFO's impact on performance under certain conditions. Consequently, high ability CFOs are hired in order to cope with a complex environment and high internal requirements. That said, we investigate the relationship between the demands on the CFO position, CFO pay gaps and firm performance.

We suggest two possibilities of this relationship. On the one side, we claim the CFO's role to be the mediator for the firm characteristics, our measures that represent the demands of the job position. This relationship indicates that a superior CFO role within the team has a general positive impact on firm performance. This conjecture can be based on the former argumentation that underlines the increased importance of today's CFOs. Combined with the arguments of H01 – H06 that predict certain firm characteristics to be a driver of the CFO pay gap, we obtain a mediated relationship: firm characteristics \rightarrow CFO's role \rightarrow firm performance. This introduces the following hypothesis:

H14: There is a positive relation between the CFO's role and firm performance, one that mediates the effect of firm characteristics.

On the other side, the impact of the CFO's relative importance within the TMT is supposed to be a moderator. In this context, we no longer assume a universal positive impact of the CFO position on firm performance, but we argue that a dominant CFO is essential to the success of a company, if the discussed characteristics undermine the importance of the CFO's activities. The moderated relationship – firm characteristics \times CFO's role \rightarrow firm performance – result in the following hypothesis:

H15: The interaction of the CFO's role and the characteristics of the firm is positively related with firm performance.

4.3 Methods

4.3.1 Data and Sample

The data sample consists of 320 firm years. We analyze the 80 biggest German stock companies that were listed in the two biggest German indices DAX and MDAX in 2008. We collected data for the years 2006 through 2009 and ended up with an unbalanced panel of 53 groups and 186 firm-year observations due to the following reasons. First, 15 companies do not report information on individual compensation. Given the approval of a two-third majority of votes at the annual stockholders' meeting, the TMT is released from disclosing individual compensation data for every executive. Fifteen firms have chosen this opting-out option for the 2008 fiscal year. Thirteen of these 15 firms were listed in the smaller MDAX. The comparison of means with respect to the *firm size* verifies the assumption that smaller firms tend to choose the opting-out option more often. Second, some companies were not forced to disclose their compensation on an individual basis due to their legal form in any of the observed years. Third, a few companies were founded or listed after 2006.³⁴ Fourth, we drop firm-years in which the firm was acquired, merged or filed for bankruptcy. Fifth, some firms had a TMT consisting of two members. Hence, a spread between the CFO and the remaining team members does not exist.

Nevertheless, we argue that our sample has a high level of representativeness for German listed companies. The market capitalization of the DAX and MDAX represents approximately 95% of the total German market capitalization. Furthermore, we have a high variation in terms of firm size. The smallest company listed in our sample has about the half of the market capitalization of the smallest S&P 500 company.³⁵ Since there is no German pendant to the ExecuComp database for compensation data in the United States, we hand-

³⁴ For instance, Tognum was founded in 2006 and listed in 2007.

³⁵ This relation is based on the market capitalizations of Oct., 30th 2010. Praktiker Holding, the smallest company in the sample, has a market capitalization of 395 Mil. EUR. The NY Times shows a value of \$ 798 m.

collected the compensation data for each executive under study as well as several independent and control variables on the basis of annual reports. A second independent reviewer verified the accuracy of the collected data. Additionally, the collected data was published every year in a descriptive study in the public press. We received no claims from the companies we reported about and hence, assume this as a further indicator for the accuracy of our data. For the financial data, we used the databases Thomson Worldscope and Datastream.

4.3.2 Measures

Dependent variables

Hypotheses 01 through 13 involve the relative importance of the CFO within the group. We measure the CFO's position within the TMT by subtracting the average total compensation of all TMT members except the CEO and the CFO from the total compensation of the CFO (*CFO Pay Spread*). By using this operationalization of the pay gap, we refer to research in the area of tournament incentives and follow the most common measure used by several studies (for instance, Main & O'Reilly III & Wade, 1993; Bognanno, 2001; Eriksson, 1999). Total compensation includes fixed compensation, variable compensation and share-based compensation.

There are two noteworthy aspects of our measure. First, we include all executives in our definition of TMT that are part of the executive committee. We argue that this inner circle is the apex of the organization that is in charge of the strategic decision-making and responsible for firm performance. As this group of executives often consists of more than five managers our work differs from existing literature as we include all TMT members, rather than the five best-paid (for instance, Kale & Reis & Venkateswaran, 2009). Second, all stock-based compensation components included in our analyses are assessed more accurately than in previous work. Stock options or any other form of stock-based compensation components are used to incentivize executives to work hard on behalf of the company. Since the remuneration of an executive depends on an ex-ante uncertain company performance, stock-based compensation is difficult to assess. Related research (Lambert & Larcker & Weigelt, 1993; Henderson & Fredrickson, 2001) has used different types of proxies to value stock plans,

stock options or performance shares. For instance, Henderson & Fredrickson, 2001 use 25% of the exercise price of stock options and valued performance shares by multiplying the performance units with the target value. Stocked-based remuneration has gained popularity in the last few decades (Hall & Liebman, 1998; Sanders & Tuschke, 2007) and the design of these compensation measures has become more complex. Individual hurdle rates that are sometimes based on the company's share price development or an index of peer group performance need to be taken into consideration. Hence, simple proxies are no longer capable of reflecting a realistic value of the respective stock-based compensation components. As all firms under study apply International Financial Accounting Standards (IFRS) and are required to report the fair value of all stock-based compensation components, we have confidence in the accuracy of the data.

Firm performance, the dependent variable in hypotheses H14 and H15, is measured by annual *ROA*. By using these common measures we adhere to the methods of related research in order to guarantee comparability (for instance, Bebchuk & Cremers & Peyer, 2011, Kale & Reis & Venkateswaran, 2009).

Independent variables

The first independent variable, *Growth Potential*, is defined as the market to book ratio and measured as the market value of equity plus total liabilities divided by total assets. We follow previous work on executive compensation that used this indicator (Ryan, JR. & Wiggins III, 2004; Linck & Netter & Yang, 2008). *Leverage* is the book value of debt scaled by the book value of equity (Gore & Matsunaga & Yeung, 2011). The operationalization of *Investment Activities* is the capital investment activity, which is the most common measure used in related studies (Henderson & Fredrickson, 2001). It is defined as annual capital expenditures divided by annual sales multiplied by 100 to measure this indicator as a percentage.³⁶ The second measure of financial transactions, *M&A Activities*, is measured by a dummy variable. This dummy variable is equal to 1 if the company had net assets from

³⁶ In contrast to other studies we have not excluded financial institutions. As we use regression analyses that control for the institution itself, the differences in balance sheets and P&Ls that stem from characteristics of different industries are implicitly controlled for.

acquisitions in the previous, current, or following year. By using this three year horizon, we reduce the potential for endogeneity problems as we describe a firm characteristic rather than the decision made for a single year. Furthermore, we argue this corridor to be representative since the CFO's activities range from preparations over execution to integration of the acquired firm. A similar measure is used in Gore & Matsunaga & Yeung, 2011. We measure *Volatility* as monthly stock price return (Erhemjamts & Gupta & Tumennasan, 2011). The indicator that measures CFO's activities based on *Foreign Currency* is the proportion of sales generated from operations in foreign countries as a percentage (Carpenter & Sanders, 2002).

The first independent variable in the group of the TMT characteristics, *CEO Outsider*, is measured by a dummy variable. A CEO is defined as an outsider if she has worked less than one year in the firm prior to becoming CEO (Hambrick & Finkelstein, 1995). *CEO Tenure* is measured as the years of the CEO in office (Finkelstein & Hambrick, 1989). Whether the CEO has an educational background in finance or not (*CEO Educational Background*) is measured by a dummy variable that equals 1 if the CEO has an educational background in business education and 0 otherwise. To measure the relative tenure of the CFO (*CFO Relative Tenure*) the average tenure of the TMT (without the CFO and CEO) is subtracted from the CFO's tenure. Hence, this value is above 0 if the CFO is longer in office as the average TMT member. We use an analog method to calculate the relation of CFO's outside appointment and those of the remaining TMT (*CFO Relative Outsider*). We determine the outsider dummy variable for each manager and subtract the average value of the TMT (without CFO and CEO) from the CFO's dummy. Hence, all values are in the range from -1 (CFO insider, remaining TMT members outsiders) and 1 (CFO outsider, remaining TMT members insider).

For the operationalization of the variables we subsume as governance characteristics we follow related research. *CEO Pay Spread* is defined as the absolute gap between the CEO and remaining team (Bognanno, 2001; Eriksson, 1999). *Pay Dispersion* is measured as coefficient of variation of TMT compensation - including the CFO, excluding the CEO (Henderson & Fredrickson, 2001).

Control variables

Although it is not obvious that the compensation of the CFO is more contingent on firm performance than the remuneration of her peers, we include the *ROA* of the current year to control for firm performance as its impact on compensation has previously been shown (for instance, Jensen & Murphy, 1990). As we measure the *CFO Pay Spread* in absolute terms, differences in levels of executive pay have to be considered. We assume that the level of TMT pay is positively correlated with the extent of the absolute spreads. To achieve our goal of identifying the determinants of the relative position, we isolate this effect as we include a control for *Average TMT Compensation* in our model. In addition, we included year variable dummies with 2006 as reference year.

In the regressions on the firm performance we include some further control variables beside the year dummy variables and the performance of the current year to purely measure the influence of the CFO pay spread, the firm characteristics and their interactions. Past research has revealed that the *Average TMT Compensation* (Sharma & Huang, 2010), *CEO Tenure* (Waldman et al., 2001), *CEO Pay Spread* (Kale & Reis & Venkateswaran, 2009), and *Pay Dispersion* (Lee & Lev & Yeo, 2008) influence firm performance. Hence, in our model those effects are controlled for.

4.3.3 Analyses

The wide range of literature on executive compensation and patterns within the team illustrates that there are numerous theories and explanation approaches. The “one approach” that perfectly explains the prevalent compensation designs has not been identified yet. The existing plurality of company-specific compensation patterns is hardly observable or testable (Murphy, 1985). Following this assumption, it is essential to eliminate the particularities of each firm. For instance, Greene, 2003 shows that omitting unobserved heterogeneity might lead to biased and inconsistent results. Thus, for our broad range of firms over the span of four years we applied linear models that allow for firm heterogeneity. The two-way firm-fixed effects model can be written as follows:

$$y_{it} = \alpha_i + \gamma_i + x_{it} \beta + \varepsilon_{it}$$

where y_{it} is the endogenous variable, $i = 1, \dots, N$ is a firm index, $t = 1, \dots, T$ is a year index, α_i is a firm time-invariant effect, γ_i is a time-variant, firm-invariant effect, x_{it} are the observable variables that can vary across i and t and ε_{it} is an idiosyncratic error. In our model we assume α_i to be a firm specific dummy variable. To address problems of heteroskedasticity we choose robust estimators.

In our second set of regressions firm performance is the endogenous variable. The investigated CFO pay spread is an endogenously determined variable that might be influenced by firm performance. We account for endogeneity problems by designing our model in several ways. First, we use future rather than contemporaneous performance measures. Second, we control for the current performance. Third, we include firm fixed effects, effectively measuring how the changes of the CFO position changes with the firm performance. Fourth, we add many additional controls that could affect the endogenous choice of pay spreads.

4.4 Results

4.4.1 Summary Statistics

Table 1 presents the means, standard deviations and pairwise correlations between all dependent and independent variables.

Table 1: Means, Standard Deviations, and Correlations of all Variables

This table shows the pairwise correlations for all variables used in our analyses. The sample period is from 2006 to 2009 and has 186 firm years. All correlations with $r > 0.14$ are significantly different from zero at the 95% confidence level; all correlations with $r > 0.24$ are significantly different from zero at the 99% confidence level. CFO pay spread, CEO pay spread and average tmt compensation is measured in 1,000 EUR units. M&A Activity, CEO Outsider, CEO Tenure, CEO Educational Background and the variables for each year are dummy variables.

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9
1 CFO pay spread	54.12	322.03	1								
2 ROA, $t+1$	4.98	5.49	0.00	1							
3 Tobin's Q, $t+1$	2.12	8.36	-0.12	0.12	1						
4 Growth Potential	2.25	1.27	-0.06	0.56	-0.08	1					
5 Leverage	3.48	4.09	-0.06	0.04	-0.02	0.16	1				
6 Investment Activity	10.54	34.55	0.12	-0.11	-0.03	-0.07	0.01	1			
7 M&A Activitiy	0.85	0.36	0.07	0.03	-0.29	0.24	0.01	0.04	1		
8 Volatility	1.68	2.28	0.00	0.01	-0.05	0.06	-0.17	-0.02	-0.05	1	
9 Foreign Currency	54.02	23.28	0.10	-0.02	0.14	-0.10	-0.21	-0.18	-0.20	0.12	1
10 CEO Outsider	0.23	0.42	-0.03	0.01	-0.06	0.08	0.33	0.25	0.08	-0.04	-0.38
11 CEO Tenure	5.80	6.11	-0.01	0.23	-0.03	0.08	0.11	-0.08	-0.01	-0.07	-0.21
12 CEO Educational Background	0.51	0.50	0.08	-0.10	-0.14	-0.18	-0.24	0.15	-0.08	0.12	0.03
13 CFO Relative Tenure	-0.03	4.91	0.28	-0.25	-0.05	-0.22	-0.16	0.11	-0.18	0.02	0.13
14 CFO Relative Outsider	0.26	0.57	-0.06	0.09	0.18	0.22	0.04	0.12	0.15	0.15	0.00
15 CEO Pay Spread	1371.86	1336.80	0.07	0.14	-0.04	0.26	-0.27	-0.06	0.15	0.35	0.12
16 Pay Dispersion	0.15	0.15	-0.02	0.10	-0.03	0.07	0.20	-0.03	0.22	-0.05	-0.27
17 ROA	5.22	6.52	0.08	0.69	-0.04	0.47	-0.08	-0.03	0.03	0.09	-0.03
18 Average TMT Compensation	1594.52	863.72	-0.11	0.05	0.00	0.13	-0.53	-0.03	0.03	0.20	0.27
19 Year 2007	0.26	0.44	0.04	0.08	0.02	0.23	-0.03	0.07	-0.03	0.00	-0.04
20 Year 2008	0.25	0.44	0.09	-0.24	0.02	-0.29	0.00	0.00	0.04	0.14	0.01
21 Year 2009	0.25	0.43	-0.14	-0.04	-0.07	-0.11	-0.03	-0.05	0.07	-0.05	0.03

Table 1: Means, Standard Deviations, and Correlations of all Variables (continued)

This table shows the pairwise correlations for all variables used in our analyses. The sample period is from 2006 to 2009 and has 186 firm years. All correlations with $r > 0.14$ are significantly different from zero at the 95% confidence level; all correlations with $r > 0.24$ are significantly different from zero at the 99% confidence level. CFO pay spread, CEO pay spread and average tmt compensation is measured in 1,000 EUR units. M&A Activity, CEO Outsider, CEO Tenure, CEO Educational Background and the variables for each year are dummy variables.

Variable	Mean	s.d.	10	11	12	13	14	15	16	17	18	19	20	21
10 CEO Outsider	0.23	0.42	1											
11 CEO Tenure	5.80	6.11	0.20	1										
12 CEO Educational Background	0.51	0.50	-0.14	-0.06	1									
13 CFO Relative Tenure	-0.03	4.91	-0.08	-0.09	0.18	1								
14 CFO Relative Outsider	0.26	0.57	-0.01	-0.26	0.22	-0.08	1							
15 CEO Pay Spread	1371.86	1336.80	0.02	0.03	-0.03	-0.18	-0.02	1						
16 Pay Dispersion	0.15	0.15	0.20	0.12	-0.16	-0.11	-0.15	0.25	1					
17 ROA	5.22	6.52	-0.06	0.22	-0.09	-0.18	-0.04	0.17	0.07	1				
18 Average TMT Compensation	1594.52	863.72	-0.25	-0.23	0.26	0.14	0.14	0.46	-0.17	0.07	1			
19 Year 2007	0.26	0.44	-0.08	0.02	-0.01	-0.01	0.02	0.06	0.02	0.18	0.10	1		
20 Year 2008	0.25	0.44	0.01	-0.01	0.02	0.07	0.00	-0.03	-0.01	0.03	-0.02	-0.34	1	
21 Year 2009	0.25	0.43	0.08	0.00	0.01	0.00	0.02	-0.10	-0.02	-0.31	-0.07	-0.34	-0.33	1

To assess potential problems of multicollinearity we first observe the pairwise correlations of the independent variables. Cohen, 1992 states that correlation coefficients higher than 0.3 might indicate multicollinearity. Five coefficients are modestly higher than 0.3.³⁷ As the correlation matrix is appropriate to prove the relation between two variables, our second test assesses for multiple correlations. We calculate the variance inflation factors (VIF) for each independent variable. The results prove that multicollinearity is not an issue. The highest VIF (average tmt compensation) reaches a value of 2.37 and is well below the conventional critical levels (Chatterjee, 1977).

4.4.2 Hypotheses Tests

Table 2 presents the results of the fixed-effects regressions of the firm, team and, governance characteristics variables on the *CFO Pay Spread*. In Model 1 we analyze the impact of the controls. We observe an increase of explanation power from 11% to 37% by entering the independent variables in Model 2.

Four of the six hypotheses that assume a positive relationship between firm characteristics and the relative CFO position are supported. *Leverage* (H02) and *Investment Activity* (H03) are significant on a 5% level. The coefficient for *Leverage* of 38.219 implies that the compensation spread between CFO and the remaining TMT members increases on average by 38,22 EUR with an increase of the ratio of book value of debt and the book value of equity by 1. The *Investment Activity* seems to be a good predictor for the *CFO Pay Spread*: a 1% increase of the capital investment activity is associated with an increase of the CFO spread by 1,59 EUR. Furthermore, the results support a strong relationship between *M&A Activity* (H04) and the *CFO Pay Spread*. A pay spread between CFOs and the remaining team is 104.981 EUR higher in companies that are involved in M&A activities ($p < 0.1$). We also observe the complexity due to *Foreign Currency* (H06) adjustments to be a driver of the CFO's relative importance ($c = 8,216$; $p < 0.1$). We reject the hypotheses that *Growth Potential* (H01) and *Volatility* (H05) predict the *CFO Pay Spread*. Both coefficients are not statistically significant.

³⁷ The highest correlation coefficient is -0.53 between the variables average tmt compensation and leverage.

Table 2: Firm Fixed Regressions on CFO Pay Spread

This table shows Firm Fixed Effects Regressions CFO Pay Spread; The annexes ***, **, and * symbolize statistical significance at the 1%, 5%, and 10% levels, respectively. All tests are two-tailed. All models are significant ($p < .001$). N = 185.

	CFO Pay Spread	
	Model 1	Model 2
Growth Potential		5.01
Leverage		38.22**
Investment Activity		1.59**
M&A Activity		104.98*
Volatility		1.28
Foreign Currency		8.22*
CEO Outsider		-220.05
CEO Tenure		-26.78*
CEO Educational Background		34.68
CFO Relative Tenure		29.2***
CFO Relative Outsider		-47.56
CEO Pay Spread		0.15**
Pay Dispersion		228.34
ROA	9.68	11.87**
Average TMT Compensation	-0.16**	-0.29***
Year 2007	36.7	63.81
Year 2008	38.99	45.57
Year 2009	-47.67	-27.5
Constant	256.17**	-287.56
R ²	0.11	0.37

The regression results support two of the five hypotheses of the dimension team characteristics. In line with previous research, tenure is used as predictor for relative importance (Bebchuk & Cremers & Peyer, 2011). Both, *CEO Tenure* (H08: $c = -26.78$; $p < 0.1$) and *CFO Relative Tenure* (H10: $c = 29.203$; $p < 0.01$) have a significant impact on the

pay difference between a CFO and his colleagues. *CEO Outsider* (H07), the *CEO's Educational Background* (H09) and the measure *CFO Relative Outsider* (H11) do not seem to be good indicators for the analyzed pay spread as all coefficients are not significant.

The hypothesis that a firm culture which accepts higher *CEO Pay Spreads* also tends to benefit the CFO with a superior position is supported by our results (H12): A 1,000 EUR increase in difference of the CEO compensation and the *average TMT compensation* is associated with 145 EUR increase of the *CFO Pay Spread* ($p < 0.05$). Our conjecture that *Pay Dispersion* (H13) is significantly associated with the analyzed compensation differential is rejected. The controls *ROA* ($c = 11.874$; $p < 0.05$) and *Average TMT Compensation* ($c = -0.294$; $p < 0.001$) are highly associated with the dependent variable. All year controls are not significant.

H14 – H15 assume different relations of the *CFO Pay Spread* and its impact on firm performance. Table 3 shows the regression models that predict firm performance measured as ROA_{t+1} . In model 1 – model 3, we test whether the relationship between the independent variables and firm performance is mediated by the *CFO Pay Spread*. Model 1 presents the impact of the controls, in model 2 the variables from the dimensions firm, team, and governance characteristics are added, and model 3 adds the assumed mediator *CFO Pay Spread*. Using the causal-steps-method of Baron & Kenny, 1986, four requirements have to be fulfilled to prove a mediated relationship. First, there should be a significant relationship between the independent variables and firm performance in model 2. Second, the effects of the independent variables on the mediator, the *CFO Pay Spread* in this case, should be significant (results from Table 2). Third, the mediator should have a significant impact on the performance in model 3. Fourth, in model 3 the significant relationship of the independent variables in model 2 has to be small (partial mediation), close to zero or nonsignificant (total mediation). The results of the model 2 show that three of the firm characteristics (*Growth Potential*, *Investment Activity*, and *M&A Activity*) have a significant impact on firm performance. We test the significance of the delta of the R^2 of model 3 ($R^2 = 0.38$) and model 2 ($R^2 = 0.35$) with the F-test, following other researchers (Jaccard & Turrisi & Wan, 1990; Greene, 2003). The $p < 0.11$ indicates non-significance.

Table 3: Firm Fixed Regressions on Firm Performance

This table shows Firm Fixed Effects Regressions on ROA_{t+1} . The annexes ***, **, and * symbolize statistical significance at the 1%, 5%, and 10% levels, respectively. All variables in model 4 are centered and coefficients multiplied by 100. All models are significant ($p < .001$). $N = 185$.

	ROA_{t+1}			
	Model 1	Model 2	Model 3	Model 4
CFO Pay Spread			0.1668	0.19
Growth Potential		193.00***	192.84***	170.24**
Leverage		103.28***	99.81***	75.51*
Investment Activity		-0.08	-0.37	3.19
M&A Activity		-247.40	-277.21	-335.61**
Volatility		-14.07	-14.63	-24.66**
Foreign Currency		4.03	2.83	4.38
Growth Potential x CFO Pay Spread				-0.10
Leverage x CFO Pay Spread				0.07*
Investment Activity x CFO Pay Spread				-0.01*
M&A Activity x CFO Pay Spread				-0.45
Volatility x CFO Pay Spread				-0.13**
Foreign Currency x CFO Pay Spread				-0.003
Average TMT Compensation	-0.06	-0.09	-0.04	-0.04
CEO Tenure	-28.12*	-15.9306	-13.39	-19.59
CEO Pay Spread	-0.04	-0.08*	-0.10*	-0.09*
Pay Dispersion	-50.74	-441.49	-469.92	-368.43
ROA	36.90*	50.92**	48.62**	41.02***
Year 2007	-172.76***	-100.30	-110.23*	-75.70
Year 2008	-405.62***	-106.88	-113.62	-131.97
Year 2009	-68.55	182.96**	189.19**	156.05*
Constant	795.78***	-128.11	-70.71	530.33***
R ²	0.35	0.49	0.50	0.57

The results of Table 2 present that the second requirement is partly fulfilled, as 4 of 6 variables are shown to have a significant impact on the pay spread. Both, the third and fourth condition are not met, since there is no significant relationship between the pay spread and firm performance ($p < 0.16$) and the impact of the three significant variables of model 3 do not decrease in model 3. Hence, we reject H14 as the results prove that *CFO Pay Spread* does not seem to be a “[...] significant pathway of influence [...]” (Baron & Kenny, 1986) from firm characteristics to firm performance.

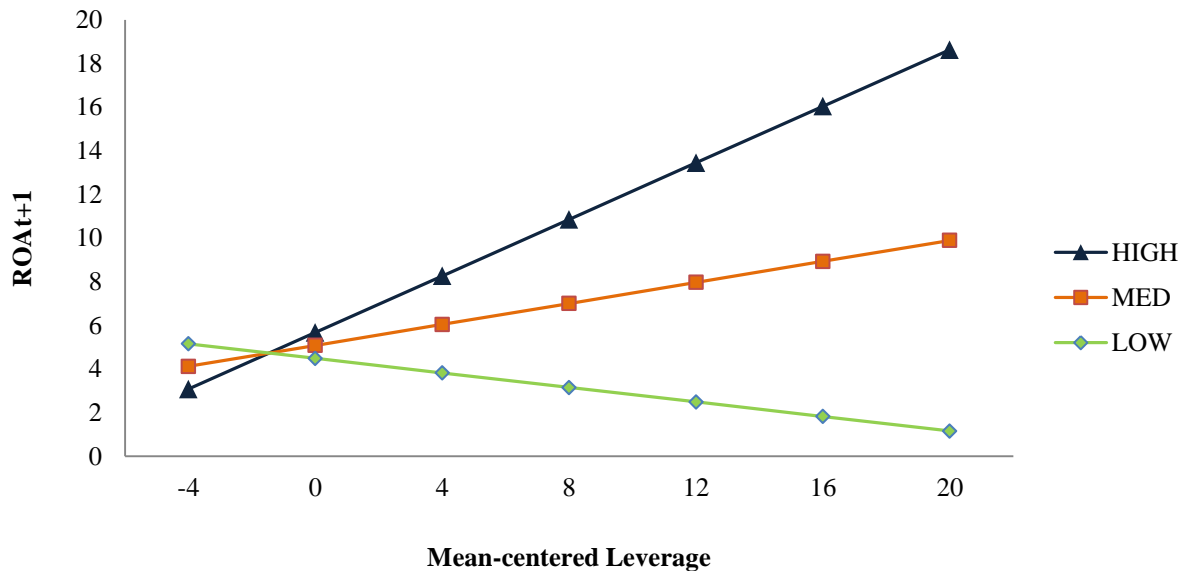
To test a moderated relationship between firm characteristics, CFO pay gap, and firm performance we include product terms for each firm characteristic and the variable *CFO Pay Spread* in model 4 of Table 3. The addition of these six further variables significantly increases the proportion of explained variability compared to model 3 ($\Delta R^2: 0.073, p < 0.05$). We find support for a relationship, namely, a bilinear interaction, for three of our six firm characteristics: The product of *Leverage* and *CFO Pay Spread* ($p < 0.1$), *Investment Activity* and *CFO Pay Spread* ($p < 0.1$), and *Volatility* and *CFO Pay Spread* ($p < 0.05$) have a significant impact on the ROA_{t+1} . The coefficients of the interaction terms express the change in slope of the firm characteristic variable and the ROA_{t+1} by an increase of the *CFO Pay Spread* by 10 EUR.³⁸ For instance, the coefficient of the product *Leverage* x *CFO Pay Spread* indicates an increase of 0.072 units of the marginal impact of *Leverage* on ROA_{t+1} for an increase of the *CFO Pay Spread* by 10 EUR. The total impact of *Leverage* on ROA_{t+1} is expressed by the partial derivative: $\delta ROA_{t+1} / \delta \text{Leverage} = 7.55 + 0.0072 \times \text{CFO Pay Spread}$. This supports H15 as in highly-levered firms larger CFO pay spreads are associated with higher performance.

Figure 2 illustrates this relation. It graphs the impact of *Leverage* on ROA_{t+1} for three different levels of *CFO Pay Spread*: Low = $\mu - \sigma$; Med = μ ; High = $\mu + \sigma$. The positive coefficient of the interaction is visible as the slope increases with higher pay gaps.

³⁸ We have multiplied the coefficients of model 4 in table 5 by 100 to provide an improved readability. As the CFO pay spreads are measured in 1,000 EUR, the coefficient indicated a change in the slope based on an increase in 10 EUR.

Figure 2: ROA_{t+1} and Leverage at different levels of CFO Pay Spread

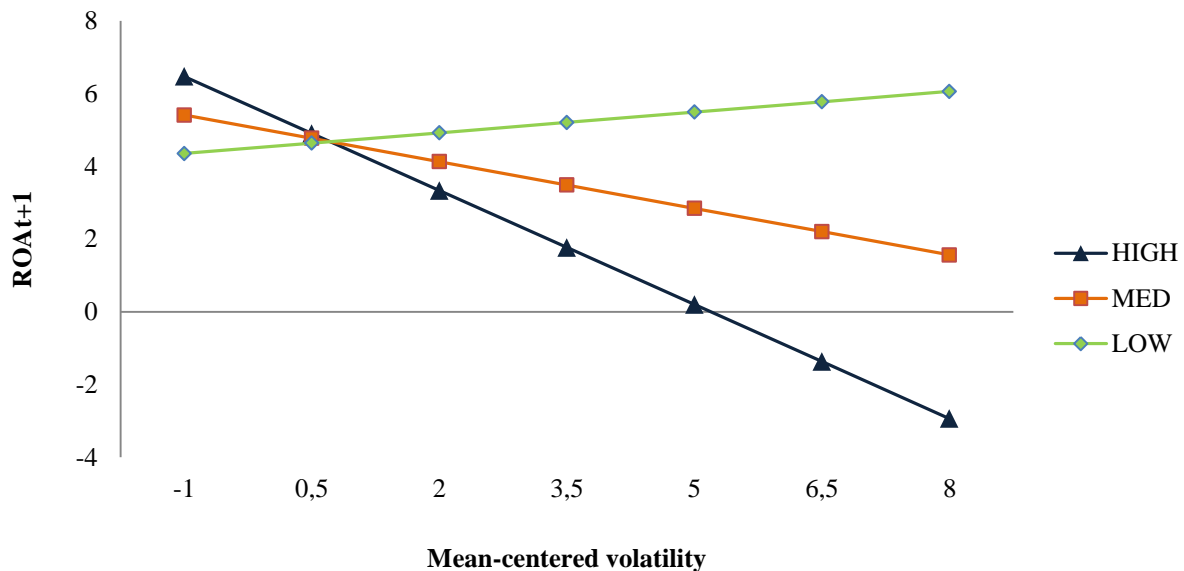
The range of mean-centered leverage is -4 - 20. For CFO Pay Spread, High = $\mu + \sigma$; Med = μ ; Low = $\mu - \sigma$.



The interactions between *Investment Activity* x *CFO Pay Spread* ($c = -0,007$; $p < 0.1$) and *Volatility* x *CFO Pay Spread* ($c = -0.127$; $p < 0.05$) yield opposing results. Both coefficients are negative. This implies that in firms with higher levels of investment activity and volatility, increased gaps between the CFO and the remaining team have a negative impact on firm performance. Hence, the hypothesis 16 is rejected for those variables. The effect of *Volatility* of ROA_{t+1} for different *CFO Pay Spreads* is illustrated in Figure 3.

Figure 3: ROA_{t+1} and Volatility at different levels of CFO Pay Spread

The range of mean-centered volatility is -1 - 8. For CFO Pay Spread, High = $\mu + \sigma$; Med = $\mu + \sigma$; Low = $\mu - \sigma$.



4.5 Discussion

This paper focuses on the role of the CFO as a part of the upper echelon of the firm. Our goal to gain a deeper understanding of the inner workings of the team and the board is illustrated through two main research questions. First, we analyze the determinants of the CFO's role within the team and hence, gain insights into what influences those in charge of TMT compensation design. We refer to former research on TMT and develop hypotheses from the principal agent, upper echelon, and tournament theory. Armed with this knowledge, we address the second question: How does the CFO's role within the team affect firm performance? We test the CFO position as a mediator and a moderator between firm characteristics and the firm performance.

The results of this study are discussed in the following three sections. First, we assess the empirical results from our regression on the CFO pay spread to identify the determinants. Second, we shed light on the performance implications. Third, we combine the findings from the two parts of our research and present consistencies and paradoxes.

CFO pay spread. The first set of hypotheses is based on the mechanism that the labor market for managers allocates managers with higher marginal products to more challenging positions. This translates in higher compensation (Rosen, 1982; Fama, 1980). By regressing six indicators for a demanding CFO position, we test whether those responsible for the compensation design, namely, the Board of Directors, act in accordance with the explanation provided by theory. In this vein, our results support four of the six hypotheses. A CFO that is faced with a higher degree of leverage, more foreign currency adjustments, more investment activities, and a higher level of M&A activities is rewarded by a superior position in the team. Why do growth potential and the stock volatility not affect the CFO's position? We assume that growth potential in terms of investment opportunities increases the job demands of a CFO to a higher extent than the demands of the remaining TMT positions. One possible explanation for the non-significance of our results is that other TMT members also experience an increased level of requirements through growth potential. The CHRO, for instance, has to cope with new organizational challenges as growth often comes with new departments that have to be integrated. Additionally, the CTO might be confronted with the conception and implementation of new information systems to maintain the changes in firm size. Hence, with an eye on the potential for further research, it is necessary to use more fine-grained measures that exclusively focus on the effects of the CFO demands than on those of the remaining team.

The second set of hypotheses analyzes the team characteristics and their effect on the CFO position. Our conjecture that the CEO as the apex of the team acts as co-designer of the TMT compensation packages (Lorsch & MacIver, 1989) finds support in H15. A TMT with a more powerful CEO, expressed by his tenure, decreases the compensation spread between the CFO and the remaining team. As former research has shown, CEOs do not only receive additional utility through higher absolute, but also through higher relative compensation. Hence, a CEO armed with power not only takes advantage of it by increasing his compensation in absolute terms, but also his pay relative to the rest of the team (Shen & Gentry & Tosi, 2003). Consequently, the CEO does not accept a second strong position within the team and therefore influences the pay-setting process to the extent that the CFO does not gain a superior role. As H09 investigates the relationship of the CEO's educational background and the CFO pay spread does not yield significant results, we could either conclude that the finance know-how of the CEO is not a relevant driver in the considerations

of the compensation makers or that each of our opposing theories is valid, but only under special conditions. If that is the case, a more detailed analysis is necessary to gain a deeper understanding. One could argue that the upper echelon hypothesis that predicts a positive relationship between the CEO's background and the CFO's position is valid if the CEO has the power to push through his goal to guide the company finance-oriented. We split the sample at the median of CEO tenure as measure of power and run the same regression for the two subsamples. Again, the impact of the CEO's educational background is not significant. Further, the relationship between the educational background of the CEO and the CFO's position might be dependent on the financial complexity of the firm. Analog to above procedure, we split the sample in a non-complex and complex subsample (using our firm characteristics variables), but again, find no support for our hypothesis. Therefore, we conclude that there is no underlying pattern that connects the financial education of the CEO and the position of the CFO. H10 that assumes relative CFO tenure to be a driver is supported and hence, confirms our conjecture that tenure is not only a driver for the CEO, but for all TMT members.

In the last set of hypotheses, we posit that the compensation designers intentionally shape the distribution within the team. We find support for H12. In TMTs with high spreads between the CEO and the remaining team members the spread between the CFO and his peers is higher, too. It seems that compensation designers act consistently with regards to the tradeoff between egalitarian pay structures that should improve performance through teamwork (Conyon & Peck & Sadler, 2001) and non-uniformly distributed patterns that result from compensation in line with the different marginal products or tournament incentives. Although H13 follows a similar line of argumentation, we find no support in our results. An explanation of the observed non-significance might be the following rationale. Some boards of directors realize the outstanding importance of the CFO position and decide to implement a three level hierarchy in the TMT. Nevertheless the awareness that inequality has negative performance implications results in an egalitarian compensation pattern of the remaining team members. In consequence, the *Pay Dispersion* (measured as coefficient of variation) is low while the *CFO Pay Spread* is high.

In addition to the discussed coefficients of the independent variables, the result of one control variable is noteworthy. *Average TMT Compensation* ($c = -0.294$; $p < 0.001$) indicates that an increasing absolute level of the TMT decreases the pay spread between the CFO and the TMT. Although it seems intuitive that the subtrahend has a negative impact on a difference, the relationship is more than obvious. The rationale to include the *Average TMT Compensation* is to control for the possibility that the CFO's remuneration exceeds the average TMT pay by a constant factor. If such an underlying relationship was present, the result would be a positive coefficient, since the absolute spread increases with the increasing average pay under the assumption of a constant spread factor. The opposite result suggests that in companies with a higher average pay level the CFO is rewarded less through an outstanding position.

Performance implications. As illustrated in Table 4, the role of the CFO itself does not have a significant impact on the firm performance of the subsequent year. But the impact of three interactions between the CFO position and firm characteristics on the ROA_{t+1} is supported by our results. We hypothesize a positive relationship by assuming an efficient labor market that allocates managers with adequate skills to jobs with the associated requirements. Consequently, CFOs with superior positions should induce higher firm performance (Fama, 1980). Only the interaction between leverage and CFO pay spread seems to confirm the positive impact on firm performance. Two of the three significant interactions (*Investment Activity x CFO Pay Spread*; *Volatility x CFO Pay Spread*) support the contradictory relationship.

What is the underlying source of these results? While basic economic theories claim the absolute pay level of each manager to be efficient when it is chosen according the marginal productivity / ability of the manager, other streams of research have focused on the interrelations of the TMT's compensation and its consequences on performance. On the one side, Lazear, 1989 shows in an extended tournament model that includes non-productive effort by the agents that less hierarchal compensation pattern have – at least under certain conditions – a positive impact on firm performance. On the other side, deprivation theory (for instance, Martin, 1982; Crosby, 1984) predicts inequity to have a negative influence on the individual's performance. Many studies find support for this negative association between

hierarchical pay patterns and firm performance. For example, Cowherd & Levine, 1992 finds that the cohesiveness of workers is positively related to wage compressions and causes increased firm performance. Many following studies argue that coordination needs within the TMT underpin the importance of this cohesiveness and collaboration (Henderson & Fredrickson, 2001) and hence, reveal a negative association between pay spreads and performance. Both investment activities as well as volatility are used in former studies as indicators for coordination needs. Although the CFO has to have a high level of financial competence to make the right investment decisions, the team's willingness to cooperate is another important success factor. For instance, the exchange with the CHRO might be necessary as a new investment demands additional personnel capacity. Therefore, one could argue that coordination is essential to evaluate a potential investment in a comprehensive manner (Henderson & Fredrickson, 1996). Following an analog line of argumentation, former studies support that the volatility is an indicator for complexity that requires a higher level of coordination within the team (Mintzberg, 1973). This explanation approach also is in line with the positive association between *Leverage x CFO Pay Spread* and *Firm Performance*. The financing structure of a company is in the single authority of a CFO and does not require intense exchange/communication with her colleagues.

Consistencies and paradoxes. Interpreting the results of the two analyses together sheds light on the question as to whether the decision concerning the CFO and TMT pay of those in charge of the compensation design is efficient in improving firm performance. The analyses yield mixed results. First, we find consistent relationship. We show that the positive relationship of the degree of *Leverage* and *CFO Pay Spread* is justified by its impact on firm performance. As a superior position of the CFO in a highly-levered company is associated with increased firm performance, the higher costs for the CFO seem to pay off. Additionally, it seems appropriate not to award the CFO with an outstanding position in case of high growth potential, as the interaction of growth potential and the CFO pay spread does not have any significant impact on firm performance. Second, we find paradoxes in the sense that the compensation seems to reflect more demanding firm characteristics for the CFO, but the resulting outstanding position has either a negative or no significant effect on performance. Based on our first analysis one could conclude that those responsible for the remuneration packages take the level of job requirements into account, but neglect to consider the negative

effects of pay disparity within the team that result from a superior CFO role. This phenomena is especially observed for investment activities, as the regressions yield a positive effect on *CFO Pay Spread*, but a negative interaction term on ROA_{t+1} . The discrepancy of *M&A Activity* and *Foreign Currency Adjustments* is more moderate: both variables impact CFO's relative position within the team without causing any significant impact on performance.

Limitations. This study delivers promising results to better understand the antecedents and consequences of TMT compensation, but it also has some limitations. First, our sample is limited. With only 65 firms that are observed over four years, we have a relatively small sample. A selection of more companies over a longer period of time should be used in future research to verify the robustness of the results. Furthermore, our study focuses on executive compensation spreads in large, publicly-listed firms in Germany. Future research is needed to show whether firms of different sizes and in different corporate governance contexts exhibit similar pay spreads among the CFO and the TMT. Second, we analyze behavioral actions and interactions of both the board as the compensation designer and the TMT as the responsible group for the firm's performance. To completely catch the underlying processes that lead to the observed pattern further field research is necessary. A noteworthy example of a former study that might provide an appropriate foundation for future research is from Eisenhardt & Bourgeois III, 1988 where researchers investigated senior management groups in field. Third, the observed pay allocations levels might be caused by underlying incentive mechanisms like bonus or stock (option) remuneration. As we use the total compensation in our research this composition of the total package is not considered. This opens an avenue for future research. Both the pay allocation as well as the performance implications might be influenced by the single contracts of each TMT member. Finally, future research could address the problems of endogeneity – always inherent when regressing compensation variables on performance – by using more sophisticated regression methods.

4.6 Concluding Remarks

The goal of this study is to shed light on the role of the CFO within the TMT. Is he second to the throne or a “regular” member of the team? Based on this simple question, we run two analyses and hence, contribute to existing literature in several ways. First, we expand

on the TMT compensation literature by investigating the antecedents of the CFO's position within the team. We find support for the hypothesis that those in charge of the TMT compensation award the CFO with a superior role – in terms of compensation – among the other TMT members when certain firm and environment characteristics, team characteristics, and governance characteristics are predominant. Second, we enrich existing research that aims to understand how pay affects performance, with implications of the *CFO Pay Spread*. We find mixed results. Under certain circumstances higher *CFO Pay Spreads* lead to increased firm performance; under certain circumstances a higher *CFO Pay Spread* is associated with lower firm performance. We posit that the underlying mechanisms of the different results are caused by the presence or absence of coordination needs as hypothesized by former research (Henderson & Fredrickson, 2001). Future research should investigate these findings explicitly and transfer previous analyses from the CEO and TMT to the CFO.

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5 CONCLUSION

This dissertation is motivated by the confusing puzzle of top executive compensation with its overarching questions

- What are the determinants of top executive pay?
- What are the consequences of top executive pay?

This work aims to gain a deeper understanding that contributes to both, the existing literature as well as practitioners. This goal is approached by concentrating on Top Management Teams and their remunerations packages. Although previous research has demonstrated the importance of executives the main focus has been on questions concerning the CEO or single executives. Following the trend of examining the inner workings of the team (Finkelstein & Hambrick & Cannella, 2009) in order to better understand the prevalent levels and structures of compensation, this dissertation comprises three empirical essays that put their main emphasis on the distribution of pay within the team. Thereby, existing literature gaps are filled.

Using German panel data, Essay I uses the framework of tournament theory to analyze the relation between complexity and pay differentials, defined as the compensation spread between the CEO and the remaining team. Based on competing hypotheses from theoretical work about tournaments (Lazear & Rosen, 1981; Lazear, 1989), the analyses show mixed results. Against the intuition that the extensions of tournaments that incorporate behavioral aspects caused by tournament structures, it is the basic, more simplistic model which better predicts the prevalent structures. The complexity measures *Firm Size* and *Diversification* are the only ones that support a negative relationship between complexity and the Total Compensation Pay Spread; *TMT Size*, *Investment Behavior*, *Internationalization*, and *Market Uncertainty* show a positive relationship. Referring to the tournament theory, this indicates that those in charge of compensation design tend to establish a larger pay spread between the CEO and the team when the firm is confronted with a high level of complexity. This goes back to the superiority of relative performance evaluation due to the monitoring difficulties that are caused by complexity.

In comparison to Essay I, Essay II investigates the other direction of causality and focuses on the consequences of the different incentives caused by the single remuneration packages. Besides the well-known and often examined incentive sources of alignment and the level of pay, this work considers pay differentials and pay dispersion as potential sources that motivates managers and thus, influences performance. This study runs several regressions with different ways to control for endogeneity. The results prove that alignment and the level of compensation are positively related to firm performance, and that pay dispersion is negatively associated with performance. Additionally, this work argues that investigations that neglect to incorporate all these incentive sources might lead to biased results. The variation caused by one incentive is assigned to another incentive, when the actual driver is ignored. This line of argumentation finds support through the results. The abstinence of certain incentive sources significantly changes the results of the others.

Essay III investigates the CFO's position within the team by examining the both directions of causality. On the one hand, the essay presents the antecedents of the CFO pay spread, defined as the total compensation difference between the CFO and the remaining team. The analyses show that the CFO is awarded with a superior position when the firm is faced a higher degree of leverage, more foreign currency adjustments, more investment activities, and a higher level of M&A activities. Additionally, there is a positive relationship between the CEO pay spread and the CFO spread, while power of the CEO – measured as tenure – is negatively associated with the CFO's position. On the other hand, the essay gives insights in the consequences of the CFO's role within the team. The regression analysis finds support that in a highly-levered firm a privileged role of the CFO is positively related to firm performance; negative associations are shown when the firm has high investment levels and confronted with volatile environments.

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