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Three Essays on the Antecedents of Structural Changes in Top Management Teams

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It is very hard for me to believe that I am sitting here and writing the acknowledgements of my Ph.D. dissertation in Business Administration and Management at Bocconi University. Around 5 years ago, I made a tough decision of leaving corporate world and pursuing a PhD with relatively few ideas about the difficulties in horizon. I remember my very first statistics class where the professor was drawing integrals to the board all the time. At that time, I was thinking whether I made a good decision of joining a Ph.D. program ☺ Nevertheless, after many ups and downs as well as numerous challenges during the last four and a half years, here I am typing this section of my dissertation. Compiling this thesis was a very rewarding and challenging experience and there is a huge list of people whom I need to thank a million for guiding me up to this point.

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I had started describing my first class at the Ph.D. program with integrals and my doubts around the decision of doing a Ph.D. during that class. However, as the years passed by, I realized what a perfect decision I have made. I would like to end this section by again saying a huge thank you to all those who assisted me along the way, whether mentioned here or not. My attempt here to acknowledge those who supported me achieve the dream of doing a Ph.D. is surely inadequate, yet worth making. I also hope that each person mentioned here knows that my gratitude goes well beyond the a few words and sentences I dedicated for them.

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SUMMARY

This dissertation examines the antecedents of structural changes in top management teams (TMTs). While upper echelons research has mostly focused on the composition, processes, incentives, and leaders of top management teams, structure dimension of TMTs remained relatively unexplored. This thesis shifts the focus to the emerging research on TMT structures by exploring how and why TMT structures change along the role and hierarchy dimensions and by investigating how and why TMTs become structurally interdependent.

This dissertation consists of three studies, each of which explores distinct characteristics of TMT structures. Study 1 focuses on the role structures and investigates the antecedents of the presence of a new generational role in TMTs, namely Chief Innovation Officers. Study 2 applies a more general lens and investigates the determinants of the structural interdependence across TMTs. Finally, Study 3 explores the TMT hierarchical structures by analyzing their characteristics and determinants. This doctoral thesis integrates upper echelons literature with different theoretical approaches such as contingency, institutional, and behavioral theory of the firm. It also adopts different research methodologies as inductive and deductive by collecting unique data on Standard & Poor (S&P) 500 firms.

Overall, this dissertation makes significant theoretical contributions. First, it responds to the calls from many scholars to pay more attention into the structure of TMTs. Second, it treats TMT characteristics and structures as consequences rather than antecedents to firm performance and explores the determinants of different TMT structural reconfigurations accordingly. Finally, it introduces behavioral theory of the firm as a new lens to analyze the antecedents of TMT structural changes by demonstrating how firms can engage in problemistic search for their TMT structures when they are below their performance aspirations.

CHAPTER 1- Introduction

1.1 | MOTIVATION

After 38 years following the publication of Hambrick & Mason's "Upper Echelons Theory", top management team (TMT) research has been one of the most dynamic research areas in management studies. The upper echelons theory rests on four critical assumptions as (1) Organizational decisions are generally results of top managers' "cognitive frames" through which different problems are viewed and interpreted. (2) These cognitive frames are a function of the top management team members' experiences, values, and personalities. (3) A focus on the combined characteristics, interactions, and resulting capabilities of the top management team will more accurately explain a firm's strategic behaviors than will the focus on individual top executive alone. (4) Demographic characteristics such as industry and firm tenure, functional background, and education can be used as valid proxies for the conventional psychological and social processes that are driving executive behavior.

A TMT is defined as the group of executives at the apex of the organization that has overall responsibility for the success of the organization where they take the most important decisions (Mintzberg, 1979). TMTs have three main conceptual elements as composition, structure, and processes (Finkelstein, Hambrick, & Cannella, 2009). For the last 35 years, upper echelons scholars have produced a large stream of work on the compositions, processes, incentives, and leaders (CEOs) of TMTs and their impact on various firm outcomes (for detailed reviews please refer to Carpenter, Geletkanycz, & Sanders, 2004; Finkelstein et al., 2009). While these studies have demonstrated that TMTs influence firm outcomes substantially, they have produced inconclusive results.

In 2007 update of the upper echelons theory, Donald Hambrick stated that much more attention needs to be paid to the structure of TMTs to complement and improve our understanding of other TMT characteristics. Accordingly, Hambrick et al. (2015, p.449) mention that "a possible breakthrough in TMT research resides in the reality that TMTs vary widely in how they are structured." According to Hambrick (1994), TMT structure refers to the roles of the TMT members and the relationship among these roles and investigating TMT structures can be crucial to extend TMT research in multiple ways. According to Ma, Kor and Seidl (2021), TMT structures display the information-processing mechanisms of TMTs where different individual roles deal with different kinds of information and the role relationships determine how information is gathered, distributed, and analyzed within the TMT. Therefore, research on TMT structures can enhance our knowledge on how TMTs process information to develop and implement various strategies. Second, TMT structures affect the coordination and collaboration mechanisms among TMT members in a way that TMT members responsible for different functional areas may collaborate closely to achieve more effective coordination whereas divisional executives work more independently and even competitively to obtain corporate resources (Hambrick et al., 2015; Ma et al., 2021). Third, TMT structural changes are significant to explore as they show the important changes within the firms' strategic and environmental dynamics and how these dynamics influence other aspects of TMTs such as compositions and processes (Beckman & Burton, 2008; Kor & Mesko, 2013). Finally, Guadalupe et al. (2014) and Beckman and Burton (2011) mention that TMT structures reflect designs of organizations, significance of different units in the firm, power dynamics within the organizations, as well as resource dependencies and institutional pressures. Therefore, examining TMT structures can connect TMT research with more comprehensive perspectives linked to organizational structure (Ma et al., 2021).

TMT structure research stream can be considered rather young, and it is only quite recently that researchers started to pay more attention to the structure of TMTs (Ma et al., 2021). Menz (2012) mentions that TMT role structures and the presence of different TMT members changed significantly over the recent decades in connection with various factors and calls for more research on analyzing the drivers influencing the TMT structures more in detail. Also, Hambrick (2007) stresses a need to turn upper echelons theory on its head by considering TMT characteristics as consequences rather than causes. Taking these suggestions into account, this thesis responds to the need of better understanding the determinants of TMT structural changes by considering the different dimensions of TMT structures such as role, hierarchy, and reward depending on the TMT structural interdependence framework of Hambrick et al. (2015).

1.2 | THEORETICAL BACKGROUND

In 2015, Hambrick et al. developed the TMT structural interdependence framework to introduce an impact on the mixed and confusing upper echelons results. TMT structural interdependence is the degree to which roles and administrative mechanisms are arranged such that members of executive group affect each other (Hambrick et al., 2015, p.450). TMT structural interdependence framework consists of three distinct facets as horizontal, vertical and reward interdependence. First, *horizontal interdependence* is the degree to which members' tasks and responsibilities rely on each other. It basically refers to the allocation between functional and divisional roles in the TMT. Then, *vertical interdependence* is the degree to which members are hierarchical peers recognizing that almost all TMTs include roles of varying ranks. Finally, *reward interdependence* is the degree to which members receive payoffs for collective accomplishment. It is concerned with whether the bonuses of the TMT members are connected to more individual,

sub-unit or group, firm performance. Also, this dimension considers whether firms compensate their executives more with long-term benefits such as stock options or restricted stock earnings.

TMT structural interdependence framework can be very effective in conceptualizing the TMT structural reconfigurations as it covers different dimensions of TMT structures such as role, hierarchy, and incentives. Since the inception of the framework, researchers mainly benefited from it from an empirical perspective where they used the different measures mostly as control variables (Gupta, Briscoe, & Hambrick, 2017; Ma & Seidl, 2018). On the other hand, antecedents of TMT structural interdependence remain largely unexplored.

Linked to horizontal interdependence, researchers analyzed the antecedents of the presence of various individual roles in TMTs including but not limited to Chief Financial Officers (Zorn, 2004), Chief Operating Officers (Hambrick & Cannella, 2004; Marcel, 2009), Chief Strategy Officers (Menz & Scheef, 2014), Chief Marketing Officers (Nath & Mahajan, 2008; Wiedeck & Engelen, 2018); Chief Supply Chain Officers (Roh, Krause, & Swink, 2016); Chief Human Resources Officers (Abt & Knyphausen, 2017) or sub-unit of roles such as functional executives (Guadalupe, Li, & Wulf, 2014). Despite these interesting studies, there is a need to consider TMT role structures from an integrative perspective and analyze the motivations of firms on how and why they change the allocation of roles in their TMTs among functional and divisional executives.

Apart from the functional executives mentioned above that are concerned with the effectiveness of the related functions in their organizations such as finance, marketing, etc., recent decades have also witnessed the emergence of new generational TMT roles such as Chief Sustainability Officers (Strand, 2014; Kanashiro & Rivera, 2019; Henry, Buyl, & Jensen, 2019, Fu, Tang, & Chen, 2020), Chief Digital Officers (Kunish, Menz, & Langan, 2020; Firk, Hanelt, Oehmichen, & Wolf, 2021), Chief Diversity Officers (Shi, Pathak, Song, & Hoskisson, 2018).

These TMT roles emerged in line with the latest management trends and value drivers such as sustainability, environmental friendliness, or digital transformation. These positions usually focus on these important trends and work as a project manager or an internal consultant aiming to bridging the other TMT members around these management trends to create even superior value.

Along these lines, another new generational role that has gained prominence in TMTs is Chief Innovation Officers. These executives have lots of responsibilities mainly as to develop an innovation strategy and work on implementing it in collaboration with other stakeholders in the organization (Hill & Barton, 2013). Research on outlets such as Forbes and Harvard Business Review state that around 30% of Fortune 500 companies have a Chief Innovation Officer or a similar role in their TMTs (Swoboda, 2020). However, despite the increasing popularity of the role and many responsibilities attached to it, we still do not know that much on why firms decide to have a Chief Innovation Officer in their TMTs.

As per the vertical interdependence, the hierarchical structure of TMTs is related to the social unity in TMTs where members have salience for each other as peers (Hambrick et al., 2015). Also, Finkelstein (1992) utilizes the hierarchical setup of the TMTs as a proxy to indicate the structural power of TMT members over each other. The studies on the hierarchical structures of TMTs mainly examined the effect of TMT hierarchical setups on various firm outcomes (Cannella & Hambrick, 1993; Patel & Cooper, 2014). Additionally, some studies used TMT hierarchical setups as moderators that may affect the relationship between TMT compositions and firm performance (Hambrick et al., 2015; Ridge, Aime, & White, 2015). Despite these valuable insights, we still lack evidence on the nature and determinants of TMT hierarchical structures.

Also, executive compensation scholars have been very active in exploring the determinants of executive pay (for a detailed review please see Devers, Cannella, Reilly, & Yoder, 2007).

However, research has yet to consider under which conditions firms tie the bonuses of their TMT members to more general firm targets and which factors make firms to increase the portion of the non-cash benefits such as stock options, etc. within the total pay packages of their TMT members.

Within the studies around TMT structures, researchers utilized mainly the contingency theory (Burns & Stalker, 1961; Chandler, 1962) and applied contingencies at different levels to explain the presences of various members in TMTs (Hambrick & Cannella, 2004; Nath & Mahajan, 2008; Menz & Scheef, 2014; Roh et al., 2016) or the development of subgroups such as the functional managers (Guadalupe et al., 2014). The analyzed contingencies include but not limited to diversification, innovation intensity, advertising intensity, CEO and TMT characteristics, industry stability and market concentration. In connection with the contingency perspective, Kavusan and Frankort (2019) consider managers as value-maximizing decision makers who make decisions based on a rational evaluation of different contingencies. On the other hand, they argue that managers can be boundedly rational (Simon, 1955) and rely on behavioral heuristics such as performance feedback while making decisions.

The behavioral theory of the firm (Cyert & March, 1963) states that firms start problemistic search and engage in organizational changes when they are below their performance aspirations. The past decades of empirical research on performance feedback have resulted in strong support for the effect of performance below aspirations on a variety of firm behavior including innovation investments (Greve, 2003), organizational changes (Greve, 1998), mergers and acquisitions (Iyer & Miller, 2008), alliances (Tyler & Caner, 2016; Kavusan & Frankort, 2019), and tie formation (Baum, Rowley, Shipilov, & Chuang, 2005). However, a significant gap in the performance feedback literature is the lack of attention to the implications of negative performance feedback for TMT structures. According to Guadalupe et al. (2014), TMT is the reflection of the firm's

organizational structure and makes important decisions linked to firm strategy and resource allocation across business units, which affects firm performance significantly. Therefore, when below performance aspirations, it is likely that firms can initiate problemistic search also at their TMTs where they can change their TMT structures with various considerations such as achieving more effective organizational design, improving the social unity and collaboration among the TMT members that can lead them to an improved performance.

Against all the backdrops described above, this dissertation is organized in a way that each of its chapters focuses on a different dimension of TMT structures such as role and hierarchy and explores the antecedents of change in those dimensions through benefiting from alternative theoretical lenses such as the behavioral theory of the firm.

1.3 | DISSERTATION OVERVIEW

This dissertation aims to investigate the antecedents of structural changes in TMTs. While studying the determinants of TMT structural reconfigurations, I focus on a different dimension of TMT structures in separate chapters. In chapter 2, I focus on the role dimension by exploring the antecedents of the presence of a new generational role in TMTs, namely Chief Innovation Officers. In chapter 3, I apply a broader perspective by examining the determinants of the more general role, hierarchy, and reward structures across TMTs. Chapter 4 shifts the focus to hierarchical structures in which I look at the characteristics and determinants of different TMT hierarchical setups. The reminder of this section presents a brief description of each of the three studies. Please also refer to Table 1 for an overview of these three chapters.

Study 1- Chief Innovation Officers: An empirical study of behavioral and institutional antecedents

The first empirical study in this dissertation examines why firms decide to have a Chief Innovation Officer in their TMTs. Chief Innovation Officers have gained lots of prominence in TMTs, but research has yet to explore why firms opt to have such a role in their TMTs. Accordingly, I argue first that firms can analyze their past innovation related performance and decide to have such a role when they are below their performance aspirations mainly to acquire different competencies and perspectives to recover their performance. Alternatively, I suggest that inclusion of this position in TMTs might carry a more symbolic meaning through which firms aim to provide signals to their different stakeholders to improve their legitimacies. To test my claims, I collected data on 280 technology intensive firms listed in the Standard and Poor 1500 index. I find that when firms underperform compared to their innovation and market share aspirations, they become more likely to have a Chief Innovation Officer in their top management teams. I also discover that when more firms in the industry of the focal firm start employing Chief Innovation Officers in their top management teams, that firm also becomes more likely to have the same role within its top management team. This paper contributes to the upper echelons, innovation governance and behavioral theory of the firm literatures by introducing Chief Innovation Officers into the research agenda and by demonstrating the different motivations of firms behind their decision of having a Chief Innovation Officer within their TMTs.

Study 2- Shake up the management: Negative performance feedback and structural interdependence within top management teams

The second study of this dissertation investigates how firms change the different pillars of their TMT structures in the cases of negative performance feedback. In this chapter, I develop a comprehensive model for TMT structural reconfigurations by integrating the TMT structural interdependence framework with the arguments of the behavioral theory of the firm. More

specifically, I investigate how performance below aspirations influences TMT horizontal, vertical and reward interdependence. To test my claims, I collected data from 260 firms listed in the Standard and Poor 500 index. My results indicate that when firms are below their performance aspirations, they decrease their TMT horizontal interdependence by decentralizing their TMT structures where they give more voice to the divisional executives as compared to the functional executives, since divisional executives can have a faster influence to recover performance as they are closer to the sources of revenue such as customers, markets, etc. Additionally, my findings show that firms increase their TMT vertical and reward interdependence by reducing the hierarchical designations in their top management teams and by making the bonus and benefit structures of their TMT members more aligned with the purpose of improving collaboration and behavioral integration to generate improved performance in return. This paper contributes to strategic leadership literature by exploring the determinants of TMT structural reconfigurations through an alternative perspective. Also, it enlarges behavioral theory of the firm by displaying that firms can engage in problemistic search also for their TMTs when they are below their performance aspirations where they make substantial structural changes with the expectation of improved performance in return.

Study 3- Top management teams hierarchical structures: An exploration of characteristics and determinants

The third study of this study sheds light on how top management teams are structured hierarchically and which factors affect TMTs' hierarchical setups. In this chapter, I apply an exploratory analysis on a dataset compiled from 260 Standard and Poor 500 firms. The results indicate that even though the average top management team sizes stayed constant between 2007 and 2018, top management teams became slightly flatter hierarchically. Furthermore, I discover

that the hierarchical setup of top management teams is influenced from a variety of factors related to CEOs, firm characteristics, top management team sizes, environmental dynamics as well as performance developments. This paper contributes to upper echelons theory and, specifically to the literature on TMT hierarchical structures. This chapter introduces empirical insights on the hierarchical structures of TMTs which has not received considerable attention from scholars. My study reveals descriptive insights on the nature of TMT hierarchical setups as well as prescriptive insights into the factors that influence different hierarchical reconfigurations across TMTs. Thereby, my exploratory paper extends the insights provided by the studies that treated TMT hierarchies as an antecedent or a moderator to firm performance.

Table 1. Overview of the three chapters

Title	**Research Question(s)**	**Type**	**Context**	**Main Theoretical Perspectives**
Study 1: Chief Innovation Officers: An empirical study of behavioral and institutional antecedents	What are the antecedents of Chief Innovation Officer presence in TMTs?	Empirical (deductive, theory testing)	280 Standard & Poor 1500 firms, 2008-2017	Behavioral theory of the firm, Institutional theory, Upper echelons
Study 2: Shake up the management: Negative performance feedback and structural interdependence within top management teams	How does negative performance feedback influence TMT structural reconfigurations?	Empirical (deductive, theory testing)	260 Standard & Poor 500 firms, 2007-2018	Behavioral theory of the firm, TMT structural interdependence, Upper echelons
Study 3: Top management teams hierarchical structures: An exploration of	What characterizes TMTs with different hierarchical structures?	Empirical (inductive, exploratory)	260 Standard & Poor 500 firms, 2007-2018	Contingency theory, Upper echelons

characteristics and determinants	What drives different TMT hierarchical setups?			

1.4 | CONTRIBUTIONS

Overall, this thesis primarily contributes to upper echelons and TMT literatures by demonstrating the antecedents of the different aspects of TMT structures. By doing so, it also advances the literatures on TMT role and hierarchical structures. Second, this dissertation enlarges behavioral theory of the firm literature by displaying how firms can become engage in problemistic search for their TMT structures when they face negative performance feedback.

The findings of the first chapter contribute to at least three literature streams. First, they extend upper echelons theory through introducing a rising executive position, Chief Innovation Officers, into the research agenda by analyzing the antecedents of their presence in the TMTs. While explaining the antecedents, I also benefit from the behavioral theory of the firm as the mechanism, rather than the dominant contingency approach used to explain the antecedents of the presence of other executive roles in TMTs (Hambrick & Cannella, 2004; Nath & Mahajan, 2008; Menz & Scheef, 2014). Second, this chapter contributes to the literature on innovation governance. Majority of the related studies exploring the relationship between organizational structures and innovation focused on the structure of the research and development departments (Argyres & Silverman, 2004). I provide an extension to these studies by taking innovation outside of the scope of the research and development units and demonstrating how the decision of establishing innovation as a separate function in TMTs with a dedicated executive is shaped and which forces are the most influential around that. Finally, this study also enlarges the behavioral theory of the firm by combining it with upper echelons perspectives. In addition to the many studies (Greve 1998, 2003; Park, 2007; Baum et al., 2005, etc.) examining negative performance feedback and

problemistic search behaviors of firms across various dimensions such as innovation, strategy, and partnerships, I show how firms can also imply changes at their TMTs by having a slightly non-traditional executive role as the CINO when their performance is left behind their aspirations.

The second chapter contributes first into upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) where I respond to the suggestion from Hambrick (2007) to pay more attention to the structure side of the TMTs. Additionally, as Hambrick (2007) suggests, I treat TMT structural reconfigurations as a consequence rather than an antecedent. Moreover, I turn upper echelons theory on its head with the support of the behavioral theory of the firm (Cyert & March, 1963) and display that TMT structures can change significantly depending on performance developments. Secondly, this study contributes into the behavioral theory of the firm (Cyert & March, 1963). Many studies up to date investigated how firm can engage in problemistic search at the organization level and implement changes in terms of investing in innovation, making more mergers and acquisitions, engaging in more organizational changes, developing different alliances and partnerships, in the cases of performance below aspirations (Greve, 2003; Iyer & Miller, 2008; Greve 1998, Park, 2007; Tyler & Caner, 2016; Kavusan & Frankort, 2019; Baum et al., 2005). I add to these studies by showing that firms can engage in problemistic search also at different levels such as TMT which reflects the organization (Hambrick & Mason, 1984).

The third chapter contributes to our understanding of TMT hierarchical structures. My study enlarges upper echelons theory and more specifically, the literature on TMT hierarchical structures, which has focused on the outcomes of TMT hierarchical setups in the past (Cannella & Hambrick, 1993; Haleblian & Finkelstein, 1993; Keck, 1997; Patel & Cooper, 2014). I complement this research by increasing our knowledge and understanding of how TMTs with different hierarchical structures are designed and by displaying what drives TMT hierarchical

stratification. As the first study to analyze the antecedents of TMT hierarchical structural configurations at different levels (CEO, strategic leadership, firm, environment, performance), my results establish that CEO duality, outsider CEOs, TMT size, firm size, divisionalization, industry growth, industry concentration and sales growth determine TMT hierarchical stratification. These findings indicate that contingency perspective is useful for explaining firms' decisions related to the hierarchical structure of their TMTs. Moreover, the results show that firms can alter the hierarchical structures of their TMT depending on their considerations around social unity and power distribution within the TMT (Hambrick et al., 2015; Finkelstein, 1992).

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CHAPTER 2- Chief Innovation Officers on top management teams: An empirical study of behavioral and institutional antecedents

ABSTRACT

To better manage the opportunities and threats around innovation, many firms created a Chief Innovation Officer (CINO) position in their top management teams (TMTs). Using insights from behavioral theory of the firm and institutional theory, I investigate how performance feedback and legitimacy considerations are important drivers of CINO presence in TMTs. I analyze the data of 280 science-oriented firms from the Standard & Poor's Index between 2008 and 2017 to assess how those factors influence CINO presence in TMTs and find convincing results. When a firm's innovation performance falls below its "social" aspirations, that firm becomes more likely to have a CINO in its TMT. Similarly, when a firm underperforms regarding its "historical" market aspirations, the probability of a CINO presence in its TMT increases. Also, CINO prevalence in a firm's industry significantly affects that firm's decision to have a CINO in its TMT. The findings of this study present important contributions into upper echelons, behavioral theory of the firm and innovation governance literatures.

Keywords:
Chief Innovation Officers, Upper Echelons Theory, and Behavioral Theory of the Firm, Institutional Theory, Innovation Governance

2.1 | INTRODUCTION

In line with the increasing significance of innovation as an important value driver, many firms started to create Chief Innovation Officer (CINO) roles in their top management teams (TMT). According to a study at the Forbes, around 30% of the Fortune 500 firms employ a CINO within their TMTs (Swoboda, 2020). Some examples of firms that appointed CINOs include Coca-Cola, General Electric, Citibank, Boeing, etc. CINOs have a range of responsibilities including formalizing the innovation discipline, formulating the innovation strategy, and building an inclusive culture around innovation (Hill & Barton, 2013; Poston, 2013).

Despite the popularity of the role and the responsibilities attached to the position, it is not fully clear why firms include such a position in their TMTs. Therefore, in this study, I analyze the question of "What are the antecedents of CINO presence in TMTs?". As regards new generational roles in TMTs such as Chief Sustainability Officers or Chief Digital Officers, people hold varying perspectives with some believing that these roles are included in TMTs for more strategic reasons to influence related performance while others suggest that firms set up these roles to meet the expectations of investors and analysts, etc. who evaluate firm efforts based on explicit activities such as corporate social responsibility or digital transformation (Fu, Tang, & Chen, 2020; Kunish, Menz, & Langan, 2020). I argue that similar considerations could also apply for CINOs where on one hand, they are included in TMTs to rationalize the innovation processes and better control the innovation related performance. On the other hand, it is possible to argue that the inclusion of such a role serves only as a signaling purpose, whereby the inclusion of the CINO is due to institutional pressures to legitimize the firm. Depending on these viewpoints, this paper examines the determinants of the presence of this new role in the TMTs by juxtaposing two alternative

theoretical mechanisms that can explain such an inclusion, namely the behavioral theory of the firm and the institutional theory.

While analyzing the antecedents of the CINO role in TMTs, behavioral theory represents the "performance feedback" and institutional theory represents the "legitimacy" perspective. The behavioral theory of the firm (Cyert & March, 1963) states that firms engage in problemistic search and make organizational changes, when their performance is below their aspirations, in order to get back on track. Accordingly, I argue that firms have a higher likelihood of having CINO roles in their TMTs when they lag their aspirations, both in terms of specific innovation performance and market performance where innovation is a key driver (Auh & Menguc, 2005). Under these circumstances, CINOs can assist their firms to recover performance mainly by improving their innovation capabilities, contributing new ideas for growth and by managing the innovation initiatives to reduce the task demands in the TMT (Gaba & Bhattacharya, 2012; Hambrick & Cannella, 2004). As an alternative to the performance feedback arguments, I also suggest that the rise of CINOs in TMTs can be driven by the social considerations of the firms influenced by the actions of their competitors, in line with the institutional and managerial fad arguments (Meyer & Rowan, 1977; Di Maggio & Powell, 1983; Abrahamson, 1991). Firms may feel a pressure to create a CINO role in their TMTs because their industry peers are doing so. By exhibiting these kinds of imitative behaviors, they aim to improve their legitimacy in the eyes of their different stakeholders.

After testing my predictions within a sample of 280 science-based firms in the Standard and Poor (S&P) Index, I find out that both behavioral and institutional arguments provide important explanations about CINO presence in TMTs. Regarding the behavioral theory of the firm, I demonstrate that the frame of reference is different for firms when they are evaluating performance feedback to decide upon CINO presence within their TMTs. The likelihood of CINO

presence increases when firms underperform compared to their social innovation and historical market performance aspirations. Also, I discover a significant relationship between the prevalence of the CINO position in a firm's industry and the decision of that firm to have a CINO in its TMT.

This study contributes into at least three different literature streams. First, it extends upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) by introducing a new executive role, CINOs, into the research agenda next to other executive roles such as Chief Strategy Officers, Chief Marketing Officers, Chief Supply Chain Officers, and Chief Digital Officers (Menz & Scheef, 2014; Nath & Mahajan, 2008; Roh, Krause, & Swink, 2016; Kunish et al., 2020). Second, my study enlarges the behavioral theory of the firm (Cyert & March, 1963) by identifying how firms can engage in problemistic search within their TMTs through employing non-traditional roles such as CINOs in connection with negative performance feedback. Third, this paper provides additional insights into innovation governance field (Tushman & Nadler, 1986; Argyres & Silverman, 2004; Birkinshaw, Hamel, & Mol, 2008). Specifically, I demonstrate the multi-dimensional performance demands linked to innovation and CINO position as a structural choice accordingly. As such, I offer an additional perspective into the micro-foundations of innovation.

2.2 | THEORETICAL BACKGROUND AND HYPOTHESES

2.2.1 | Upper Echelons Theory and Chief Innovation Officers

The upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) states that firms and their performances are reflections of their top managers. According to the upper echelons perspective, firms' strategic choices are highly influenced by both the values and the cognitive biases of powerful actors. These values and cognitive bases are closely linked to the actors' observable characteristics such as education, work experience, and the like, which in turn significantly affect organizational outcomes. Recent studies on functional executives have

demonstrated the fact that more specialized executives are appointed into TMTs to influence firm performance on specific dimensions, such as Chief Human Resources Officers to control relations with employee unions (Abt & Knyphausen, 2017), Chief Strategy Officers to manage the mergers, acquisitions and alliance outcomes (Menz & Scheef, 2014) and Chief Sustainability Officers to create more value through environmental and social responsibility initiatives (Kanashiro & Rivera, 2019; Henry, Buyl, & Larsen, 2019; Fu et al., 2020). In addition to these roles, CINO positions have become quite prominent, in line with the increasing significance of innovation. According to a study by Egon Zehnder, 29% of Fortune 500 firms have a CINO or similar in their TMTs (Lovric & Schneider, 2019).

The formalization of the CINO role only started recently, even though innovation has been an important concern for firms for a considerable time (Johnson, 2010). The rise of the CINOs is mainly attributed to the digital revolution, sustainability considerations of firms in their commercial initiatives and a higher focus on building the appropriate leadership style for innovation (Johnson, 2010). According to Maier (2014) innovation processes include contradictions where, on the one hand, firms strive to create an environment for communication and creativity but on the other hand, they aim for efficiency. To manage this balance, firms started to structure and formalize their innovation processes which led to the emergence of innovation as a profession and innovation executives, accordingly.

Maier (2014) and Maier and Brem (2018) state that there is no universal description of tasks, traits, and skills of CINOs within the scientific literature. However, some professional reports provide more clarity as to their different duties and characteristics. According to the Innovation Enterprise Report (Hill & Barton, 2013), the main purpose of the CINO position can be to incubate new practices or products either to gain market prominence or maintain

performance. Often, an idea needs to be implemented quickly to have maximum impact and one of the CINO's key roles is making this process as fast as possible. Additionally, innovations and changes can often represent risk, especially with disruptive technologies or practices that change the core functions of a firm. At this stage, CINOs can support firms to minimize the risks involved with innovating. From a practitioner perspective, Bill Poston, the founder of chiefinnovationofficer.com, thinks that CINOs must formulate and communicate the innovation strategy as well as manage the corporate innovation portfolio. Additionally, they must assume responsibilities to develop frameworks for measuring and analyzing innovation results. Furthermore, they are seen as being crucial to enhance innovation capabilities especially by developing innovation expertise across the firm.

CINOs could have similarities with other new generational executives such as Chief Sustainability Officers or Chief Digital Officers since they all deal with an important business trend and its related strategic initiatives. Accordingly, CINOs focus on placing innovation at the center of attention within the TMT, thereby bridging different business units and functions around the business trend of innovation (Stevenson & Euchner, 2013). While discussing the effect of strategic leadership on innovation, many studies focused also on Chief Technology Officers (CTOs) (Wu, Dbouk, Hasan, Kobeissi, & Zheng, 2021; Medcof & Lee, 2017). CINOs differ from CTOs mostly related to their role of defining and executing an essential innovation strategy just like sales, marketing strategies, etc. which includes many elements such as technological capabilities, customer preferences, competitors, etc. Innovation strategy cuts across functions (Pisano, 2015) making the role of CINO more cross functional whereas CTOs mostly focus on monitoring and selecting new technologies through assessing their potential of becoming value adding products of services (Smith, 2003). Moreover, Pisano (2015) mentions that innovation

strategy must align well with overall business strategy. Here, CINOs work more closely with Chief Strategy Officers that are responsible for the management of their firms' general strategy processes, as well as strategy execution activities (Menz & Scheef, 2014).

The recent study by Innovation Enterprise Foundation (Hill and Barton, 2013) outlines some of the factors for why firms appoint a CINO into their TMTs. The report mentions that CINOs allow for real game changing and formalized systems of innovation through which pipelines of ideas can be built and supported within the TMT and in the firm. Secondly, TMTs need tools to quickly evaluate new ideas, which CINOs can build in a more efficient manner. Moreover, other considerations such as avoiding group thinking, increasing inclusivity, and rewarding efforts around innovation are provided for creating CINO roles.

The decision to include a CINO in the TMT is mostly made by the CEO. Hill and Barton (2013) and Stevenson and Euchner (2013) identify that CINOs typically report to CEOs. Kelly (1980) also states that CEOs include new members in the TMT, which they can rely on to reinforce strategic change. Other studies further analyze how the CEO and senior executive team influence the strategic decision-making and firm performance together (Tushman & Rosenkopf, 1996; Shen & Cannella, 2002). Based on that, CEOs might need different executives like CINOs to foster improved decision-making and performance on innovation-related matters. Additionally, when I look at two recent CINO appointments at Cronos Group and 4media Group, I can see comments and views from the CEOs of both companies (Cronos Group, 2019; Pavinska, 2019). This provides further support into the fact that CINOs work directly with CEOs and their presence in the TMTs is impacted mostly by the decisions of CEOs.

The above research about CINOs leads me to the question of why firms choose to have a CINO in their TMTs. My choice of theoretical perspectives to analyze CINO presence in TMTs is

mainly inspired from the latest discussions around the newer generational executives like Chief Sustainability Officers and Chief Digital Officers. Strand (2014) suggests that firms appoint a Chief Sustainability Officer to incorporate sustainability into their business strategy and to substantially improve their corporate sustainability performance. However, he also argues that firms can have a Chief Sustainability Officer in their TMTs to enhance their public image, rather than an improvement in sustainability performance. Similarly, Kunish et al. (2020) suggest that adoption of the Chief Digital Officer position might carry a symbolic meaning to signal capabilities and priorities to stakeholders but can also be functional and have a crucial impact on digital transformation outcomes. Depending on these viewpoints, I first draw on the behavioral theory of the firm (Cyert & March, 1963) and argue that firms can take feedback from their past performance and include a CINO position in their TMTs to improve their innovation related performance. Alternatively, I use institutional theory (Meyer & Rowan, 1977; Di Maggio & Powell, 1983) to explore how firms' decisions to include a CINO in their TMTs are shaped by their social concerns and legitimacy considerations.

2.2.2 | CINO Presence in TMTs: Behavioral Perspective

According to the behavioral theory of the firm (Cyert & March, 1963), firms are goal-directed systems that use simple decision making mechanisms to adapt their behaviors in response to performance feedback. The performance feedback is a useful tool to provide firms with a sense of how they are performing and whether they need to make any changes going forward (Lant, 1992). The term "aspiration level" is another core construct of the behavioral theory of the firm and refers to the smallest outcome that would be deemed satisfactory by the decision maker (Schneider, 1992: 1053). Organizational decision makers can benchmark their firm's current performance against its own historical performance, using their historically derived aspirations to

determine how their firms should strategize (Levinthal & March, 1981). Also, the decision-makers compare the firm's performance against the performance of a referent or peer group of other firms, a process that has been called social aspirations (Greve, 1998).

The behavioral theory of the firm states that when the performance of firms is below their aspiration levels, they get engaged in more problemistic search. Problemistic search is intended to immediately counter the challenge(s) so that performance can return to its aspiration level. On the other hand, when firms just achieve their aspirations, they tend to maintain current routines and have limited motivation to search for anything new (Cyert & March 1963, Levinthal & March 1981). Greve (1998 and 2003) also identifies that firms become more prone to organizational changes when they fail to achieve their goals. Performance feedback and organizational change perspectives have been utilized extensively to analyze the innovation related actions of firms including research & development (R&D) investments, new product introductions and R&D alliances (Greve, 2003; Chen & Miller, 2007; Joseph & Gaba, 2015; Tyler & Caner, 2016). In line with these arguments, I state that when firms are faced with negative performance feedback, these innovation related actions could also take place at the TMT level with the inclusion of a role dedicated to innovation management. Stevenson and Euchner (2013) also suggest that when something is missing in an organization, one response is to have a new role, such as a CINO where innovation performance is struggling.

Greve (2003 and 2008) argues that firms seek to sequentially meet aspirations across different goals based on their salience and stresses the need to match goals to their related problems so that firms can more effectively initiate their search. Gaba and Bhattacharya (2012) find accounting metrics such as return on assets lacking certain specifications and use more specific innovation metrics to understand the firm's decisions as to whether to create a corporate venture

capital unit or not. In line with these scholars and considering the CINO role, I benefit from two performance metrics that can provide more effective feedback to firms while they are evaluating CINO presence in their TMTs. I first use specific innovation performance like Gaba and Bhattacharya (2012). Additionally, for a more general performance indicator where innovation is a key driver, I use market performance based on the classification of Auh and Menguc (2005).

Based on the behavioral theory of the firm complemented with upper echelons arguments, I propose that as the firms' innovation performance falls below their aspiration levels, they will be more motivated to employ a CINO role in their TMTs for various reasons. First, firms would wish to increase their knowledge and capabilities to recover their innovation performance. Gaba and Bhattacharya (2012) find that when firms' innovation performance is below their aspirations, they tend to establish a corporate venture capital unit to partner with different types of organizations, such as start-ups, to tap into different knowledge sources. Tyler and Caner (2016) suggest when their new product introduction rate trails below their aspiration, firms establish more R&D alliances to acquire different capabilities from their partners.

Aligned with the arguments above, having a CINO role in the TMT could assist firms to enhance their innovation knowledge and capabilities and recover their performance in many ways. First, they can formalize the process of innovation and evolve it as a business discipline by devising a language around it (Hill & Barton, 2013; Maier, 2014). Then, they can more effectively formulate, communicate, and implement the innovation strategy by acting as a bridge across various functions such as marketing, R&D, strategy, engineering, etc. (Maier, 2014; Stephenson & Euchner, 2013). They can also develop new tools and frameworks to evaluate new ideas quickly and make more informed decisions about supporting them (Hill & Barton, 2013). Additionally, they can promote a culture for innovation around support, inclusivity, and reward through which

they can assist the TMTs to overcome the resistance and status quo for innovation by effectively addressing their concerns (Hill & Barton, 2013; Maier, 2014). Moreover, they may develop the innovation roles, people, skills, and career paths for the sustainability of the discipline (Poston, 2013). Furthermore, from a knowledge management perspective, they can introduce new ways to manage both internal and external knowledge of their firms by making the knowledge carriers communicate more effectively with each other (Maier, 2014).

In addition to helping with innovation capabilities and knowledge, CINOs can also play a crucial role in increasing the attention level of the TMT and the whole firm towards innovation. According to the attention-based view of the firm (Ocasio, 1997 and 2011), firm behavior is highly impacted from the way it distributes and channels its attention. Hambrick (2007) mentions that different positions and sub-teams at the TMT highly influence the awareness and salience of issues within the firm. Accordingly, Nath and Mahajan (2008) note that Chief Marketing Officers raise the significance of marketing issues at the TMT level which could potentially equally apply for CINOs towards innovation related issues.

Ocasio (1997 and 2011) suggests that the allocation of resources and support towards certain issues is very much linked to the attention they receive. He also argues that firms evaluate the criticality of the issue from the perspective of the attention carrier. Fu et al. (2020) analyze the Chief Sustainability Officers as attention carrier for sustainability related matters in the TMT and find strong support for improved social performance in return. Yadav, Prabhu and Chandy (2007) also mention that increased attention leads to better innovation outcomes. Based on these points, CINOs can fulfill the role of the attention carrier towards innovation related issues very effectively. Therefore, their presence can enable increased saliency and support towards innovation which translates into better decision making and improved performance on innovation-related matters.

To conclude, I posit that in the case of challenging innovation performance compared to aspirations, the presence of a CINO role in the TMT will support firms to recover their performance since CINOs can increase the innovation knowledge and capabilities as well as enhance the attention of the TMT towards innovation. Therefore, I suggest the below hypothesis.

Hypothesis (H1) *The lower a firm's innovation performance relative to its aspirations, the greater the likelihood of CINO presence in the firm's TMT.*

In addition to specific innovation goals, firms also pursue broader goals where innovation is a key driver. Auh and Menguc (2005) argue that exploration is more connected to effective firm performance conceptualized as sales growth or market share while exploitation is linked to efficient firm performance defined as return on assets or profitability. They also state that exploration is concerned with challenging existing ideas with innovative and entrepreneurial concepts, which fits well with the job descriptions of CINOs described above. Building on all these arguments, I argue that CINOs will have more influence on market performance compared to return on assets, etc. and feedback coming from market performance is going to be more crucial for firms when they are evaluating inclusion of a CINO in their TMTs.

When firms underperform on their market ambitions, including a new CINO role could support them in many ways. Poston (2013) mentions that when firms reach a limit on geographical expansion or have no room to raise their prices, they must either engage in mergers and acquisitions or innovate. He argues that acquiring growth may be both expensive and risky; therefore, firms must follow the tough road of innovation. At this stage, CINOs can assist their firms to discover different paths to growth through which they can differentiate themselves from the competition. The job description of the Coca-Cola Company CINO clearly states that he is responsible for accelerating growth through continued innovation (Coca Cola Company, 2019), while the role of the CINO of General Electric is centered on finding unconventional ways of

growth (General Electric, 2019). Stevenson and Euchner (2013) provide support to these viewpoints by stating that CINOs and market performance work in parallel. Additionally, Maier (2014) calls CINOs as trend watchers who follow and identify new disruptive opportunities and trends for their firms which can support them to outperform competition going forward. Moreover, Kunish et al. (2020) find out that the probability of Chief Digital Officer presence in a firm's TMT increases when its sales growth is reduced. The main motivation here is to find new digital means to enhance sales performance. This finding can further highlight that firms are open to have more new generational positions in their TMTs in the case of poor sales or market performance.

Applying the framework of Auh and Menguc (2005) between innovation and market performance as well as on the studies looking at the link between performance aspirations gaps and innovation (Greve, 2003; Chen & Miller, 2007; Chen, 2008), I can expect that firms will invest more in innovation to recover their market performance and to catch up with their aspirations. However, these extra innovation initiatives are also expected to create more task demands on the TMT (Hambrick & Cannella, 2004). Menz and Scheef (2014) suggest that delegating the strategy related tasks to a Chief Strategy Officer ensures that related initiatives receive sufficient focus and resources. Based on that logic, employing a CINO role in the TMT reduces the workload of other TMT members and allows firms to better manage the corporate innovation portfolio and analyze the innovation results more effectively (Hill & Barton, 2013). Likewise, Haleblian and Finkelstein (1993) argue that new roles in the TMT increase information-processing capabilities and in this regard, Marcel (2009) finds strong support for Chief Operating Officers. Following the arguments of Eisenhardt and Bourgeois (1988), CINOs increase the capabilities of the TMT to select the best innovations for increasing market performance based on the information available. Moreover, Kanashiro and Rivera (2019) and Henry et al. (2019) state that Chief Sustainability Officers

involve TMT members in sustainability discussions and allow the diffusion of sustainability-related ideas more effectively throughout the organization. Similarly, CINOs can catalyze the discussions for innovation in the TMT and support middle managers to champion the innovation initiatives for better market performance.

To sum up, CINOs can support their firms to recover their market performance aligned to their aspirations more directly through introducing unconventional strategies for differentiation. In addition to this, they may contribute to improved market performance more indirectly by reducing the task demands of other executives through assuming responsibility for the innovations planned for improving market performance. In line with that reasoning, they enhance the information-processing capabilities of the TMT while evaluating the innovations and enable more effective diffusion of these initiatives to fuel the market performance. By bridging all these insights, I suggest the following hypothesis.

Hypothesis (H2) *The lower a firm's market performance relative to its aspirations, the greater the likelihood of CINO presence in the firm's TMT.*

2.2.3 | CINO Presence in TMTs: Institutional Perspective

Institutional theory explains that individuals and organizations aim to get legitimacy for their structures and processes in socially constructed environments by adapting their business practices, processes, programs, and structures to social norms as well as to internal or external forces (DiMaggio & Powell, 1983; Meyer & Rowan, 1977). These forces also play a role in pressuring firms to resemble others in the environment, to gain legitimacy (DiMaggio & Powell, 1983; Meyer & Rowan, 1977).

To cope with the pressures of legitimization, firms may adopt different practices. Di Maggio and Powell (1983) state that prevalence is the main driver of a legitimate practice. Therefore, one strong mechanism for firms to gain legitimacy is the imitation of practices that are

prevalent among their referent others. By adopting practices of others, firms show that they can reach their goals with the most optimum positioning in their environments. This imitative behavior is also another useful way of dealing with uncertainty. Decision makers believe that imitating other firms reduces the risk of uncertainty. Consequently, these imitative behaviors lead to mimetic isomorphism and assimilation of practices across different industries or similar firms.

The "management fad" perspective of Abrahamson (1991) combines the "herding" perspective with institutional theory to explain how social forces lead to imitative behaviors across firms. Abrahamson and Rosenkopf (1997) mention that following the "herd" while adopting a practice is a mechanism to cope with information asymmetries for firms. Herding behavior is attributed to the fear of reputation loss (reputational herding) or competitive position (competitive herding) (Abrahamson & Bartner, 1990). The main drivers of both reputational and competitive herding are based on the belief that it is better to fail as part of the herd rather than to succeed as a deviant (Hirshleifer & Teoh, 2003).

Menz (2012) argues that the appointment of new generational TMT members such as a Chief Ethics Officer or Chief Sustainability Officer are connected to some bandwagon effects where the roles may diffuse across firms in accordance with rising trends and management fashions. In line with these arguments, Abt and Knyphausen (2017) analyze the presence of Chief Human Resources Officers (CHRO) in the TMT in connection with the contingency, institutional and homophily arguments and show that emergence of CHROs in TMTs are mainly linked to institutional logic compared to contingency or homophily arguments. Wiedeck and Engelen (2018) look at how imitative behaviors of firms drive the existence of Chief Marketing Officers (CMO) within TMTs and find strong support that the diffusion of CMOs in the industry significantly impacts the presence of the role in a specific firm. Like CHROs or CMOs, Shi, Pathak, Song and

Hoskisson (2018) explore the link between Chief Diversity Officer adoption and mimetic isomorphic behaviors of firms and discover a significant relationship between the two. Moreover, Fu et al. (2020) find support for the fact that firms follow their industry peers when adding Chief Sustainability Officers roles in their TMTs.

Looking at the influence of institutional factors on the presence of different executives in TMTs, firms' imitative behaviors can also explain the presence of CINOs. Wiedeck and Engelen (2018) state that firms appoint a CMO into their TMTs to preserve their legitimacy and the new CMO role can be regarded as a legitimizing structural practice. Additionally, Henry et al. (2019) mention that presence of sustainability executives signals the commitment of the firm towards sustainability matters. Strand (2014) argues that by hiring a sustainability officer, firms aim to enhance their public image rather than to improve their performance. Similarly, a new CINO position in the TMT could drive the legitimacy of firms, as it will provide a strong signal to the environment and to the related stakeholders about the prominence they place on innovation as one of the most important business trends.

Abt and Knyphausen (2017) also mention that organizational decisions can be based on rational cost and benefit considerations, but the most efficient alternative may not be selected. They interview different firms about their rationale for appointing new members to their TMTs. One of the most common responses they receive is that "Our competitors do it that way". Moreover, in line with views on the herding perspective, firms imitate to counter the risk of deviating from the consensus or to provide a response to the competitor moves. Therefore, firms may include a CINO in their TMTs when their competitors have one, believing that they may be left behind in terms of innovativeness in the absence of a similar position.

Burt (1997) suggests that industry peers become the most visible frame of reference when firms decide to imitate. Wiedeck and Engelen (2018) argue that firms monitor the behaviors of their industry peers and act in a sensitive way towards any changes in their behaviors. Abt and Knyphausen (2017) support these views by stating that human resources practices and policies of most successful firms in an industry are duplicated. Moreover, Finkelstein, Hambrick and Cannella (2009) state that TMT structures reflect assimilation especially within the same industry. Therefore, taking all the above perspectives into consideration, I present the below hypothesis.

Hypothesis (H3) *The greater the CINO prevalence in a firm's industry, the greater the likelihood of CINO presence in the firm's TMT.*

2.3 | METHODOLOGY

2.3.1 | Sample and Data

I collected data from a variety of sources including a range of ten years between 2008 and 2017. I obtained information about the TMTs and CINOs from BoardEx, which contains the TMT members of firms listed within their 10Ks and 8Ks (Fu et al., 2020). I used Compustat to retrieve information concerning firm and industry financials. Further, I retrieved patent data from the US Patent Office (USPTO) database. In addition to these sources, I utilized Execucomp and CapitalIQ databases to complete other information for TMTs and firms in general.

For sampling, I started with all the firms listed in the BoardEx database. Like many studies focusing on innovation, I decided to select more science-based firms to better explore the presence of CINOs. To detect the science focused firms, I eliminated those not reporting any research and development expenses in Compustat. After that, I cross-matched these firms with their respective records at USPTO database to obtain the patent information. After excluding the firms that do not have significant patent records and also have missing information on the BoardEx database, I ended up with 280 firms and 2,577 unbalanced firm-level observations distributed across six

industries based on the 2-digit SIC codes; namely Chemicals and Allied Products (SIC 28), Machinery and Computer Equipment (SIC 35), Electronic and Electrical Equipment (SIC 36), Transportation Equipment (SIC 37), Instruments and Clocks (SIC 38) and Business Services (SIC 73). Using the 2-digit SIC codes for an industry is supported by the study of Wiedeck and Engelen (2018) in which they talk to several consultants and industry experts and confirm that 2-digit SICs are more useful compared to 4-digit SIC codes to define an industry.

2.3.2 | Measures

2.3.2.1 | Dependent Variable

The dependent variable for all hypotheses is CINO presence. The presence of the CINO in the TMT is coded as "1" if the firm employs an innovation related executive and "0" if it does not for each year. To understand the presence of a CINO in the TMT, I followed a comprehensive approach, like other related TMT studies (Nath & Mahajan, 2008; Menz & Scheef, 2014; Abt & Knyphausen, 2017). I defined the TMTs of sampled firms by considering all the titles listed in the BoardEx database (Fu et al., 2020; Kunish et al., 2020). The conceptualization of TMTs based on BoardEx data is like the method of Hambrick, Cho and Chen (1996), in which they define TMTs as the executives above a certain title such as vice president or director.

To identify the CINOs, I scanned all the titles in the BoardEx database based on some keywords and phrases such as "innovation" and others that may resemble innovation as "ventures", "creativity", "accelerator", "exploration", "innovation center", "new businesses", etc. After the determination of the titles, I double checked all of them through firm records or press releases to see whether they belong to the function of innovation or not. In some cases, there were some executives with the titles containing these words, but their job descriptions turned out to be significantly different from innovation like Chief Creativity Officers who work more on product

designs with an engineering perspective. On the other hand, there were some TMT members that did not have the word "innovation" within their titles, but their role descriptions were identical to CINOs such as the Head of Global Creative Strategy at Meta Platforms Inc. (formerly Facebook Inc.). Moreover, some firms had executives with additional responsibilities in their titles next to innovation such as "Chief Innovation and Technology Officer" or "Vice President of Innovation and Strategy". I also considered these types of roles to be part of the subset of CINOs. For more details about CINO related titles, please refer to the Appendix.

2.3.2.2 | Independent Variables

For Hypotheses 1 and 2, the independent variable is performance aspirations gap. I developed the measures of aspirations based on historical and social aspirations following previous studies (Greve, 1998 and 2003). Historical aspirations depend on the firm's own performance in previous years and social aspirations depend on the firm's performance compared to its industry peer group.

For Hypothesis 1, I measured the "innovation performance" by taking the ratio of the number of applied patents to the total R&D spending (Gaba & Bhattacharya, 2012) instead of total patent counts, to eliminate various effects related to technological opportunities and firm scales (Kortum & Lerner, 1998). Subsequently, I calculated the performance aspirations gap by subtracting the historical and social aspiration levels, respectively, from the actual innovation performance for a given year.

Following prior research (Greve, 2003), I calculated historical aspiration levels as the exponentially weighted moving averages of historical performance defined as follows: $A_{it}=aA_{it-1} + (1-a)P_{it-1}$, where i represents the focal firm and t the related time. P stands for the past innovation performance measured as a moving average of the past 3 years like the approach of Tyler and

Caner (2016); and the updating parameter a is the weight attached to the most recent historical aspiration level A_{it-1}. Based on the methodology of Greve (2003), I defined a as the value that provides the best fit of the models to the data based on the increments of 0.1 (Gaba & Bhattacharya, 2012; Kavusan & Frankort, 2019). For the innovation performance model, I kept the a as 0.9. I obtained the social aspiration levels as the simple average of the innovation performance of all other firms within the focal firm's industry based on the 2-digit SIC codes.

For Hypothesis 2, I operationalized the "market performance" by taking the revenue share of the focal firm to the total revenue of the industry each year. The market share metric has also been utilized in other behavioral theory studies such as Greve (1998) and Baum, Rowley, Shipiloy and Chuang (2005). I obtained the historical and social aspirations in a similar way as described above, except that innovation performance has been replaced with market performance. Like the innovation performance model, I kept the a as 0.9 concerning historical aspirations.

After the calculation of the aspiration gaps as P_{it}-A_{it}, I utilized the spline functions for both historical and social aspirations by categorizing them as above and below aspirations (Greve, 2003; Chen and Miller, 2007; Gaba and Bhattacharya, 2012). The performance below historical aspirations is equal to 0 for all observations when the firm's performance is higher than its historical aspirations and taken as the absolute value of the difference between its performance and historical aspirations, in the opposite case. In connection with this approach, I defined the performance above historical aspirations symmetrically. Similarly, I conceptualized performance above and below social aspirations in the same way as described for historical aspirations. I applied this procedure for both innovation and market performance.

For Hypothesis 3, the independent variable is CINO prevalence. I captured CINO prevalence in the industry of the focal firm by taking the percentage of firms having a CINO in

their TMTs to the total number of firms within the 2-digit SIC code, in accordance with similar studies (Abt & Knyphausen, 2017; Wiedeck & Engelen, 2018). It is worth mentioning that I excluded the focal firm while determining the CINO prevalence within the industry.

2.3.2.3 | Control Variables

I included control variables at different levels including firm, environment, TMT, and individual CEOs. The controls used are *technological intensity, diversification, firm size, firm age, firm leverage, CEO Tenure, CEO Science Orientation, Outsider CEO, industry dynamism, market concentration, slack and whether the firm has a Chief Technology Officer (CTO) and Chief Marketing Officer (CMO) or not in its TMT.* I note that many of these measures are used in other studies as part of the contingency perspective to address the presences of various executives such as Chief Operating Officers (Hambrick &Cannella, 2004), Chief Marketing Officers (Nath & Mahajan, 2008; Wiedeck & Engelen, 2018), Chief Strategy Officers (Menz & Scheef, 2014) and Chief Human Resources Officers (Abt & Knyphausen, 2017). Please refer to the table below for details of the control variables.

[Insert Table 1 about here]

2.3.3 | Model and Estimation

In connection with the binary nature of my dependent variable, I implemented logistic regression analyses to analyze the relationship between the presence of CINOs and my independent variables. Also, I pooled the data in line with prior research on other executive roles (Hambrick & Cannella, 2004; Menz & Scheef, 2014; Nath & Mahajan, 2008; Abt & Knyphausen, 2017; Wiedeck & Engelen, 2018; Kunish et al., 2020). Using pooled data may lead to more precise estimates but these estimates can be biased since observations are not completely independent (Kunish et al., 2020). To better deal with this possibility, I utilized generalized estimating

equations (GEE) approach (Liang & Zeger, 1986). GEE requires the specification of a distribution family, link function, and correlation structure. As my dependent variable was dichotomous, I applied a binomial distribution and logit link function[1]. Then, I chose an autoregressive (AR1) correlation structure which controls for time-related relationships within each panel. Moreover, I used robust standard errors to account for heteroskedasticity. Furthermore, I accounted for time trends by using year dummies and for reverse causality by taking the one-year lagged versions of the independent and control variables (Hambrick & Cannella, 2004; Hambrick, 2007).

2.4 | RESULTS

Table 2 displays the descriptive statistics for all the variables included in testing the hypotheses. I can observe that most of the correlations are below 0.55 meaning that multicollinearity is not a major problem. Also, I computed variance inflation factors (VIFs) and found no variable in my model with a score above 4.50, while the mean VIF for all variables included in my model was 2.18, below accepted standards.

[Insert Table 2 about here]

The mean CINO presence is 21% indicating that a CINO was present in the TMTs at 541 of the 2,577 firm observation years. Figure 1 shows the development of CINO presence in TMTs between 2008 and 2017 in total and for the industries included in the sample. The figure points out that the CINO role received more interest among the sampled firms over the time where its prevalence in the TMTs increased by 17%, from 11% to 28%. The CINO prevalence has increased the most for Business Services (SIC 73) by 23% (from 28% to 51%) during the years of

[1] I ran the models also with logistic regression including firm fixed effects and standard errors clustered at the firm level, where my results were not that different from my models with GEE.

observation. Chemical and Allied Products (SIC 28) industry has the second highest CINO prevalence of 40% in 2017 achieving a 16% increase from 2008.

[Insert Figure 1 about here]

Table 3 presents the results of the hypotheses. Representing the logistic regression, Model 1 includes only the control variables and Model 2 adds the institutional effects. Models 3 and 4 include the main effects for historical innovation performance aspirations gaps separately and combined with institutional effects whereas models 5 and 6 do the same for social aspirations. models 7 through 10 repeat the same analysis by focusing on market performance. Analyzing model 1, the only control that has a significant effect on CINO presence is the availability of a Chief Technology Officer, where its presence impacts the likelihood of CINO presence positively (ß=0.51, $p<0.01$). This result can indicate that firms see these roles as complementary rather than substitutes which can create important synergies to generate even stronger innovation results. This finding is like the study of Kunish et al. (2020) who also find a positive correlation between the presence of Chief Digital Officers and Chief Information Officers in the TMTs.

[Insert Table 3 about here]

Hypothesis 1 predicted that when firms fall behind their aspiration levels in terms of innovation performance, they might tend to introduce a CINO into their TMTs. Looking into models 3 and 4, I do not observe any significant effect of performance below historical aspirations on CINO presence. However, models 5 and 6 display a significant relationship between performance below social aspirations and CINO presence (model 5- ß=1.01, $p<0.05$; model 6- ß=0.88, $p<0.05$). Therefore, hypothesis 1 is partially supported. Regarding magnitude effects, 1 standard deviation decrease in the innovation performance compared to the social aspirations increases the likelihood of CINO presence in TMTs by 2.2% as shown in the respective figure.

[Insert Figure 2 about here]

Hypothesis 2 assumed that the probability of CINO presence increases when firms perform worse than their market aspirations. Models 7 and 8 indicate a significant relationship between performance below historical market aspirations and CINO presence in TMTs (model 7- ß=10.47, $p<0.05$; model 8- ß=10.29, $p<0.05$). On the other hand, performance below social market aspirations does not seem to influence CINO presence in TMTs significantly according to models 9 and 10. Therefore, hypothesis 2 is also partially supported. As for the magnitude effects, 1 standard deviation decrease in the market performance compared to the historical aspirations increases the probability of CINO presence in TMTs by 1.5% as displayed in the below figure.

[Insert Figure 3 about here]

Hypothesis 3 suggested that there is a higher chance of CINO presence in a firm's TMT, when more firms in the same industry also have a CINO position within their TMTs. I tested this hypothesis at models 2 for the individual effect and at models 4,6,8 and 10 in addition to performance aspirations across both innovation and market dimensions. The effect of CINO prevalence is positive and significant on all models ($p<0.05$). Therefore, hypothesis 3 is supported. For the magnitude effects, 1 standard deviation increase in the CINO prevalence within the industry of the firm increases the probability of CINO presence by 7.1% shown in the below figure.

[Insert Figure 4 about here]

2.4.1 | Additional Analyses

To further strengthen my findings, I performed five additional analyses as described below. All these additional analyses are available upon request.

First, I used a different measure for CINO prevalence by taking the revenue share of the firms (excluding the focal firm) employing a CINO in their TMTs for each of the industries, like

Wiedeck and Engelen (2018). I used this approach mainly to account for the firm sizes as Haunschild and Miner (1997) state that firms observe the larger ones within their industries relative to the others. The results did not turn out be significantly different from my original analysis where I had the number of firms having a CINO as the measure.

Second, Henry et al. (2019) differentiate between "Token" and "Non-Token" Chief Sustainability Officers where "Token" refers to the situation in which sustainability is an add-on role to another TMT member such as Sustainability and Human Resources, etc. On the other hand, "Non-Token" refers to pure Chief Sustainability Officers. Similarly, I applied the same classification for CINOs based on their job titles by categorizing them as "Token" and "Non-Token" and separately conducted the same analyses on them. In half of my observations, innovation was paired with another function and in the other half, it was a stand-alone function. In connection to my main findings, the likelihood of non-token CINO presence was much higher when firms underperformed on their innovation performance aspirations. This indicates that firms create innovation as a stand-alone function in the TMT to provide even stronger focus and attention towards innovation-related challenges so that the innovation performance recovers more quickly. On the other hand, my analyses demonstrated that firms preferred token CINOs when their market performance was below their aspirations. By pairing innovation with another function such as strategy or marketing, firms might aim to exploit synergies among these functions to develop new strategies and actions so that their market shares could return to the desired levels. Additionally, institutional effects proved to be linked more to token CINO presence compared to non-Token CINO presence, complementing Henry et al. (2019) concerning Chief Sustainability Officers.

Since I found significant effects for the negative performance feedback on CINO presence, I analyzed the effect of CINOs on firm performance from both innovation and market perspectives.

I assessed both types of performance based on years t+1, and t+2 to avoid reverse causality. As the appointment of the CINO may not be random, I followed the approach of Fu et al. (2020) to control for endogeneity. Since the CINO prevalence in the industry was a significant driver of CINO presence in the TMTs but not correlated to the error term, I used it as an instrumental variable. My results demonstrated that CINOs do not have significant effect on both innovation and market performance. These findings provide justification for the perspectives of Hill and Barton (2013) who argue that capturing the real value from the CINO position requires time and patience. As it is a new position, firms may not be used to working with CINOs. Therefore, it could require additional time to establish more clarity around the CINO role and create an environment where CINOs can fully deliver value.

In this study, I used the traditional definition of social aspirations gaps as the difference between the focal firm's performance and the average performance of all firms in the related industry. However, managers of large firms may not consider all the firms in their industries as their referent others but focus on a smaller peer group of meaningful others (Fiegenbaum & Thomas, 1990). Kuusela, Keil and Maula (2017) also mention that performance aspirations depend on a focal peer group most relevant to a firm's performance rather than the performance of all firms within the industry. Depending on these considerations, I constructed new social aspiration levels for both innovation and market performance based on the mean performance of firms within the 3-digit SICs instead of 2-digit SICs and calculated the social aspiration gaps accordingly. My analyses including the newly formed social aspiration levels and performance aspirations gaps led to similar results to those of my main analyses.

Finally, I explored the speed of CINO adoption and the factors that separate early and late CINO adopters. I used the same set of explanatory variables with speed of CINO adoption as the

dependent variable. I employed the Cox proportional hazard model like Shi et al. (2018). According to my results, larger sized firms having CMOs, CTOs as well as outsider CEOs introduced the CINO role faster compared to the others. Additionally, the institutional perspective received strong support where firms whose industry displayed higher CINO prevalence created the position in their TMTs earlier. On the other hand, I could not discover a significant relationship between performance aspirations and the speed of CINO adoption in TMTs.

2.5 | DISCUSSION

Guided by the discussions around the emergence of new generational roles in TMT, I examine the antecedents of CINO presence in TMTs with the support of behavioral and institutional perspectives and provide valuable insights. I discover that both performance feedback and legitimacy considerations provide significant explanations as to the usefulness of CINO presence on TMTs. The presence of CINOs in TMTs were correlated with both specific innovation and general market performance below aspirations. This shows that firms can become more open to problemistic search in their TMTs and employ different roles such as CINOs to acquire different competencies and recover their performance in various areas. However, when firms interpret the feedback coming from their innovation performance, they take their social aspirations more into consideration than their historical aspirations. On the other hand, historical aspirations prevail over social aspirations in terms of market performance. Moreover, firms are more sensitive to negative performance feedback from their more specific innovation aspirations compared to the more general feedback from market performance, while deciding to include a CINO in their TMTs.

My results suggest that CEOs and other decision makers can shift their attention between social and historical aspirations while deciding on CINO presence depending on the type of performance (Park, 2007). The finding that innovation performance relative to social aspirations

matters more compared to historical aspirations in predicting the presence of CINOs in TMTs is like Gaba's and Bhattacharya's (2012) study in which they also find that firms externalize their R&D activities depending on external but not internal standards of innovation performance. They also argue that social aspirations can dominate over historical aspirations in more dynamic and technology-intensive industries, which is also the setting of my study. On the other hand, the dominance of historical aspirations over social aspirations for market performance has parallels with the study of Audia and Brion (2007). Greve (2003) and Audia and Greve (2006) mention that managers prefer historical aspiration levels when they see their firms as unique which would imply that managers of the firms in my sample view their organizations as distinct from others in terms of market performance where they believe that they are affected substantially from their own internal dynamics translating into different levels of market shares. Moreover, market performance seemed to have less volatility compared to innovation performance with lower standard deviation levels. On the other hand, since innovation performance seems more volatile compared to market performance, it could be more difficult for firms to set up internal performance benchmarks for themselves making them consider more their peers. Despite these insights, the relative salience of one aspiration type over the other is still unclear and there may be other factors and contingencies influencing the prevalence of one aspiration type over the other. As Greve and Gaba (2017) and Posen, Keil, Kim and Meissner (2018) suggest, more research should be conducted on this matter.

The results of this study display that institutional theory also effectively explains CINO presence in TMTs. CINO presence is significantly driven by social and legitimacy concerns of firms through which they take imitative actions to better comply with both the internal and external forces in the environment. These findings complement other studies like Abt and Knyphausen (2017); Wiedeck and Engelen (2018); Fu et al. (2020) and Kunish et al. (2020) who also find that

social and institutionalist forces are key factors behind the presence of different executives in TMTs. Additionally, I support the fact that the rise of new generational officers like Chief Sustainability Officers, Chief Digital Officers and CINOs could also carry a symbolic meaning through which firms aim to strengthen their images on different dimensions. Strand (2014), Kanashiro and Rivera (2019) and Henry et al. (2019) argue that the Chief Sustainability Officer role is created for publicity to illustrate a firm's environmental friendliness, with relatively less concerns around its performance effects. Similarly, CINOs can serve to enhance the images of their firms as being innovative organizations. Similarly, Kunish et al. (2020) find that the addition of Chief Digital Officers is influenced by the mimetic behaviors of firms where they look at their competitors while dealing with the challenges of digital transformation. Accordingly, my results show that this can also be the case also for tackling difficulties around managing innovation.

The findings of this study contribute to at least three literature streams. First, they extend upper echelons theory through introducing a rising executive position, CINOs, into the research agenda by analyzing the antecedents of their presence in the TMTs. While explaining the antecedents, I take a more situational perspective by employing the behavioral theory of the firm as the mechanism, rather than a structural perspective implemented in similar studies through the lens of the contingency theory (Hambrick & Cannella, 2004; Nath & Mahajan, 2008; Menz & Scheef, 2014, Roh et al., 2016; Abt & Knyphausen, 2017). Also, in response to the calls from Menz (2012) for using more specific performance measures relating to the role of the relevant TMT member, I consider performance from market and innovation dimensions which are better linked to the CINO role instead of using more generalized financial measures like return on assets or return on equity. Also, the upper echelons theory is mainly concerned with how executive roles and their characteristics influence performance outcomes. In this paper, I slightly turn upper

echelons theory on its head (Hambrick, 2007) with the support of the behavioral theory of the firm and demonstrate that performance considerations can also lead to the presence of new generational roles in the TMTs.

Further, this research contributes to the literature on innovation governance. Most of the related studies exploring the relationship between organizational structures and innovation focused on the structure of R&D departments (Argyres & Silverman, 2004). While Tushman and Nadler (1986) explored how firms can organize for innovation. I provide an extension to these studies by demonstrating how the decision of establishing innovation as a separate function in TMTs with a dedicated executive is shaped and which are the most influential forces around that. Additionally, I show that prevalence of the CINO role has increased considerably during my period of observation. Displaying the evolution of this central innovation role in TMTs also provides a better understanding into the micro foundations of innovation.

This study also enlarges the behavioral theory of the firm by combining it with upper echelons perspectives. In addition to the many studies (Greve 1998 and 2003; Park, 2007; Baum et al., 2005, etc.) examining performance feedback and change behaviors of firms across various dimensions such as innovation, change, strategy, and partnerships, I focus on whether firms can also apply changes in their TMTs by having a slightly non-traditional executive as the CINO when their performance is lower than their aspirations. Accordingly, I find out that firms become more prone to problemistic search in their TMTs by including new CINO roles. Additionally, I demonstrate that firms can take feedback both internally and externally depending on the type of performance while assessing the presence of CINO roles within their TMTs.

2.5.1 | Limitations

As with many empirical studies, this one also has its limitations, which can suggest further

research opportunities. First, this study takes more research and development intensive firms as its sample. CINOs may be present in different types of firms operating in different industries such as financial services. Analyzing the antecedents of CINO presence also within different settings and industries may produce interesting results.

Secondly, a different conceptualization of the TMT might introduce different perspectives on CINO presence. Scholars such as Tihanyi, Ellstrand, Daily and Dalton (2000) operationalize TMTs by looking at the roles reported in the 10K documents of firms and by considering the ones equal to or above the executive vice president title. Applying a rather focused conceptualization of the TMT from other lenses such as the 10K approach or the highest five paid executives (Bertrand & Schoar, 2003) could provide different results going forward.

Moreover, this paper takes patents as the innovation measure. However, Pahnke, Katila and Eisenhardt (2015) differentiate between technological innovation measured in terms of patents and commercial innovation operationalized as new product introductions. Benefiting from different innovation metrics such as new product introductions might suggest different explanations into the antecedents of CINO presence in TMTs.

2.5.2 | Future Research Areas

In addition to the potential research areas mentioned above, this paper can open further possibly research avenues within various literature streams. I have executed a preliminary analysis on the impact of CINOs on market and innovation performance. Further studies could focus on the consequences of having a CINO in the TMT by utilizing different metrics for innovation and by defining some boundary conditions to analyze the link between CINOs and firm performance.

It may also be interesting to understand the power of the CINO in the TMT and how the role influences firm outcomes akin to the studies of Nath and Mahajan (2011) for Chief Marketing

Officers, Venus and Engelen (2012) for Chief Financial Officers or Garms and Engelen (2019) for Chief Technology Officers. This paper has shown that the presence of CINOs in TMTs is connected to different factors that may also influence their power in the firm. So, looking across at how the power of CINOs is affected by different structural and environmental factors such as diversification, industry dynamism, etc. and how this translates into different performance outcomes may be a worthwhile research avenue to pursue.

Moreover, this study investigated the changes in the TMT only from the perspective of CINO presence. The inclusion of the CINO role might be part of wider structural changes within the TMT or simply an elevation in the hierarchy. Therefore, analyzing the presence of CINOs within the context of wider TMT structural changes could offer valuable insights. Furthermore, future studies can focus on TMT changes in general and assess how TMTs react to performance feedback. Therefore, combining behavioral theory of the firm with upper echelons perspectives and investigating how performance aspirations gaps influence structural changes in the TMT (Beckman & Burton, 2011) could offer promising research directions.

2.6 | CONCLUSION

Overall, the findings of this paper aim to provide important insights to both scholars and practitioners into the decisions of companies to employ a dedicated CINO within the top management team. The theoretical and empirical sections of the paper may assist different stakeholders to conceptualize the CINO role more effectively and offer them several criteria to evaluate their decisions about whether to have a CINO or not in their TMTs. Academics and practitioners may find it of great interest to explore the added value of CINOs and I hope this paper can trigger further research on these rising stars of TMTs.

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2.8 | TABLES AND FIGURES

Table 1. Control Variables

Variable	Definition	Reference
Technological Intensity	Ratio of R&D expenditures over total revenue	Nath and Mahajan (2008)
Diversification	Entropy index by taking the dispersion of sales across different business segments	Palepu (1985)
Firm Size	Natural logarithm of total employee number	Tyler and Caner (2016)
Firm Age	Natural logarithm of years since founding	Caselli and DiGiuli (2010)
Firm Leverage	Ratio of total debt over total assets	Roh, Krause and Swink (2016)
CEO Tenure	Natural logarithm of the time for the person in the CEO position after the appointment	Menz and Scheef (2014)
CEO Origin	Dummy variable of 1 if the CEO is an outsider (has firm tenure of at least 2 years before promotion into the CEO position)	Karaevli (2007)
CEO Science Orientation	Dummy variable of 1 if the CEO has experience within technology, R&D, etc. areas.	Cuatrecassas (2006)
Industry Dynamism	Calculated as the absolute difference in the industry growth rate from t−2 to t−1 vs. from t − 1 to t.	Hambrick and Cannella (2004)
Market Concentration	Obtained through the Herfindahl – Hirshmann Index that takes the sum of the square of revenue shares of all firms at the 2 digits SIC level	Nath and Mahajan (2011)
Chief Technology Officer (CTO) Presence	Whether the firm employs a CTO or not in its TMT; 1 for yes and 0 for no. Similar to identification strategy for CINOs, keywords such as "Technology", "Research and Development" and "Science", etc. are used	Garms and Engelen (2019)
Chief Marketing Officer (CMO) Presence	Whether the firm employs a CMO or not in its TMT; 1 for yes and 0 for no. Similar to identification strategy for CINOs, keywords such as "Marketing", "Branding" are used	Nath and Mahajan (2008, 2011) Wiedeck and Engelen (2018)
Slack	Total of available slack (assets/liabilities), absorbed slack (working capital/sales) and potential slack (equity/debt). All these categories have standardized and summed up to create the total index.	Tyler and Caner (2016)

Table 2. Descriptive Statistics

	Variable	Mean	S.D	1	2	3	4	5	6	7
1	CINO Presence	0.21	0.40	1						
2	Diversification	0.55	0.55	0.13**	1					
3	Technological Intensity	0.11	0.22	-0.04*	-0.17**					
4	Firm Size	8.65	1.89	0.28**	0.36**	-0.19**	1			
5	Firm Age	3.75	0.82	0.12**	0.36**	-0.22**	0.33**	1		
6	Firm Leverage	0.16	0.15	0.11**	0.15**	-0.11**	0.35**	0.26***	1	
7	Industry Stability	7.68	7.95	-0.03	0.01	-0.00	-0.00	-0.00	-0.06*	1
8	Market Concentration	8746	526	-0.08**	-0.01	-0.06*	-0.09**	0.00	-0.06*	0.13**
9	CEO Tenure	1.51	1.03	-0.09**	-0.09**	0.04	-0.12**	-0.12***	-0.12**	0.00
10	CEO Science Orientation	0.39	0.49	-0.04*	0.03	0.06*	0.04*	-0.14***	-0.05*	-0.01
11	CEO Outsiderness	0.37	0.48	0.07**	-0.08**	0.11**	-0.23**	-0.09***	-0.01	0.01
12	Chief Marketing Officer Presence	0.75	0.44	0.18**	-0.05*	0.07**	0.04*	-0.05**	-0.04*	-0.02
13	Chief Technology Officer Presence	0.60	0.49	0.25**	0.02	0.12**	0.12**	-0.04*	-0.02	-0.05*
14	Slack	2.37	3.90	-0.04	-0.05*	0.00	-0.01	-0.03	-0.08**	0.05*
15	Innovation Performance- Above Historical	0.05	0.15	-0.04*	0.00	-0.05*	-0.05*	-0.02	-0.05*	0.06*
16	Innovation Performance- Below Historical	0.11	0.33	-0.03	-0.02	-0.02	-0.09**	-0.04*	-0.05*	0.02
17	Innovation Performance- Above Social	0.14	0.63	0.00	0.00	-0.05*	-0.04	-0.00	-0.05*	0.02
18	Innovation Performance- Below Social	0.16	0.16	-0.05*	-0.01	0.15**	-0.02	-0.02	0.09**	0.09**
19	Market Performance- Above Historical	0.00	0.00	0.18**	0.00	-0.03	0.21**	-0.03	-0.02	0.01
20	Market Performance- Below Historical	0.00	0.01	0.21**	0.20**	-0.04*	0.30**	0.16***	0.11**	0.00
21	Market Performance- Above Social	0.01	0.05	0.33**	0.24**	-0.06*	0.46**	0.20***	0.11**	-0.02
22	Market Performance- Below Social	0.01	0.01	-0.20**	-0.27**	0.14**	-0.51**	-0.19***	-0.15**	-0.07**
23	CINO Prevalence	0.19	0.11	0.27**	-0.01	0.07**	0.10**	-0.03	0.13**	-0.15**

N=2577 "† p<0.1 * p<0.05 ** p<0.01"

All independent and control variables are one year lagged

	Variable	8	9	10	11	12	13	14	15
1	CINO Presence								
2	Diversification								
3	Technological Intensity								
4	Firm Size								
5	Firm Age								
6	Firm Leverage								
7	Industry Stability								
8	Market Concentration	1							
9	CEO Tenure	0.05*	1						
10	CEO Science Orientation	-0.01	0.13**	1					
11	CEO Outsiderness	0.01	-0.15**	-0.16*	1				
12	Chief Marketing Officer Presence	0.07**	0.34**	0.22*	0.04*	1			
13	Chief Technology Officer Presence	0.05*	0.37**	0.16*	0.03	0.27**	1		
14	Slack	0.03	0.05*	0.01	-0.02	-0.04*	-0.00	1	
15	Innovation Performance- Above Historical	0.03	-0.03	-0.01	0.01	-0.08**	-0.03	-0.01	1
16	Innovation Performance- Below Historical	0.02	0.03	0.02	0.00	-0.06*	-0.08**	-0.00	-0.13**
17	Innovation Performance- Above Social	0.01	-0.02	-0.01	-0.04*	-0.06*	-0.04*	-0.01	0.31**
18	Innovation Performance- Below Social	0.06*	-0.06*	-0.13*	0.08**	-0.01	-0.09**	0.04	-0.27**
19	Market Performance- Above Historical	-0.04*	-0.04*	0.03	-0.07**	0.05*	0.10**	-0.02	-0.03
20	Market Performance- Below Historical	-0.05*	-0.09**	0.02	-0.05*	0.09**	0.13**	-0.02	0.05*
21	Market Performance- Above Social	-0.10**	-0.08**	0.06*	-0.11**	0.12**	0.19**	-0.03	-0.02
22	Market Performance- Below Social	-0.39**	0.06*	-0.01	0.15**	-0.14**	-0.18**	0.02	0.04
23	CINO Prevalence	-0.30**	-0.02	-0.09*	0.03	0.15**	0.12**	0.01	-0.06*

N=2577 "† p<0.1 * p<0.05 ** p<0.01"

All independent and control variables are one year lagged

	Variable	16	17	18	19	20	21	22	23
1	CINO Presence								
2	Diversification								
3	Technological Intensity								
4	Firm Size								
5	Firm Age								
6	Firm Leverage								
7	Industry Stability								
8	Market Concentration								
9	CEO Tenure								
10	CEO Science Orientation								
11	CEO Outsiderness								
12	Chief Marketing Officer Presence								
13	Chief Technology Officer Presence								
14	Slack								
15	Innovation Performance- Above Historical								
16	Innovation Performance- Below Historical	1							
17	Innovation Performance- Above Social	0.42**	1						
18	Innovation Performance- Below Social	-0.10**	-0.23**	1					
19	Market Performance- Above Historical	0.00	-0.02	-0.03	1				
20	Market Performance- Below Historical	-0.05*	0.01	-0.00	-0.06*	1			
21	Market Performance- Above Social	-0.04*	-0.02	-0.03	0.45**	0.51**	1		
22	Market Performance- Below Social	0.07**	0.08**	0.01	-0.21**	-0.24**	-0.38**	1	
23	CINO Prevalence	-0.01	0.01	-0.01	0.03	0.03	0.04*	0.17**	1

N=2577 "† p<0.1 * p<0.05 ** p<0.01"

All independent and control variables are one year lagged

Table 3. Antecedents of CINO Presence in TMTs

Results of the logistic regression with CINO presence as dependent variable

			Innovation				Market			
			Historical		Social		Historical		Social	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Constant	-6.86***	-6.63***	-6.64***	-6.49***	-7.01***	-6.82***	-6.64***	-6.27***	-4.85***	-4.01***
	(1.75)	(1.71)	(1.69)	(1.69)	(1.76)	(1.73)	(1.73)	(1.67)	(2.11)	(2.11)
Diversification	0.10	0.13	0.11	0.13	0.09	0.13	0.10	0.15	0.07	0.10
	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.17)	(0.17)
Technological Intensity	-0.31	-0.35	-0.31	-0.37	-0.48	-0.48	-0.48	-0.45	-0.32	-0.43
	(0.63)	(0.57)	(0.58)	(0.57)	(0.74)	(0.67)	(0.75)	(0.62)	(0.56)	(0.55)
Firm Size (ln)	0.16	0.17	0.17	0.16	0.16	0.17	0.15	0.15	0.09	0.07
	(0.14)	(0.14)	(0.13)	(0.14)	(0.13)	(0.14)	(0.14)	(0.13)	(0.10)	(0.09)
Firm Age (ln)	0.65	0.72	0.63	0.70	0.64	0.71	0.58	0.60	0.44	0.45
	(0.48)	(0.48)	(0.42)	(0.46)	(0.45)	(0.45)	(0.46)	(0.40)	(0.26)	(0.24)
Firm Leverage	0.03	-0.13	-0.00	-0.15	-0.01	-0.16	0.09	-0.02	0.12	0.05
	(0.53)	(0.55)	(0.53)	(0.55)	(0.53)	(0.54)	(0.53)	(0.53)	(0.51)	(0.51)
Industry Dynamism	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Market Concentration	0.00	-0.00	-0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CEO Tenure (ln)	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	-0.00	-0.01
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
CEO Science Orientation	0.02	0.05	0.02	0.04	0.02	0.05	0.02	0.04	-0.01	0.00
	(0.19)	(0.20)	(0.19)	(0.20)	(0.19)	(0.20)	(0.19)	(0.19)	(0.18)	(0.18)
CEO Outsiderness	0.16	0.20	0.18	0.20	0.15	0.18	0.14	0.17	0.17	0.21
	(0.19)	(0.19)	(0.18)	(0.19)	(0.18)	(0.19)	(0.19)	(0.18)	(0.18)	(0.18)
Chief Marketing Officer Presence	0.08	0.07	0.09	0.06	0.07	0.06	0.06	0.06	0.02	-0.00
	(0.15)	(0.15)	(0.15)	(0.15)	(0.14)	(0.15)	(0.15)	(0.15)	(0.14)	(0.14)
Chief Technology Officer Presence	0.51***	0.55***	0.52***	0.54***	0.53***	0.57***	0.49***	0.51***	0.43***	0.44***
	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.17)	(0.16)	(0.16)	(0.17)
Slack	-0.01	-0.03**	-0.02	-0.02**	-0.01	-0.02**	-0.00	-0.01	-0.00	-0.00
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)
Year	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Performance - Aspiration			-0.24	-0.28	0.06	0.05	1.32	0.76	-0.44	-0.19
(Above Aspirations)			(0.34)	(0.36)	(0.07)	(0.07)	(7.66)	(7.77)	(2.76)	(2.70)
Performance - Aspiration			-0.31	-0.35	1.01**	0.88**	10.47**	10.29**	-24.57	-33.08
(Below Aspirations)			(0.27)	(0.30)	(0.43)	(0.44)	(4.89)	(4.85)	(22.74)	(23.18)
CINO Prevalance (Ind)		3.22**		3.13**		2.92**		2.74**		2.62**
		(1.39)		(1.37)		(1.37)		(1.29)		(1.26)
Number of Observations	2577	2577	2577	2577	2577	2577	2577	2577	2577	2577
Number of Firms	280	280	280	280	280	280	280	280	280	280
Wald Chi Square	72.09***	75.88***	80.70***	76.04***	67.77***	70.83***	70.95***	73.77***	73.28***	73.20***

Standard errors are in paranthesis. All independent and control variables are lagged by one year

"* p<0.1 ** p<0.05 *** p<0.01"

Figure 1. CINO Prevalence Among Industries (2008 and 2017)

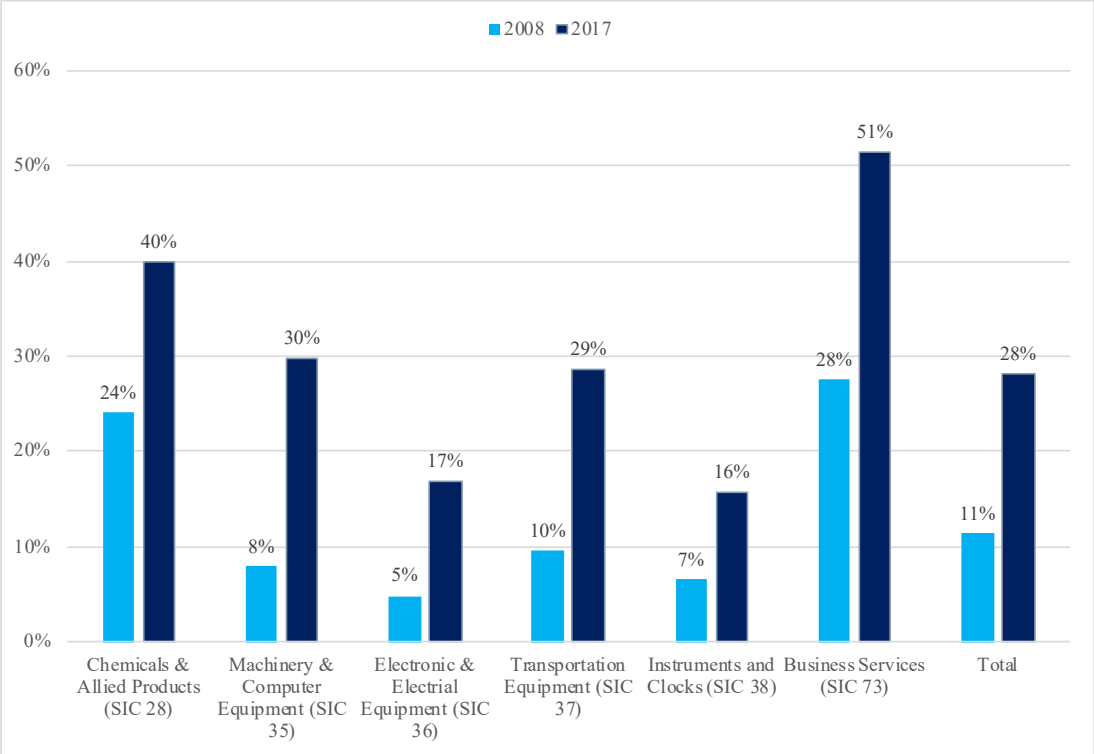


Figure 2. Social Aspiration Gaps and CINO Presence (Innovation Performance)

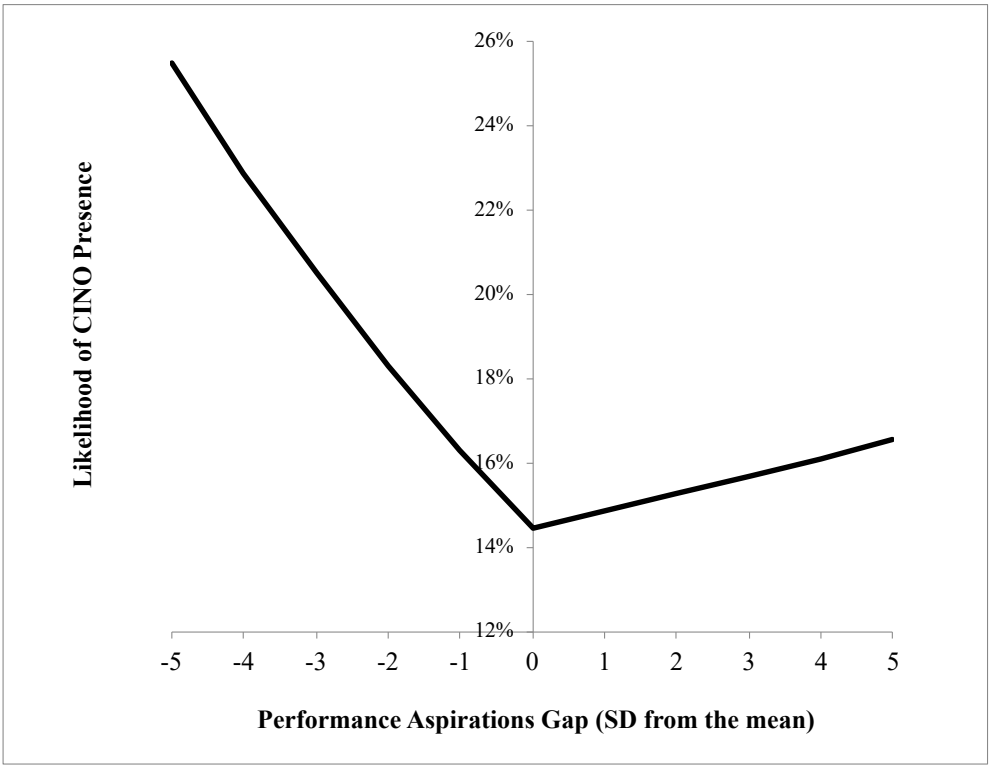


Figure 3. Historical Aspiration Gaps and CINO Presence (Market Performance)

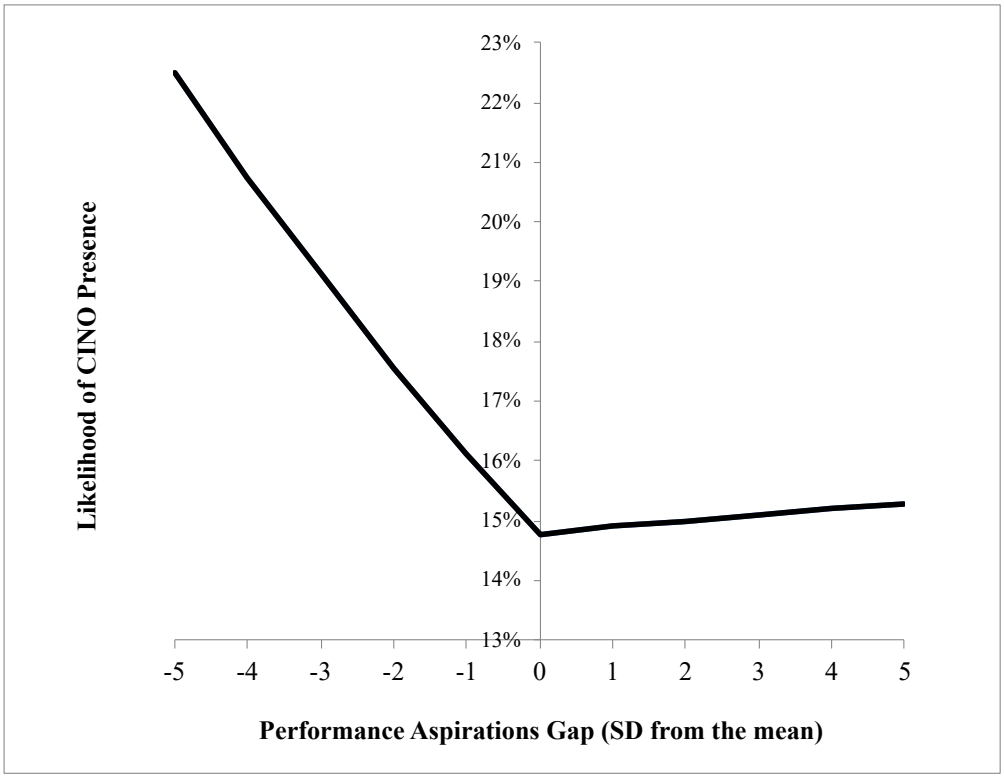
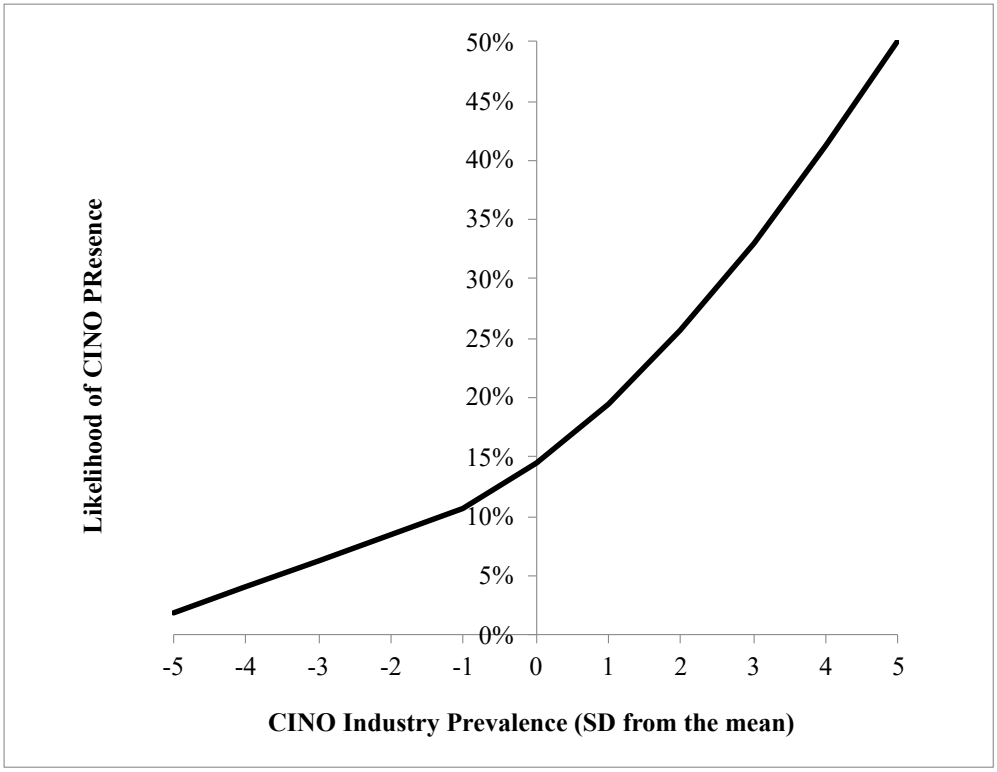


Figure 4. CINO Prevalence and CINO Presence



2.9 | APPENDIX

Table A1: CINO Titles and Role Designations

Hierarchical Designation	
Term in the Title	Frequency
Executive Vice President	33,0%
Senior Vice President	27,3%
Vice President	34,1%
Other	5,7%

Additional Role Designation	
Functional area (term) in the title[1]	Frequency
Strategy	26,1%
(eg. Strategy, Corporate Development, Business Development	
Commercial Development, Ventures, Growth)	
Research and Development	15,9%
(eg. R&D, Technology, Science)	
Marketing	4,5%
(eg. Marketing, Product Development)	
Digital & IT	4,5%
(eg. Digital, Information, Ecommerce)	
Other	2,3%
(eg. Sustainability, Operations, etc.)	

Top 10 Actual Titles	
Title	Frequency
Chief Innovation Officer	17,0%
Vice President- Innovation	9,1%
Chief Innovation and Technology Officer	8,0%
Vice President- Innovation and Business Development	6,8%
Chief Creative Officer	4,5%
Senior Vice President- Innovation and Strategy	4,5%
Chief Innovation and Strategy Officer	3,4%
Executive Vice President- Innovation	3,4%
Vice President- Innovation and Ventures	3,4%
Senior Vice President- Innovation	2,3%

Sample of 280 S&P Firms from 2008 to 2017

[1] 50% of the CINO have an additional role designation, including additional goals

CHAPTER 3- "Shake up the management": Negative performance feedback and structural interdependence within top management teams

ABSTRACT

The research on top management teams (TMTs) has mostly focused on the composition, processes, incentives, and leaders of TMTs, with limited attention to the structural aspects. In this study, I develop a comprehensive model for TMT structural reconfigurations by integrating the TMT structural interdependence framework with the behavioral theory of the firm. By characterizing decision makers as boundedly rational that rely on performance feedback, I investigate how performance below aspirations influences TMT horizontal, vertical and reward interdependence. After analyzing data from 260 Standard and Poor (S&P) firms between 2007 and 2018, I find that when a firm's performance falls below its aspirations, its TMT horizontal interdependence decreases but its TMT vertical and reward interdependence increases. Additionally, I discover that TMT horizontal and reward interdependence are impacted more from social and vertical interdependence more from historical aspirations. The findings of this study introduce important contributions into upper echelons theory and to the behavioral theory of the firm.

Keywords: Top Management Teams, TMT Structures, Upper Echelons Theory, Behavioral Theory of the Firm

3.1 | INTRODUCTION

Since the first publication of the upper echelons study (Hambrick & Mason, 1984), strategic leadership researchers have been very active in exploring the composition, processes, incentives, and leaders (i.e., CEOs) of top management teams (TMTs) (for detailed reviews, see Finkelstein, Hambrick, & Cannella, 2009; Bromiley & Rau, 2016; Neely, Lovelace, Cowen, & Hiller, 2020). On the other hand, there have been calls to focus on the "structure" of TMTs through differentiating structural elements from individual incumbents and by analyzing the factors that lead to changes among TMT structures (Hambrick, 2007; Beckman & Burton, 2011; Menz, 2012; Hambrick, Humphrey, & Gupta, 2015). As Hambrick et al. (2015) point out, a possible breakthrough in TMT research lies in the fact that TMTs differ widely in how they are structured.

Hambrick (1994) mentions that structure of top management teams is concerned with the roles of the members and the relationship among these roles. TMT structures reflect different choices of firms around organizational design, strategy formulation and implementation, information-processing mechanisms, as well as nature of coordination, collaboration, and power relationships among TMT members which in turn affect various organizational outcomes (Ma, Kor, & Seidl, 2021; Beckman & Burton, 2011; Guadalupe, Li, & Wulf, 2014; Hambrick, et al., 2015). Therefore, studying why and how firms decide to change the configuration of, or reconfigure, the structures of their TMTs gain more importance as we can learn more about the different motivations of firms and decision-makers while they are making the above-mentioned choices for superior performance.

Ma et al. (2021) mention that it is only very recently that researchers have started to pay more attention to the structure of TMTs and analyze the determinants of roles and role relationships in TMTs more in detail. Hambrick and Cannella (2004), Menz and Scheef (2014) and Guadalupe

et al. (2014) explored the antecedents of the presence of various individual positions in the TMTs such as Chief Operating Officers or Chief Strategy Officers or groups of executives such as functional managers. Despite these very interesting studies, there is still a need to analyze the determinants of structural changes by looking at TMTs from a wider perspective instead of focusing only on individual or sub-unit of positions in isolation. Moreover, Radek and Menz (2020) note that antecedents of other dimensions of TMT structures such as hierarchy, etc. are unexplored limiting our understanding of TMT structural reconfigurations.

While analyzing the antecedents of various TMT structural reconfigurations, scholars benefited mainly from contingency theory in addition to others such as institutional, information processing perspectives (Ma et al., 2021) and looked at the impact of various factors at different levels on the presence of different individual or sub-units of roles in TMTs (Hambrick & Cannella, 2004; Menz & Scheef, 2014; Guadalupe et al., 2014). Kavusan and Frankort (2019) characterize decision makers as rational and value maximizing while making decisions based on contingencies. On the other hand, they state that they can be boundedly rational and rely on the feedback coming from their performance (especially when it is below their aspirations) for a wide range of decisions. Despite the evidence that negative performance feedback influences different organizational changes (Cyert & March, 1963; Greve, 1998), we still do not know that much about how such factors affect firms' TMT structural reconfigurations.

Against the backdrops mentioned above, this study analyzes the question of "how does performance below aspirations influence TMT structural reconfigurations" by integrating the TMT structural interdependence framework of Hambrick et al. (2015) with the arguments of the behavioral theory of the firm (Cyert & March, 1963). Depending on the behavioral theory of the firm, my central argument is that firms will engage in problemistic search for their TMT structures

when they underperform compared to their aspirations. Guadalupe et al. (2014) mention that the TMT is the reflection of the firm's organizational structure as well as the governing body that sets firm strategy. Therefore, in the cases of performance below aspirations, it becomes very likely that problemistic search can also take place at the TMT structures mainly to achieve more effective organizational designs as well as better coordination and collaboration mechanisms among TMT members which can help firms to recover their performance. More specifically, my central argument consists of 3 parts based on the TMT structural interdependence framework. First, I posit that firms will decrease their TMT *horizontal interdependence* when they underperform regarding their aspirations with the motivation of giving more voice to the divisional managers compared to functional managers as they can have a more direct impact on generating the revenues and profits of their firms. Second, I suggest that firms will increase their TMT *vertical interdependence* based on negative performance feedback so that they minimize the hierarchical gradations which in turn increases the behavioral integration and social unity in the TMT leading to improved performance afterwards. Lastly, I propose that firms are expected to increase their TMT *reward interdependence* when they are below their performance aspirations with the intention of limiting pay dispersion and aligning the risk preferences of TMT members for enhanced performance. I test these arguments on a sample of 260 firms included in the Standard & Poor (S&P) 500 Index from 2007 to 2018 and obtain general support for my predictions.

My primary contribution lies in developing and testing a theory of how negative performance feedback influences TMT structural reconfigurations. Accordingly, I extend upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) in at least two ways. First, I respond to the calls from different scholars (Hambrick, 2007; Beckman & Burton, 2011; Menz, 2012; Ma et al., 2021) by investigating the rather unexplored TMT structures where I separate individuals

from their roles and titles within the TMT. Second, in line with the suggestions of Hambrick (2007) to treat TMT characteristics as consequences, I demonstrate the antecedents of TMT structural interdependence from a performance feedback perspective. Moreover, the behavioral theory of the firm has analyzed the problemistic search behaviors of firms in response to negative performance feedback on many dimensions such as innovation, mergers and acquisitions, alliances, etc. (Greve, 2003; Iyer & Miller, 2008; Tyler & Caner, 2016). Additionally, I show that firms can engage in problemistic search also at different levels reflecting the organization such as the TMT (Hambrick & Mason, 1984) and make structural changes to recover their performance.

3.2 | THEORETICAL BACKGROUND

3.2.1 | TMT Structural Interdependence

Hambrick (2007) states that much more attention must be paid to the structure of TMTs to enhance our understanding of different TMT processes and outcomes. He notes that much of the upper echelons findings exploring how TMT composition and processes influence different firm outcomes have been mixed and confusing. Accordingly, he states that analyzing how TMTs are structured by looking into the roles and the relationship among them can help scholars to reduce the equivocality among upper echelons results.

In the light of the above points, Hambrick et al. (2015) introduced the "TMT Structural Interdependence" framework as a mechanism that can introduce a significant effect on upper echelons predictions. Based on this framework, they mention that some TMTs are structured independently and some more interdependently in terms of roles and responsibilities. They also suggest that TMT compositions and processes will influence firm outcomes within structures in which TMT members have more opportunities to affect each other.

TMT structural interdependence is defined as *the degree to which roles and administrative mechanisms are arranged such that members of an executive group affect each other*. It has three pillars as horizontal, vertical, and reward interdependence. *Horizontal interdependence* refers to the degree to which members' roles and responsibilities affect each other. *Vertical interdependence* is related to the degree to which members are hierarchical peers in the presence of different ranks within the TMT. Lastly, *reward interdependence* is concerned with the degree to which members receive payoffs for collective accomplishment.

TMT horizontal interdependence is the degree to which roles are configured such that the effectiveness of the members influences each other (Hambrick et al., 2015). This term basically refers to the distinction between a divisional and functional structure managed by specific executives. The divisional executives have responsibility for the profit centers of their firms where they basically control different revenue streams (Rajan & Wulf, 2006). On the other hand, Menz (2012) states that linked to the growing complexity in a company's environment, new task demands gave rise to the functional executives. He describes them as specialist executives that lead a specific functional area in the organization such as finance, legal or marketing. Vieregger, Larson and Anderson (2017) mention that a firm's TMT can be composed of entirely functional or divisional roles, but a vast majority of firms fall somewhere in between these two types of structures through employing both functional and divisional executives.

TMT vertical interdependence refers to the degree to which members are peers, as opposed to hierarchically separate (Hambrick et al., 2015). Some TMTs are structured in a way containing a CEO and a set of direct reports with the same title grade such as executive vice presidents. In other TMTs, some of CEO's direct reports are executive vice presidents, but others are senior vice presidents or even plain vice presidents. These title designations have a significant meaning which

reflects the order and various groupings in the TMT. Hambrick et al. (2015) mention that when the hierarchical distinctions are minimal in the TMT, members will view each other as part of the same social and task entity. On the other hand, members will lose their salience towards each other in the cases of increased hierarchical distinctions.

TMT reward interdependence is defined as the degree to which TMT members receive payoffs for firm performance rather than individual or sub-unit performance. In some firms, bonuses depend largely on firm performance and move in unity for everyone; whereas other firms tie bonuses to subunit performance making executives receive different payoffs on a yearly basis (Hambrick et al., 2015). Additionally, Hambrick et al. (2015) mention that some firms provide their executives more non-cash benefits such as stock options or restricted grants with the aim of increasing the shared-fate perspective within the TMT.

In this study, I benefit from TMT structural interdependence framework to conceptualize TMT structures since it serves as a very effective platform by integrating the role (horizontal), hierarchy (vertical) and incentive (reward) structures in the TMTs.

3.2.2 | Antecedents of TMT Structural Interdependence

Hambrick et al. (2015) benefited from the TMT structural interdependence framework as a moderator that can influence the relationship between TMT tenure heterogeneity and TMT turnover, firm performance. They find empirical support for their predictions that TMT tenure heterogeneity affects both TMT member departures and firm performance positively and that TMT structural interdependence amplifies these relationships. After its introduction, researchers benefited from the TMT structural interdependence framework mainly from an empirical perspective where they utilized the different pillars of the framework mostly as control variables

(Gupta, Briscoe, & Hambrick, 2017; Jeong & Harrison, 2017; Ma & Seidl, 2018). On the other hand, the antecedents of TMT structural interdependence remain largely unexplored.

In connection with TMT horizontal interdependence, researchers have explored the antecedents of the presences of different individual roles in the TMTs such as Chief Financial Officers (Zorn, 2004), Chief Operating Officers (Hambrick & Cannella, 2004), Chief Marketing Officers (Nath & Mahajan, 2008; Wiedeck & Engelen, 2018), Chief Strategy Officers (Menz & Scheef, 2014), Chief Supply Chain Officers (Roh, Krause, & Swink, 2016), etc. or group of roles such as functional vs. divisional (Guadalupe et al., 2014), output vs. throughput orientation (Cho & Hambrick, 2006), diverse vs. technically focused (Eesley, Hsu, & Roberts, 2014); internally vs. externally oriented (Bermiss & Murrmann, 2015). Despite these interesting studies, there is still a need to consider TMT role structures from a wider perspective by integrating all these individual and sub-unit of roles and examining the antecedents accordingly.

Linked to TMT vertical interdependence, some studies have analyzed the influence of TMT hierarchical setups on different firm outcomes including mergers and acquisitions performance, etc. (Hambrick & Cannella, 1993; Haleblian & Finkelstein, 1993; Ridge, Aime, & White, 2015). On the other hand, it is difficult to find studies concerned with the antecedents of TMT hierarchical designations. This side remains under researched while prior studies do not provide many insights into why TMTs are hierarchically structured the way they are (Radek & Menz, 2020).

In relation to TMT reward interdependence, executive compensation scholars have been very active in examining the determinants of executive reward by considering contextual, governance, human capital, and social factors (for a detailed review please see Devers, Canella, Reilly, & Yoder, 2007). However, more research is also needed to understand why and how firms

make the reward structures including bonuses, non-cash pay, restricted stocks, etc. of their TMT members more interdependent of each other.

The information provided above on the different pillars of TMT structural interdependence takes me to the questions of how and why firms decide to make changes regarding their TMT structural interdependence. Within the studies around TMT structures, researchers utilized mainly the contingency theory (Burns & Stalker, 1961; Chandler, 1962) and applied contingencies at different levels to explain the additions of various members into the TMTs (Hambrick & Cannella, 2004; Nath & Mahajan, 2008; Menz & Scheef, 2014) or the development of subgroups such as the functional managers (Guadalupe et al., 2014). The analyzed contingencies include but are not limited to diversification, innovation intensity, advertising intensity, CEO and TMT characteristics, industry stability and market concentration.

In connection with the contingency perspective, Kavusan and Frankort (2019) consider managers as value-maximizing decision makers who make decisions based on a rational evaluation of different contingencies. On the other hand, the behavioral theory of the firm rejects these arguments and mentions that firms consist of various coalitions that reach decisions by repeating actions likely to yield desired performance levels in the pursuit of factored goals (Gaba & Bhattacharya, 2012). Failure to achieve these goals lead firms to change their programmed actions where performance-aspiration gaps motivate greater responses to goal achievement and serve as powerful mechanisms to initiate action (Lant, Milliken, & Batra, 1992; Greve, 2003). Therefore, behavioral theory introduces a logic that is strongly suited to model firms' decisions to change the structures of their TMTs, also considering that performance feedback provides a realistic perspective of how firms engage in change decisions (Martinez-Noya & Garcia-Canal, 2021). Thus, I next draw on the behavioral theory of the firm (Cyert & March, 1963) and discuss how

firm can make changes across the three pillars of their TMT structural interdependence in connection with negative performance feedback.

3.3 | HYPOTHESES

According to the behavioral theory of the firm (Cyert & March, 1963), firms are goal-directed systems that use simple decision-making mechanisms to adapt their behaviors in response to performance feedback. The performance feedback is a useful tool to provide firms with a sense on how they are performing and whether they need to make any changes going forward (Lant, 1992). The term "aspiration level" is also another core construct of the behavioral theory of the firm and refers to the smallest outcome that would be deemed satisfactory by the decision maker (Schneider, 1992: 1053). The behavioral theory of the firm states that when the performance of firms is below their aspiration levels, they engage in problemistic search. Problemistic search is intended to counter the challenges immediately so that performance can return to its aspiration level. On the other hand, when firms just achieve their aspirations, they tend to maintain current routines and have limited motivation to search for anything new (Cyert & March 1963, Levinthal & March 1981). In addition to these arguments, Greve (1998 and 2003) mention that firms become more prone to organizational changes when they fail to achieve their goals.

The past decades of empirical research on performance feedback have resulted in strong support for the effect of performance below aspirations on a variety of firm behavior including innovation investments (Greve, 2003), organizational changes (Greve, 1998), mergers and acquisitions (Iyer & Miller, 2008), alliances (Tyler & Caner, 2016; Kavusan & Frankort, 2019), and tie formation (Baum, Rowley, Shipilov, & Chuang, 2005). However, a significant gap in the performance feedback literature is the lack of attention to the implications of negative performance feedback for TMT structures. According to Guadalupe et al. (2014), TMT is the reflection of the

firm's organizational structure and makes important decisions linked to firm strategy and resource allocation across business units, which affects firm performance significantly. Therefore, when below performance aspirations, it is likely that firms can initiate problemistic search also at their TMTs where they change their TMT structures mainly to optimize the role allocations, to improve the collaboration and to align the incentive mechanisms among the TMT members so that they can work more effectively for improving performance.

I would like to note also that behavioral theory of the firm also focuses on firm responses when they are above their performance aspirations. However, I do not focus on performance above aspirations in this study since the literature on TMT compositional changes and member turnover focused mostly on poor performance as a driver of changes in TMTs (Hilger, Mankel, & Richter, 2013; Kesner & Sebora, 1994) whereas the link between strong performance and TMT changes is not explored at all. Also, when I looked at some press releases on the TMT changes of various S&P 500 companies, I observed a reference to poor performance occasionally as an explanation for the changes in the TMTs of various firms including but not limited to Oracle (Reuters, 2016), Eli Lilly (Weintraub, 2017) and IBM (Evans, 2020), while I could not detect much reference to strong performance. Therefore, I decided to focus on the performance below aspirations rather than above aspirations in this paper as it becomes much more relevant also for analyzing structural changes in TMTs in addition to compositional changes described above.

Based on these insights, I next formulate my predictions on how performance below aspirations can influence the different pillars of TMT structural interdependence described in previous sections.

3.3.1 | Performance Below Aspirations and TMT Horizontal Interdependence

Researchers have distinct opinions about the degree of horizontal interdependence within TMTs. On one hand, scholars such as Hambrick et al. (2015), Beckman and Burton (2011), Hill and Hoskinson (1987) find the functional (more horizontally interdependent) structure more effective as each executive holds responsibility for a different part of the value chain enabling better synergies and collaborative interactions among the TMT members. On the other hand, Vieregger et al. (2017) argue that a functional structure might hinder firms to achieve strategic change as functional executives apply a tighter control and longer decision-making time frames. According to Hult, Ketchen, and Slater (2005) and Jospeh and Ocasio (2012), a divisional (less horizontally interdependent) structure allows for better market, customer orientation as well as stronger insights for future investment opportunities. Moreover, Galunic and Eisenhardt (2001) and Shepherd, McMullen, and Ocasio (2017) characterize divisional managers as having more creativity, entrepreneurial orientation, and sensitivity towards the changes in environment compared to functional managers.

By considering all the above arguments between functional and divisional executives, I argue that firms will prefer a rather divisional (less horizontally interdependent) structure compared to a functional structure when their performance is below their aspirations. Cyert and March (1963) argue that firms are simple minded in their search behavior in the cases negative performance feedback making the problemistic search take place in the vicinity of the problem. In addition to these arguments, Greve (2003) mentions that firms perform problemistic search in a relatively narrow manner to mend performance shortfalls. Depending on these viewpoints, firms could turn to divisional executives and increase their portion on their TMTs since they are directly responsible for generating the revenues and the profits as the main components of performance.

Additionally, when firms underperform compared to their aspirations, Greve (2003) mentions that they put more emphasis on innovation and Jung and Bansal (2009) argue that they engage more in international expansion. This increased focus on innovation and internationalization could be reflected in the TMT by giving more weight to the divisional executives as they can better execute these strategies linked to their stronger customer, market orientation and entrepreneurial mindset.

Another key premise of the behavioral theory of the firm is that organizations become more risk taking and engage in organizational changes when they underperform compared to their aspirations. Bardolet, Fox and Lovallo (2011) define functional executives as having more stable and neutral cognitive frames, pushing them to "play-it safe" in general. Also, this risk neutrality of functional executives can introduce more conflicts with the divisional executives lengthening the decision-making time frames. On the other hand, divisional executives can reinforce the risk orientation of the TMT which is essential to implement the organizational changes and overcome the underperformance regarding the aspirations.

Researchers have also examined the impact of various functional roles such as Chief Strategy Officers, Chief Operating Officers, Chief Marketing Officers, Chief Sustainability Officers, etc. on different facets of firm performance (Menz & Scheef, 2014; Hambrick & Cannella, 2004; Nath & Mahajan, 2008; Kanashiro & Rivera, 2019). However, most of these studies found out that majority of these functional roles do not have a significant effect on firm performance whereas some of them might have negative consequences. On the other hand, divisional executives can have a more direct impact on firm performance since they control the revenue and profit centers of their firms. Therefore, when below the aspirations, firms could give more authority to divisional roles to recover performance in a faster manner.

In sum, I posit that when firms underperform regarding their aspirations, they can have a better tendency to increase the proportion of the divisional executives on their TMTs and lower its horizontal interdependence. Their main anticipation here is that divisional executives can have a quicker and direct impact to recover performance connected to their profit center responsibility, stronger knowledge of customers as well as shorter decision making time-frames. Moreover, they are characterized by better risk taking and entrepreneurial orientation which can fuel the identification of new opportunities to improve performance. Furthermore, these arguments can be better illustrated with the below example of Hewlett-Packard (HP) from 2011.

After years of underperformance compared to their financial aspirations, HP's CEO Leo Apotheker added four new divisions into his management team that are commercial computing, hardware and software sales, and new business services. He mentions that these business lines play a very important role for the revitalized growth of HP especially during times of intense competition; therefore, should acquire more say to drive overall direction of the company. Also, he eliminated two functional roles which are Chief Information Officer and Chief Administrative Officer to streamline the administrative operations (Bailey, 2011). The HP case here can display how firms can lower the horizontal interdependence of their TMTs in the situation of struggling performance compared to their aspirations. Accordingly, I present my first hypothesis.

Hypothesis (H1) *The lower a firm's performance relative to its aspirations, the lower the firm's TMT horizontal interdependence*

3.3.2 | Performance Below Aspirations and TMT Vertical Interdependence

Hambrick et al. (2015) argue that TMT members will see each other as team members where their actions and characteristics are going to be more significant for each other in the cases of higher vertical interdependence with limited hierarchical distinctions. Therefore, when the vertical interdependence is greater, there is going to be a better social unity and behavioral

integration within the TMT. Based on these points, I suggest that when firms underperform regarding their aspirations, they will show more tendency towards increasing their TMT vertical interdependence to reinforce the behavioral integration within the TMT with the expectation of improved performance in return.

According to Hambrick (2007), behavioral integration represents the degree to which a TMT acts as a homogenous team and engages in collective and mutual interaction. A more behaviorally integrated TMT can assist to recover firm performance through many ways such as enabling better decision-making processes in the TMT, improving service quality of the TMT and by enhancing the improvisational skills and exploratory attention of the TMT members (Carmeli, 2008; Carmeli & Schaubroeck, 2006).

To complement the above perspectives, I also point out that behaviorally integrated TMTs have a better potential of generating more novel and innovative ideas which can support to recover performance linked to various reasons. First, more behaviorally integrated TMTs will have more face-to-face interactions which enables better information exchange (Hambrick, Nadler, & Tushman, 1998) and this context where information is shared more systematically will promote a stronger platform for the creation of innovative initiatives (De Dreu, Nijstad, Bechtoldt, & Bass, 2011). Also, behavioral integration promotes a supportive environment where members have little fears of criticism when they offer new thoughts which then reinforces an open communication culture leading to higher levels of innovation (Eisenhardt & Martin, 2000).

By bridging the above viewpoints, I argue that firms will aim to increase the vertical interdependence of their TMTs in response to negative performance feedback to promote more team unity and behavioral integration. In return, this enhanced behavioral integration is expected to contribute into improved performance through different means such as more effective decision-

making processes in the TMT and a more supportive environment for the generation of more innovative ideas. Moreover, these claims can be better supported with an example from Novo Nordisk AS (NN) in 2015.

After a significant reduction in its sales growth at the end of 2014, following solid performance within the previous years, the CEO and board of directors of NN decided to remove the President and Chief Operating Officer position in 2015. After that, all roles under the Chief Operating Officer having the title of Senior Vice Presidents were promoted to Executive Vice Presidents and the TMT was composed of a CEO and all Executive Vice Presidents. CEO Lars Rebien Sorensen, explains that elimination of the extra COO layer and elevation of some functions in the executive team will allow them to create better integration of different perspectives and faster decision making in the TMT, driving more sustainable performance going forward (Zawadski, 2015). Depending on all these insights, I suggest the below hypothesis.

Hypothesis (H2) *The lower a firm's performance relative to its aspirations, the greater the firm's TMT vertical interdependence*

3.3.3 | Performance Below Aspirations and TMT Reward Interdependence

According to Hambrick et al. (2015); when the reward interdependence is greater, TMT members will be more careful of each other's behaviors and actions which in turn positively influences TMT processes and outcomes. Also, they mention that more reward interdependence makes the executives more considerate towards the effectiveness of their colleagues in the TMT.

Considering the above viewpoints, I argue that TMTs become more interdependent in terms of rewards, when their performance is below their aspirations. Concerning one pillar of reward interdependence; when the bonuses and other benefits are tied to more general firm performance thus move more in unity within the TMT, pay dispersion is also limited having potential positive impact on performance recovery through various ways. First, individual

motivation and productivity of TMT members are increased and then turnover among them is reduced (Devers et al., 2007; Festinger, 1954; Adams, 1965). Moreover, when the pay gap is lowered in the TMT, it could support firms to catch up with their aspirations also by enhancing the coordination and collaboration among the TMT members, by reducing the executive opportunism and through improving the information processing mechanisms within the TMT (Devers et al., 2007; Carpenter & Sanders, 2004).

Another central claim of TMT reward interdependence is linked to provision of non-cash benefits such as stock options or restricted stock grants within the total pay packages of the TMT members. When firms compensate their TMT members more with non-cash benefits such as stock options, it may support performance recovery mostly by aligning the incentives of TMT members, preventing excessive rent extraction by executives and through setting common interests among the TMT (Hanlon, Rajgopal, & Shevlin, 2003; Kato, Lemmon, Luo, & Schallheim, 2005). Also, when firms increase the level of stock options, restricted stock grants, etc. within the compensation packages of their TMT members, that provides more effective alignment among the risk preferences of TMT members, thus introducing another mean for performance improvement compared to aspiration levels (Devers et al., 2007).

Based on all these arguments, I posit that firms will increase the reward interdependence of their TMTs in the cases of negative performance feedback. Their main aim here is first to enhance the collaboration and coordination in the TMT by aligning the bonus structures and limiting pay dispersion in parallel for performance improvement. Also, firms wish to align the risk preferences and goals of their TMT members through providing more long-term benefits such as stock options, etc. which can further assist to recover performance. Furthermore, the below

example from Microsoft Corporation could provide further insights into the respective actions of firms when they face performance declines compared to their targets.

In 2016, when Microsoft faced a decline in the number of women that make up its workforce, they decided to tie some part of its executive bonuses to the company's diversity performance. The move was intended to incentivize the top leadership to reform company's hiring practices to include more women and minorities (Statt, 2016). Microsoft here aimed to recover its diversity performance also by creating a related bonus target for all its executives at the firm level thus aligning the payoffs of their TMT members around diversity performance. That kind of a bonus structure also aims to nurture a shared-fate environment where the executives work more collaboratively to improve diversity performance. All these points lead me to the below hypothesis.

Hypothesis (H3) *The lower a firm's performance relative to its aspirations, the greater the firm's TMT reward interdependence.*

3.4 | METHODOLOGY

3.4.1 | Sample and Data

The sample selection for this study started by identifying the firms in the S&P 500 Index at the end of 2018. Then, I identified the 2-digit SIC code for each company and included in the sample any industry that had more than 15 firms like the approach of Hambrick and Cannella (2004). I obtained data on the TMT structures from the 10-Ks and proxy statements of firms like the other TMT studies (Hambrick & Cannella, 2004; Nath & Mahajan, 2008; Marcel, 2009; Menz & Scheef, 2014). Firms list the names and titles of their TMT members in their 10-Ks, or proxy statements and I benefit from the titles of the TMT members to analyze TMT structures. I retrieved data for firm financials from Compustat and I benefited from BoardEx to gather the information about board structures of the concerned firms. Moreover, I received the data for executive compensation from Execucomp.

I collected the above data starting from 2007 until 2018 as there was a much higher coverage in the SEC database for TMT information after 2006. Also, I excluded firms for which there were missing data especially on TMT information and financials during this period. After that my final sample resulted in 260 firms within a 12-year period, generating 3120 balanced observations, distributed across 13 industries based on the 2-digit SIC codes. The industries represented in the sample include Oil and Gas Extraction (SIC 13), Food and Kindred Products (SIC 20), Chemical and Allied Products (SIC 28), Industrial Machinery and Equipment (SIC 35), Electronic and Other Electric Equipment (SIC 36), Transportation Equipment (SIC 37), Instrument and Related Products (SIC 38), Electric, Gas and Sanitary Services (SIC 49), Depository Institutions (SIC 60), Security and Commodity Brokers (SIC 62), Insurance Carriers (SIC 63), Holding and Other Investment Offices (SIC 67) and Business Services (SIC 73).

The TMTs have been conceptualized in many ways within the upper echelons studies (Carpenter, Geletkanycz, & Sanders, 2004) and I used the most consistent approach like other TMT research such as Menz and Scheef (2014), Abt and Knyphausen (2017). In my study, TMTs include all the executives reported in the 10-Ks or proxy statements. Within my sampled firms, TMTs consist of 8 people on average and this figure stays constant over the observed years.

3.4.2 | Measures

3.4.2.1 | Dependent Variables

For Hypothesis 1, the dependent variable is the *TMT horizontal interdependence* which is operationalized by taking the ratio of the number of functional roles to the total TMT size (Guadalupe et al., 2014; Hambrick et al., 2015). To identify the functional roles, I went through all the titles in my constructed database and classified them as either functional or divisional. In some cases, I made cross checks with different firm records to confirm the classification of roles.

For Hypothesis 2, the dependent variable is *TMT vertical interdependence*. I calculated it by combining the methodologies of Hambrick et al. (2015) and Finkelstein (1992) to better reflect the power concentration in the TMT based on the hierarchical designations. While operationalizing TMT vertical interdependence, I first went through all the titles in my database and detected the relevant grades for all them such as Executive Vice President, Senior Vice President, Vice President, etc.. Also, connected to the approach of Hambrick et al. (2015), if there was a Chief Operating Officer in the TMT, I marked it as an additional title grade. After determining the total number of title grades in the TMT, I followed the approach of Nath and Mahajan (2011) to generate the measure of TMT vertical interdependence. The number of title grades represents the total levels in the TMT with CEO taking the value of 1 and the other grades lined up respectively. So, if the TMT consists of the CEO and Executive Vice Presidents, the total number of hierarchical designations is 2. After that I calculated the distance of the lowest title level from the CEO. Therefore, if a TMT is composed of CEO, Executive Vice Presidents, Senior Vice Presidents and Vice Presidents, the distance becomes 3 as the difference from the Vice President (4) to the CEO (1). Then, I took the ratio of the distance to the CEO measure to the total number of title grades in the TMT. In this example, the respective figure is 0.75. Finally, I subtracted this ratio from 1 so that increasing values represented lower hierarchical designations thus higher vertical interdependence in the TMT.

For Hypothesis 3, the dependent variable is *TMT reward interdependence* for whose calculation I relied on the approach Hambrick et al. (2015). Accordingly, I created the measure by standardizing and averaging the following indicators for each of the TMTs across all years: co-movement of bonuses and non-cash pay (stock options and restricted stock grants); and the proportion of non-cash pay as described above to the total pay of the TMT. While compiling the

co-movement of bonuses and non-cash pay, I calculated the percentage change in these elements for each executive and then computed the coefficient of variation of these changes among the TMT members. Finally, I reversed these coefficients of variations to have increasing values represent higher levels of TMT reward interdependence.

3.4.2.2 | Independent Variable

For all the hypotheses, the independent variable is *performance aspirations gap*. I developed the measures of aspiration based on historical and social aspirations following the previous studies (Greve, 1998, 2003; Bromiley & Harris, 2014). Historical aspirations depend on the firm's own performance across the past years and social aspirations depend on the firm's performance compared to its industry as the peer group.

For the performance measure, I utilized return on assets (ROA) in line with many behavioral theory and upper echelons studies (Greve, 2003; Hambrick & Cannella, 2004; Menz & Scheef, 2014). Posen, Keil, Kim and Meissner (2018) mention a trend among behavioral theory of the firm literature to analyze broader strategic changes in connection to more general performance indicators such as return on assets or market to book value. In accordance with this line of thinking, I argue that ROA is a suitable metric to analyze TMT structural reconfigurations as these kinds of changes can be considered as relatively broad.

Following Greve (2003), I calculated historical aspiration levels as the exponentially weighted moving averages of historical performance defined as follows: $A_{it}=aA_{it-1} + (1-a)P_{it-1}$, where i represents the focal firm and t the related time. P stands for the past ROA measured as the moving average of the past 3 years like the approach of Tyler and Caner (2016); and the updating parameter a is the weight attached to the most recent historical aspiration level A_{it-1}. Based on the methodology of Greve (2003), I defined a as the value that provides the best fit of the models to

the data dependent on the increments of 0.1 (Gaba & Bhattacharya, 2012; Kavusan & Frankort, 2019). For the model concerning TMT horizontal interdependence, I retained the a as 0.9 and it was 0.2 for TMT vertical and reward Interdependence models. I obtained the social aspiration levels as the simple average ROA of all other firms within the focal firm's industry based on the 2-digit SIC codes (Greve, 2003).

After the calculation of the aspiration gaps as P_{it} - A_{it}, I utilized the spline functions for both historical and social aspirations by categorizing them as above and below aspirations (Greve, 2003; Gaba & Bhattacharya, 2012). The performance below historical aspirations is equal to 0 for all observations when the firm's performance is higher than its historical aspirations and taken as the absolute value of the difference between its performance and historical aspirations, in the opposite case. Accordingly, I defined the performance above historical aspirations symmetrically. Similarly, I conceptualized performance above and below social aspirations in the same way as described for historical aspirations.

3.4.2.3 | Control Variables

I included many control variables at different levels to account for other elements that may influence TMT structural interdependence. First, since CEO is the leader of the TMT and has significant influence over structural changes in TMTs (Ma & Seidl, 2018), I controlled for various CEO characteristics including *CEO age, gender, tenure, outsider CEO, CEO duality and CEO change.* Then, board of directors may also have an influence on the reconfiguration of TMTs linked to their monitoring and advisory functions (Johnson, Schnatterly, & Hill, 2013). Their characteristics influence corporate governance practices significantly which may then affect TMT structures. Therefore, I included different controls related to the boards such as *board size, percentage of outside directors, board gender diversity, board tenure diversity and board age*

diversity. Also, I added some variables reflecting the demographic diversity of the TMT as *TMT gender diversity, TMT tenure diversity and TMT age diversity*. In line with the arguments of Hambrick et al. (2015), firms could aim for restructuring their TMTs to enable the maximum effect of TMT diversity on firm outcomes. Lastly, I benefited from some controls that reflect the structural and environmental complexity faced by the firms as *firm size, firm age, diversification, industry stability, market concentration and slack*. These aspects can introduce additional information-processing, coordination requirements and firms may choose to reconfigure the structures of their TMTs accordingly to deal with these demands. Please refer to the below table for the details of the control variables.

[Insert Table 1 about here]

3.4.3 | Model and Estimation

According to Hambrick (2007), the best upper echelons studies include temporal lags and control for prior states of the independent variable to handle reverse causality. Therefore, I took the one-year lagged versions of the independent and control variables to address reverse causality (Menz & Scheef, 2014; Abt & Knyphausen, 2017).

For Hypotheses 1 and 2; since the dependent variable ranges between 0 and 1 and since same firms are observed over a period, I applied the generalized estimating equations (GEE) method (Liang & Zeger, 1996). The advantage of this method is that it analyzes both within-firm and between-firm variation and handles observed differences and correlations. In my GEE models, depending on Papke and Woolridge (2008), I chose the link function as "logit" for connecting the covariates and the dependent variables, "binomial" for the distribution of the dependent variable and "autoregressive (AR1)" specification concerning the functioning of the correlation matrix. Using the first-order autocorrelation specification enabled me to also control for the

autocorrelation caused by the possible inertia within the TMT structures (Greve, 2003).

For Hypothesis 3; as the dependent variable is standardized, I used OLS regression with firm fixed effects. Firm fixed effects introduce a within-firm correlation structure on the data which considers stable differences among firms while analyzing different outcomes (Kavusan & Frankort, 2019). Therefore, it serves as an effective method to capture the causality between TMT reward interdependence and performance feedback by ruling out other alternative explanations.

In all the models described above, I used robust standard errors to account for heteroskedasticity. Furthermore, I included year dummies in the analyses to better demonstrate the related impacts.

3.5 | RESULTS

The table below displays the descriptive statistics including all the variables. I observe that most of the correlations are below 0.55 meaning that multicollinearity is not a major problem. Also, I computed variance inflation factors (VIFs) and found no variable in my model with a score above 6.15, while the mean VIF for all variables was 2.24, below accepted standards.

[Insert Table 2 about here]

Table 3 presents the results of the hypotheses. For all the 3 pillars of TMT structural interdependence, I first develop a model only with the control variables and add the main effects for historical and social performance aspirations separately in different models.

[Insert Table 3 about here]

Models 1, 4 and 7 analyze the effects of the control variables on the 3 pillars of TMT structural interdependence. Looking at model 1, TMT horizontal interdependence is influenced the most from the diversification levels of firms as it decreases when firms become more diversified (ß=-0.10, $p<0.01$). In addition to diversification, firms with larger sizes also have lower levels of

TMT horizontal interdependence (ß=-0.04, p<0.10). Furthermore, firm age influences TMT vertical interdependence negatively (ß=-0.08, p<0.01). Regarding the CEO characteristics, outsider CEOs have more tendency to create more horizontally interdependent TMTs (ß=0.08, p<0.05). Additionally, CEO tenure has a negative effect on both TMT vertical (ß=-0.02, p<0.05) and reward (ß=-0.04, p<0.10) interdependence. As per the TMT characteristics, TMT tenure diversity has a negative impact on TMT horizontal interdependence (ß=-0.02, p<0.05). On the other hand, TMT tenure diversity has a positive effect on TMT vertical (ß=0.02, p<0.05) and reward (ß=0.03, p<0.10) interdependence. Like tenure diversity, TMT gender diversity has a positive impact on TMT reward interdependence (ß=0.33, p<0.10).

Hypothesis 1 predicted that when a firm's performance is below its aspirations, its TMT horizontal interdependence decreases. Looking across model 2 and 3, I observe a significant and negative correlation for social aspirations (ß=-0.16, p<0.05) but not for historical aspirations. Therefore, this hypothesis is partially supported. Moreover, 1 standard deviation decrease in performance compared to the social aspirations decreases TMT horizontal interdependence by 3 percentage points as in the below figure.

[Insert Figure 1 about here]

Hypothesis 2 suggested that when a firm's performance is below its aspirations, its TMT vertical interdependence increases. Looking across models 5 and 6, I observe a significant and positive correlation for historical aspirations (ß=0.13, p<0.05) but not for social aspirations. Therefore, this hypothesis is also partially supported. Moreover, 1 standard deviation decrease in performance compared to the historical aspirations increases TMT vertical interdependence by 2 percentage points as in the figure on the next page.

[Insert Figure 2 about here]

Hypothesis 3 suggested that when the firm performance is below the aspirations, its TMT reward interdependence increases. Looking across model 8 and 9, I observe a significant and positive correlation for social aspirations (ß=0.31, $p<0.05$) but not for historical aspirations. Therefore, this hypothesis is also partially supported. Moreover, 1 standard deviation decrease in performance compared to the social aspirations increases TMT reward interdependence by 0.02 standard deviations above the mean as in the below figure.

[Insert Figure 3 about here]

3.5.1 | Robustness and Endogeneity Checks

I addressed potential endogeneity which could exist mainly due to reverse causality and omitted variables. In addition to lagging the explanatory variables and applying an autoregressive correlation structure, I included the lagged dependent variables regarding the different pillars of TMT structural interdependence within my regressions to reduce the threat of spuriousness and reverse causality (Choi, Rhee, & Kim, 2019). After including the lagged dependent variables, my findings remained intact.

It is also possible that an omitted variable could influence the relationship between performance below aspirations and TMT structural interdependence. Therefore, I tested for the potential effect of an omitted variable by calculating the impact threshold for a confounding variable (ITCV) (Gamache & McNamara, 2019; Busenbark, Yoon, Gamache, & Withers, 2021). This analysis suggests that for an omitted variable to invalidate my findings, it would need to be correlated with both performance aspirations gap and TMT structural interdependence above certain thresholds ($r > 0.11$ for horizontal, $r > 0.29$ for vertical and $r > 0.25$ for reward interdependence models). In my analyses, to ensure that I am considering the potential factors that could affect my hypothesized relationships, I included all the control variables in my ITCV

analysis like Gamache and McNamara (2019). Out of these control variables, only "firm age" and "market concentration" had a higher correlation with dependent and independent variables than the impact threshold. Depending on the perspectives of Gamache and McNamara (2019), this is evidence that it is unlikely that there is an omitted variable that would invalidate my findings.

3.5.2 | Additional Analyses

To further strengthen my findings, I performed several additional analyses as described below. All these additional analyses are available upon request.

To better interpret these findings around TMT horizontal interdependence, I also looked at how the probability of the presence of certain functional roles as well as the proportion of general and regional managers change in the TMT. My additional analyses showed that the likelihood of Chief Administrative Officer presence decreases in the TMT significantly when firms are below their social performance aspirations, whereas there was not a significant effect for other functional roles. Concerning the divisional executives, the results showed that when a firm's performance is below its social aspirations, the ratio of the general managers in its TMT increased. On the other hand, I could not find any significant relationship between the proportion of regional roles in a firm's TMT and its performance below social aspirations. These findings provide additional support into the case of Hewlett Packard as discussed previously where they eliminate different administrative roles such as Chief Administrative Officer and increase the portion of general managers in their TMT when they underperform compared to their aspirations.

Connected to the results around vertical interdependence, one way of decreasing the hierarchical layers in the TMT thus increasing the vertical interdependence could be linked to the elimination of Chief Operating Officer (COO) position. I choose to focus on the COO position as different scholars such as Hambrick and Canella (2004) and Rajan and Wulf (2006) mention that

COO can be considered as the second in command and stands between the CEO and other TMT members. My additional analysis showed that the probability of having a COO in a firm's TMT decreases when its performance is below its historical aspirations. Depending on this finding, I can state that firms increase their TMT vertical interdependence mainly by eliminating the intermediary COO position which represents an extra layer in the TMT. This insight also extends more support for the case of Novo Nordisk AS described in the previous sections.

TMT reward interdependence was composed of three different pillars including the co-movement of bonuses, co-movement of non-cash pay, and the proportion of non-cash pay within the total compensation packages of the TMT members. When I looked at how these different components reacted to negative performance feedback, I obtained the most significant relationship for the non-cash benefits compared to co-movement of bonuses and non-cash options. This demonstrates that when firms underperform compared to their social aspirations, they increase their TMT reward interdependence mostly through giving more weight for the non-cash benefits within the total pay packages.

In this study, I used the traditional definition of social aspirations gaps as the difference between the focal firm's performance and the average performance of all firms in the related industry. However, managers of large firms may not consider all the firms in their industries as their referent others but focus on a smaller peer group of meaningful others (Fiegenbaum and Thomas, 1990). Kuusela, Keil and Maula (2017) also mention that performance aspirations depend on a focal peer group most relevant to a firm's performance rather than the performance of all firms within the industry. Depending on these considerations, I constructed new social aspiration levels for both innovation and market performance based on the mean performance of firms within the 3-digit SIC codes instead of 2-digit SICs and calculated the social aspiration gaps accordingly.

My analyses including the newly formed social aspiration levels and performance aspirations gaps led to similar results to those of my main analyses.

3.6 | DISCUSSION AND CONCLUSIONS

While the composition, processes, incentives, and leaders of TMTs have received considerable scholarly attention, less is known about how and why firms reconfigure their TMT structures over time. In this study, I complement the literature on TMT structures by developing and testing a comprehensive performance feedback perspective on TMT structural interdependence. I find that as firms' performance fall below their aspiration levels, they decrease their TMT horizontal interdependence but increase their TMT vertical and reward interdependence. Additionally, I discover that while adjusting their TMT horizontal and reward interdependencies, firms take their social aspirations into consideration compared to their historical aspirations. On the other hand, firms prioritize the feedback coming from their historical aspirations, while deciding to adjust their TMT vertical interdependence.

My finding of decreased TMT horizontal interdependence linked to performance feedback introduces a counter point of view to the claims of different scholars such as Hambrick et al. (2015), Guadalupe et al. (2014), Beckman and Burton (2011) who argue about the effectiveness of a more horizontally interdependent TMT structure. I demonstrate that in the case of decreasing performance compared to aspirations, firms can decentralize some of their functions and give more authority to divisional executives to provide more focus on revenue and profit generation to recover performance. However, Hambrick et al. (2015) mention that a structure with multiple general managers running related business can be more horizontally interdependent compared to a more functional structure. Although not tested directly, I can argue that while firms are

decreasing their horizontal interdependence in response to negative performance feedback, they structure their TMTs around more related business divisions.

On the other hand, I complement the arguments of Hambrick et al. (2015) about the benefits of more vertical and reward interdependence. My results show that firms increase the vertical and reward interdependencies of their TMTs mainly to promote better collaboration, coordination, decision-making processes, and risk alignment among the higher proportion of divisional executives in the TMT. Depending on the arguments of Sengul and Obloj (2017), the increased TMT vertical and reward interdependence based on negative performance feedback can also be related to the purpose of exerting more effective monitoring and control over the increased portion of divisional executives in the TMT through the hierarchy and incentive mechanisms, so that they do not take excessive risks that may further trouble firm performance.

In my analyses, I found out that different pillars of TMT structural interdependence are affected more significantly from different aspiration types. TMT horizontal and reward interdependence are influenced more from social aspirations gaps and TMT vertical interdependence more from historical aspirations gaps. Greve (2003) and Audia and Greve (2006) suggest that firms prefer social aspiration levels when they see themselves as comparable to others but historical aspiration levels when they view themselves as unique. Since TMT vertical interdependence is more related to internal social unity within the TMT, firms may consider these more culture related dynamics as not having too much in common with other firms, making them prioritize historical aspirations over social aspirations. On the other hand, while firms are re-designing the role and incentive structures of their TMTs, research has documented that they follow their reference groups much more and adjust their structures depending on the respective actions of their peers (Cadman & Carter, 2014; Wiedeck & Engelen, 2018; Kunish, Menz, &

Langan, 2020; Fu, Tang, & Chen, 2020). Depending on these viewpoints, they could prioritize the feedback coming from their performance relative to their industry peers while formulating their decisions around TMT horizontal and reward interdependence.

This study enlarges first upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) where I respond to the suggestion from Hambrick (2007) to pay more attention to the structure side of the TMTs. To do so, I benefit from the TMT structural interdependence framework of Hambrick et al. (2015) and demonstrate how different elements of TMT structural interdependence change linked to negative performance feedback. Additionally, as Hambrick (2007) suggests, I treat TMT structural reconfigurations as consequences rather than antecedents. Moreover, I turn upper echelons theory on its head with the support of the behavioral theory of the firm (Cyert & March, 1963) and display that TMT structures can change significantly depending on performance developments. Furthermore, I introduce behavioral theory of the firm (Cyert & March, 1963) as a crucial mechanism to analyze TMT structural changes. Many of the previous studies exploring the presence of individual positions in TMTs as well as sub-groups (Menz & Scheef, 2014; Hambrick & Cannella, 2004; Guadalupe et al., 2014) benefited from the contingency theory and characterized decision makers as more rational and value-maximizing. Instead, I show that decision makers can be boundedly rational while evaluating their TMT structures and act depending on the feedback coming from their performance.

Second, this study contributes into the behavioral theory of the firm (Cyert & March, 1963). Many studies up to date have investigated how firms can engage in problemistic search at the organization level and apply changes through investing in innovation, making more mergers and acquisitions, engaging in more organizational changes, developing different alliances and partnerships, in the cases of performance below aspirations (Greve, 2003; Iyer & Miller, 2008;

Greve 1998, Park, 2007; Tyler & Caner, 2016; Kavusan & Frankort, 2019; Baum et al., 2005). I add to these studies by showing that firms can engage in problemistic search also at different levels such as TMT that reflects the organization (Hambrick & Mason, 1984). Accordingly, I demonstrate that firms can be open to problemistic search also at their TMT structures and make substantial changes among all role, hierarchy, and reward dimensions to take their performance back to the aspiration levels. I also show that firms can be attentive to performance feedback coming from different benchmarks (internal vs. external) while changing their TMT structures. Much evidence suggests that firm aspirations are influenced by both historical and social comparisons, but it is unclear which one dominates (Greve & Gaba, 2017). Some studies report the prevalence of social (Mishina, Dykes, Block, & Pollock, 2010) and others the one of historical aspirations (Audia & Brion, 2007). Even though I provide some possible explanations above, Gaba and Bhattacharya (2012) mention that there may be various other factors such as environment, industry, etc. that can influence the selection of the comparison group. Accordingly, Posen et al. (2018) suggest that future research should investigate these factors further.

3.6.1 | Limitations and Future Research

I acknowledge various limitations of my study and provide future research directions. First, my sample takes large firms belonging to the S&P 500 Index into consideration. Using a different sample composed of small and medium sized firms could introduce different insights into TMT structural changes. Additionally, my sample consists of mostly US Firms. Future studies can also consider using firms from different institutional contexts while assessing the TMT structural developments. Second, I conceptualize TMTs based on the list of executives within 10-Ks and proxy statements of firms. Applying a different definition of the TMT and using other databases

such as BoardEx (Fu et al., 2020; Kunish et al., 2020) or Execucomp (Wiedeck & Engelen, 2018; Roh et al., 2016) may produce other results for TMT structural reconfigurations.

Also, since I use Execucomp data for reward interdependence, my sample is limited to only top highest 5 paid executives for each firm. On the other hand, I have a larger group of TMT members while analyzing horizontal and vertical interdependence. For the future studies, researchers can try to collect additional data for the compensation of other executives besides the highest top 5 ones reported in the proxy statements.

I strongly believe that this study could open further research avenues. First, researchers can benefit from other theoretical perspectives such as contingency or institutionalism (Burns & Stalker, 1961; Chandler, 1962; Meyer & Rowan, 1977; DiMaggio & Powell, 1983) to explain the drivers of different TMT structural reconfigurations. TMT structural interdependence can be influenced from a variety of factors linked to the firm, CEOs, boards, environment, industry, as well as from the mimicry behaviors of firms. Thoroughly analyzing them will offer lots of interesting explanations into the antecedents of TMT structural reconfigurations.

In this paper, I used the TMT structural interdependence framework of Hambrick et al. (2015) to conceptualize TMT structural reconfigurations. However, there can be alternative conceptualizations of TMT structures by differentiating between output vs. throughput or internally vs. externally oriented roles (Cho & Hambrick, 2006; Bermiss & Murrmann, 2015). Future studies can classify TMT structural reconfigurations across different dimensions and investigate how they alter in connection to various theoretical perspectives described above.

Finally, further studies could explore how different TMT structural reconfigurations affect firm performance. It is also likely that different TMT structures can be effective under different circumstances. Therefore, clarifying the boundary conditions and interactions between TMT

structures and various contingencies and establishing their link with different facets of firm performance offer very promising research directions.

3.6.2 | Conclusion

Different from the research focusing the on the consequences of TMT composition, this study offers an integrative behavioral perspective to analyze the antecedents of TMT structural reconfigurations. Suggesting that managers can be boundedly rational and depend on performance feedback, I focused on the antecedents of TMT structural interdependence and offered some evidence on how its different pillars respond to negative performance feedback. I hope my theory and analyses will trigger more research on the evolution of these TMT shake-ups and the drivers influencing those developments.

3.7 | REFERENCES

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3.8 | TABLES AND FIGURES

Table 1. Control Variables

Variable	Definition	Reference
CEO Age	Age of the CEO	Simsek (2007)
CEO Gender	1 if the CEO is female 0 otherwise	
CEO Tenure	Natural logarithm of the time for the person in the CEO position after the appointment	Menz and Scheef (2014)
Outsider CEO	Dummy variable of 1 if the CEO is an outsider (has firm tenure of at least 2 years before promotion into the CEO position)	Karaevli (2007)
CEO Duality	1 if the CEO is also the Chairman and 0 otherwise	Menz and Scheef (2014)
CEO Change	1 if there is a change of CEO and 0 otherwise	Hambrick and Cannella (2004), Marcel (2009)
TMT Age Diversity	Standard deviation of the TMT age	Marcel (2009)
TMT Tenure Diversity	Standard deviation of the TMT tenure	Marcel (2009)
TMT Gender Diversity	Calculated through Blau Index (1977) between men and women	Ali and Konrad (2017)
Board Size	Number of directors on the board	Bommaraju et al. (2019)
Board Outsider Directors %	Percentage of external board members	Krause, Withers and Semadeni (2017)
Board Gender Diversity	Percentage of women on the board	Bommaraju et al. (2019)
Board Tenure Diversity	Standard deviation of board tenure	Tarus and Aime (2014)
Board Age Diversity	Standard deviation of board age	Menz, Kunish and Langan (2020)
Diversification	Entropy index by taking the dispersion of sales across different business segments	Palepu (1985)
Firm Size	Natural logarithm of total employee number	Tyler and Caner (2016)
Firm Age	Natural logarithm of years since founding	Caselli and DiGiuli (2010)
Industry Dynamism	Calculated as the absolute difference in the industry growth rate from t−2 to t−1 vs. from t − 1 to t.	Hambrick and Cannella (2004)
Market Concentration	Obtained through the Herfindahl – Hirshmann Index that takes the sum of the square of revenue shares of all firms at the 2 digits SIC level	Nath and Mahajan (2011)
Slack	Total of available slack (assets/liabilities), absorbed slack (working capital/sales) and potential slack (equity/debt). All these categories have been standardized and summed up to create the composite slack index.	Tyler and Caner (2016)

Table 2. Descriptive Statistics

	Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1	TMT Horizontal Interdependence	0.60	0.17	1										
2	TMT Vertical Interdependence	0.33	0.09	0.12***	1									
3	TMT Reward Interdependence	0.00	0.58	-0.08***	-0.04*	1								
4	CEO Age	4.03	0.11	-0.02	-0.02	-0.03	1							
5	CEO Gender	0.05	0.22	-0.02	-0.00	0.01	0.02	1						
6	CEO Tenure	1.45	0.98	0.03	0.01	-0.10***	0.36***	-0.04*	1					
7	Outsider CEO	0.37	0.48	0.04**	0.10***	0.03	0.05**	-0.04*	0.06**	1				
8	CEO Duality	0.49	0.50	-0.06***	-0.14***	0.02	0.31***	0.05**	0.28***	0.05**	1			
9	CEO Change	0.11	0.31	-0.01	0.01	0.05**	-0.18***	0.02	-0.52***	-0.04*	-0.21***	1		
10	TMT Age Diversity	5.04	1.69	0.01	-0.03	-0.03	0.06***	-0.05**	0.05**	0.05**	-0.01	-0.02	1	
11	TMT Tenure Diversity	3.01	1.61	-0.02	0.04*	-0.05**	0.15***	0.01	0.20***	-0.10***	-0.01	-0.02	0.12***	1
12	TMT Gender Diversity	0.12	0.13	0.09***	0.00	0.04*	-0.03	0.04*	-0.13***	-0.14***	0.03	0.04*	-0.12***	-0.08***
13	Board Size	2.32	0.38	-0.05*	-0.06***	0.02	0.03	0.09***	-0.04*	-0.16***	0.03	0.01	-0.06***	-0.02
14	Board Outsider Directors	0.85	0.13	0.01	0.03	0.01	-0.00	0.07***	-0.06***	-0.05**	-0.01	0.00	-0.05**	-0.08***
15	Board Gender Diversity	0.16	0.10	-0.01	-0.05**	0.02	0.05**	0.21***	-0.08***	-0.15***	0.13***	0.01	-0.10***	-0.00
16	Board Tenure Diversity	5.65	2.66	0.01	0.02	-0.02	0.10***	-0.05**	0.10***	-0.08***	-0.06**	-0.01	-0.01	0.18***
17	Board Age Diversity	6.67	1.98	0.07***	-0.01	-0.02	-0.22***	-0.02	0.02	-0.02	-0.17***	-0.01	0.07***	-0.01
18	Diversification	0.46	0.53	-0.15***	-0.01	0.05**	-0.05**	-0.00	-0.08***	0.03	0.01	0.01	0.01	-0.12***
19	Firm Size	9.29	1.55	-0.16***	-0.14***	0.05**	0.07***	0.04*	-0.11***	-0.16***	0.15***	0.03	-0.16***	-0.05**
20	Firm Age	3.98	0.84	-0.17***	-0.20***	0.10***	0.16***	0.00	-0.10***	-0.21***	0.24***	0.01	-0.12***	0.04*
21	Industry Stability	9.23	10.71	-0.01	-0.02	0.04*	0.04*	0.02	0.05**	-0.05**	0.07***	-0.01	-0.01	0.02
22	Market Concentration	8503	679	0.08***	-0.04*	-0.03	0.06***	0.01	-0.05*	-0.06**	0.02	0.00	0.01	-0.01
23	Slack	2.94	1.46	0.06**	0.02	-0.03	0.02	-0.04*	0.09***	0.05**	-0.01	-0.01	0.02	0.08***
24	Performance - Aspirations (>0) (Historical- Horint)	0.02	0.06	0.09***	0.07***	-0.01	-0.06***	-0.03	-0.04*	0.08***	-0.08***	-0.01	0.02	-0.04*
25	Performance - Aspirations (<0) (Historical- Horint)	0.02	0.06	0.07***	0.06**	0.01	-0.04*	-0.02	-0.04*	0.05*	-0.06***	0.05**	-0.02	-0.05**
26	Performance - Aspirations (>0) (Historical- Verint)	0.02	0.05	0.10***	0.08***	-0.02	-0.06***	-0.04*	-0.04*	0.09***	-0.08***	-0.01	0.02	-0.04*
27	Performance - Aspirations (<0) (Historical- Verint)	0.02	0.06	0.07***	0.05**	0.01	-0.04*	-0.02	-0.04*	0.04*	-0.06***	0.05**	-0.02	-0.04*
28	Performance - Aspirations (>0) (Historical- Rewint)	0.02	0.05	0.12***	0.09***	-0.03	-0.08***	-0.05**	-0.03	0.11***	-0.10***	-0.01	0.03	-0.05**
29	Performance - Aspirations (<0) (Historical- Rewint)	0.02	0.06	0.07***	0.05*	0.02	-0.04*	-0.02	-0.04*	0.03	-0.06***	0.06***	-0.02	-0.04*
30	Performance Above Aspirations (Social)	0.02	0.04	0.05**	-0.00	-0.07***	-0.06**	-0.04*	-0.00	0.00	-0.05**	-0.01	-0.03	0.04*
31	Performance Below Aspirations (Social)	0.02	0.07	0.08***	0.08***	0.06**	-0.05**	-0.02	-0.03	0.09***	-0.08***	0.06***	0.04*	-0.08***

N=3120 "* p<0.1 ** p<0.05 *** p<0.01"
All independent and control variables are one year lagged

	Variable	Mean	S.D.	12	13	14	15	16	17	18	19	20	21
1	TMT Horizontal Interdependence	0.60	0.17										
2	TMT Vertical Interdependence	0.33	0.09										
3	TMT Reward Interdependence	0.00	0.58										
4	CEO Age	4.03	0.11										
5	CEO Gender	0.05	0.22										
6	CEO Tenure	1.45	0.98										
7	Outsider CEO	0.37	0.48										
8	CEO Duality	0.49	0.50										
9	CEO Change	0.11	0.31										
10	TMT Age Diversity	5.04	1.69										
11	TMT Tenure Diversity	3.01	1.61										
12	TMT Gender Diversity	0.12	0.13	1									
13	Board Size	2.32	0.38	0.12***	1								
14	Board Outsider Directors	0.85	0.13	0.09***	0.46***	1							
15	Board Gender Diversity	0.16	0.10	0.22***	0.31***	0.29***	1						
16	Board Tenure Diversity	5.65	2.66	0.00	0.26***	0.15***	0.08***	1					
17	Board Age Diversity	6.67	1.98	-0.08***	0.34***	0.28***	-0.01	0.28***	1				
18	Diversification	0.46	0.53	0.01	0.03	0.06**	0.06**	-0.04*	-0.04*	1			
19	Firm Size	9.29	1.55	0.11***	0.26***	0.14***	0.24***	0.03	-0.11***	0.28***	1		
20	Firm Age	3.98	0.84	0.19***	0.27***	0.12***	0.32***	0.13***	-0.14***	0.15***	0.44***	1	
21	Industry Stability	9.23	10.71	-0.04*	0.01	-0.05*	-0.06***	-0.01	-0.03	-0.08***	-0.09***	0.02	1
22	Market Concentration	8503	679	0.10***	0.05**	0.12***	0.18***	-0.01	-0.04*	0.06***	-0.09***	0.02	-0.15***
23	Slack	2.94	1.46	-0.07***	-0.07***	-0.07***	-0.10***	0.11***	0.12***	0.02	0.02	-0.06**	0.01
24	Performance - Aspirations (>0) (Historical- Horint)	0.02	0.06	-0.04*	-0.08***	-0.01	-0.09***	-0.03	0.04*	-0.03	-0.12***	-0.14***	0.03
25	Performance - Aspirations (<0) (Historical- Horint)	0.02	0.06	-0.01	-0.12***	-0.06***	-0.08***	-0.03	-0.02	-0.02	-0.07***	-0.10***	-0.04*
26	Performance - Aspirations (>0) (Historical- Verint)	0.02	0.05	-0.05**	-0.08***	-0.02	-0.09***	-0.03	0.04*	-0.03	-0.12***	-0.14***	0.03
27	Performance - Aspirations (<0) (Historical- Verint)	0.02	0.06	-0.01	-0.12***	-0.06***	-0.08***	-0.03	-0.02	-0.02	-0.07***	-0.09***	-0.04*
28	Performance - Aspirations (>0) (Historical- Rewint)	0.02	0.05	-0.06**	-0.09***	-0.02	-0.11***	-0.03	0.05**	-0.04*	-0.14***	-0.17***	0.01
29	Performance - Aspirations (<0) (Historical- Rewint)	0.02	0.06	-0.00	-0.12***	-0.06***	-0.07***	-0.03	-0.02	-0.02	-0.06***	-0.08***	-0.02
30	Performance Above Aspirations (Social)	0.02	0.04	-0.05**	-0.08***	-0.07***	-0.05**	-0.01	0.03	-0.06**	-0.01	-0.05**	-0.06***
31	Performance Below Aspirations (Social)	0.02	0.07	-0.01	-0.10***	-0.03	-0.07***	-0.04*	0.05**	-0.04*	-0.13***	-0.13***	-0.03*

N=3120 "* p<0.1 ** p<0.05 *** p<0.01"
All independent and control variables are one year lagged

	Variable	Mean	S.D.	22	23	24	25	26	27	28	29	30	31
1	TMT Horizontal Interdependence	0.60	0.17										
2	TMT Vertical Interdependence	0.33	0.09										
3	TMT Reward Interdependence	0.00	0.58										
4	CEO Age	4.03	0.11										
5	CEO Gender	0.05	0.22										
6	CEO Tenure	1.45	0.98										
7	Outsider CEO	0.37	0.48										
8	CEO Duality	0.49	0.50										
9	CEO Change	0.11	0.31										
10	TMT Age Diversity	5.04	1.69										
11	TMT Tenure Diversity	3.01	1.61										
12	TMT Gender Diversity	0.12	0.13										
13	Board Size	2.32	0.38										
14	Board Outsider Directors	0.85	0.13										
15	Board Gender Diversity	0.16	0.10										
16	Board Tenure Diversity	5.65	2.66										
17	Board Age Diversity	6.67	1.98										
18	Diversification	0.46	0.53										
19	Firm Size	9.29	1.55										
20	Firm Age	3.98	0.84										
21	Industry Stability	9.23	10.71										
22	Market Concentration	8503	679	1									
23	Slack	2.94	1.46	-0.06***	1								
24	Performance - Aspirations (>0) (Historical- Horint)	0.02	0.06	-0.03	0.01	1							
25	Performance - Aspirations (<0) (Historical- Horint)	0.02	0.06	-0.04*	-0.00	-0.09***	1						
26	Performance - Aspirations (>0) (Historical- Verint)	0.02	0.05	-0.03	0.01	0.09***	-0.09***	1					
27	Performance - Aspirations (<0) (Historical- Verint)	0.02	0.06	-0.03	-0.00	-0.09***	0.09***	-0.09***	1				
28	Performance - Aspirations (>0) (Historical- Rewint)	0.02	0.05	-0.05**	0.03	0.08***	-0.10***	0.08***	-0.11***	1			
29	Performance - Aspirations (<0) (Historical- Rewint)	0.02	0.06	-0.03	-0.00	-0.09***	0.09***	-0.09***	0.09***	-0.12***	1		
30	Performance Above Aspirations (Social)	0.02	0.04	-0.10***	0.09***	0.25***	-0.06**	0.28***	-0.06***	0.39***	-0.07***	1	
31	Performance Below Aspirations (Social)	0.02	0.07	-0.06***	-0.03	0.02	0.72***	0.02	0.07***	-0.02	0.07***	-0.20***	1

N=3120 "* p<0.1 ** p<0.05 *** p<0.01"
All independent and control variables are one year lagged

Table 3. Performance Aspirations and TMT Structural Interdependence

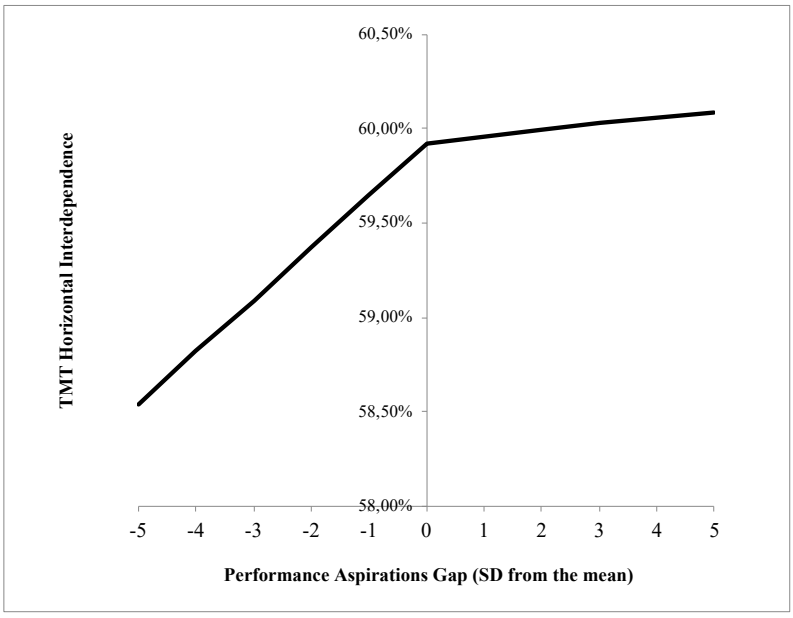
	TMT Horizontal Interdependence			TMT Vertical Interdependence			TMT Reward Interdependence		
		Historical	Social		Historical	Social		Historical	Social
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Constant	1.56**	1.56**	1.56**	-1.44***	-1.48***	-1.48***	0.04	0.06	-0.01
	(0.67)	(0.67)	(0.67)	(0.52)	(0.53)	(0.53)	(0.81)	(0.81)	(0.81)
CEO Age (ln)	-0.08	-0.07	-0.06	0.33	0.33	0.33	-0.13	-0.13	-0.13
	(0.16)	(0.16)	(0.16)	(0.12)	(0.12)	(0.12)	(0.19)	(0.19)	(0.19)
CEO Gender	-0.08	-0.08	-0.08	-0.05	-0.05	-0.05	0.01	0.01	0.01
	(0.06)	(0.06)	(0.06)	(0.03)	(0.03)	(0.03)	(0.09)	(0.09)	(0.09)
CEO Tenure (ln)	-0.00	-0.00	-0.00	-0.02**	-0.03**	-0.03**	-0.04*	-0.04*	-0.04*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Outsider CEO	0.08**	0.08**	0.08**	0.00	0.01	0.00	-0.00	0.00	0.00
	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
CEO Duality	0.00	0.00	0.00	-0.03	-0.03	-0.03	0.03	0.03	0.03
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
CEO Change	0.01	0.02	0.02	-0.01	-0.01	-0.01	0.00	0.00	-0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
TMT Age Diversity	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.01	-0.01	-0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
TMT Tenure Diversity	-0.02**	-0.02**	-0.02**	0.02**	0.02**	0.02**	0.03*	0.03*	0.03**
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
TMT Gender Diversity	-0.03	-0.03	-0.04	0.07	0.07	0.07	0.33*	0.33*	0.33*
	(0.09)	(0.09)	(0.09)	(0.06)	(0.06)	(0.06)	(0.19)	(0.19)	(0.19)
Board Size	-0.02	-0.03	-0.03	-0.04	-0.03	-0.04	-0.10	-0.10	-0.09
	(0.12)	(0.12)	(0.05)	(0.04)	(0.04)	(0.04)	(0.07)	(0.07)	(0.07)
Board Outsider Directors (%)	0.06	0.06	0.06	-0.02	-0.04	-0.03	0.20	0.20	0.19
	(0.12)	(0.12)	(0.12)	(0.13)	(0.13)	(0.13)	(0.19)	(0.19)	(0.19)
Board Gender Diversity	0.03	0.02	0.03	0.03	0.03	0.04	-0.26	-0.27	-0.26
	(0.01)	(0.01)	(0.01)	(0.10)	(0.10)	(0.10)	(0.21)	(0.21)	(0.21)
Board Tenure Diversity	-0.00	-0.00	-0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
Board Age Diversity	-0.00	-0.00	-0.01	-0.00	-0.00	-0.00	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Diversification	-0.10***	-0.10***	-0.10***	-0.01	-0.01	-0.01	-0.07	-0.07	-0.07
	(0.04)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.06)	(0.06)	(0.06)
Firm Size (ln)	-0.04*	-0.04*	-0.04*	-0.01	-0.01	-0.01	0.09	0.09	0.09*
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.05)
Firm Age (ln)	-0.06	-0.06	-0.06	-0.08***	-0.08***	-0.08***	-0.06	-0.07	-0.06
	(0.04)	(0.04)	(0.05)	(0.02)	(0.02)	(0.02)	(0.11)	(0.11)	(0.11)
Industry Stability	-0.00	-0.00	-0.00	0.00	0.00	0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Market Concentration	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(-0.15)	(0.00)	(0.00)
Slack	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.11)	(0.00)	(0.00)
Year	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Performance - Aspiration		0.01	0.04		0.09	-0.11		-0.17	-0.03
(Above Aspirations)		(0.10)	(0.15)		(0.12)	(0.10)		(0.23)	(0.24)
Performance - Aspiration		-0.10	-0.16**		0.13**	-0.02		0.00	0.31**
(Below Aspirations)		(0.09)	(0.08)		(0.07)	(0.07)		(0.16)	(0.15)
Number of Observations	3120	3120	3120	3120	3120	3120	3120	3120	3120
Number of Firms	260	260	260	260	260	260	260	260	260
Wald Chi Square*	65.35***	66.65***	66.79***	79.98***	84.95***	79.98***	4.61***	4.41***	4.52***

Standard errors are in paranthesis. All independent and control variables are lagged by one year

"* p<0.1 ** p<0.05 *** p<0.01"

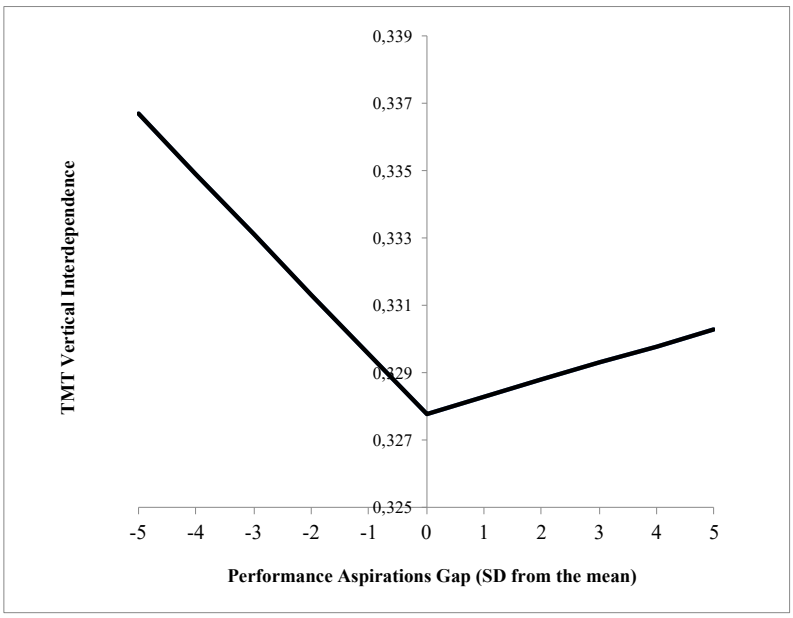
* Refer to the F Statistic for the reward interdependence models

Figure 1. Performance vs. Social Aspirations and TMT Horizontal Interdependence



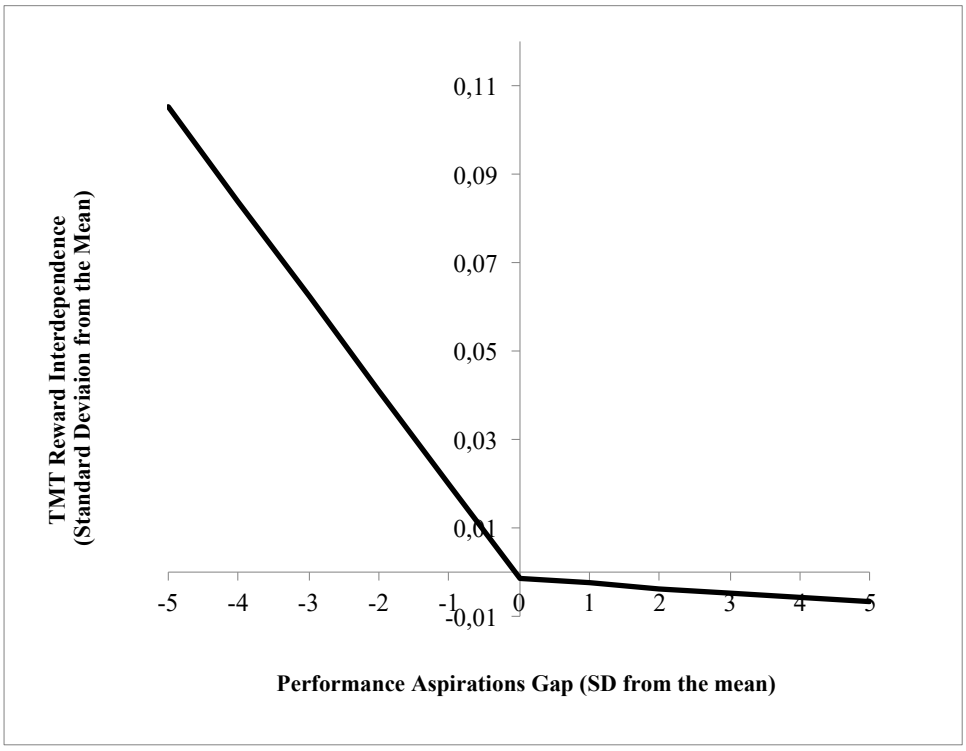
- Horizontal Interdependence represents the proportion of functional executives in the TMT

Figure 2. Performance vs. Historical Aspirations and TMT Vertical Interdependence



- Vertical Interdependence axis shows the relative power of the lowest ranked executive in terms titles compared to the CEO whose power is defined as 1.

Figure 3. Performance vs. Social Aspirations and TMT Reward Interdependence



CHAPTER 4- Top management teams hierarchical structures: An exploration of characteristics and determinants

ABSTRACT

Although researchers started to focus on the role structure of top management teams (TMT), the hierarchical structure of TMTs remains underexplored. In this study, I conduct an empirical analysis to better understand how TMTs are hierarchically structured and what drives different hierarchical configurations across TMTs. My exploratory analysis of 260 Standard & Poor firms between 2007 and 2018 offers unique insights. In descriptive terms, I find that even though TMT sizes remained constant between the years of observation, their hierarchical stratification decreased slightly meaning that TMTs became relatively flatter. In prescriptive terms, I find that several factors related to CEO characteristics, strategic leadership, firm, and environmental conditions, as well as firm performance influence the hierarchical structure of TMTs. These combined empirical insights call for nuanced theoretical explanations of TMT hierarchical structures. I contribute to the TMT literature by highlighting the characteristics of different TMT hierarchical structures and providing new insights into their determinants.

Keywords: Top management teams, TMT hierarchy, TMT structure, Upper echelons theory

4.1 | INTRODUCTION

In the 2007 update of the upper echelons theory, Donald Hambrick stated that researchers must pay more attention to the structure dimension of the top management teams (TMT) and to treat TMT characteristics as consequences rather than antecedents to firm performance. Accordingly, scholars have increased their focus mainly for the role structures within TMTs where they examined the antecedents and consequences of the presences of different executive roles in TMTs such as Chief Strategy Officers, Chief Operating Officers, Chief Marketing Officers, and Chief Supply Chain Officers, etc. (Menz & Scheef, 2014; Hambrick & Cannella, 2004; Nath & Mahajan, 2008; Roh, Krause, & Swink, 2016).

Besides the role structures, another significant dimension of TMT structures is the hierarchical setup of the TMTs (Radek & Menz, 2020). However, this dimension is relatively unexplored compared to role structures where we know much less about the antecedents of different TMT hierarchical configurations (Radek & Menz, 2020). The way how a TMT is structured hierarchically has a crucial impact on the power distribution and social unity between TMT members which influences various TMT processes and firm performance in return (Finkelstein, 1992; Beckman & Burton, 2011; Hambrick, Humprey, & Gupta, 2015). Also, the evolution of the hierarchical structure of a TMT can signal the changes in the strategic and environmental context of a firm and which functions, roles, etc. become more strategically important accordingly through their title grades (Ma, Kor, & Seidl, 2021). Therefore, understanding the drivers of TMT hierarchical structures gains particular importance since we can acquire more insights into the motivations of decision makers while they are formulating their choices around power distribution and social coherence within their TMTs and while they are determining the significance levels of different functions and units within their organizations.

Hambrick et al. (2015) recognize that almost all TMTs include members of varying ranks. They mention that in some TMTs, members are more hierarchical peers such as in a team including a CEO and all other members with an executive vice president title. On the other hand, some TMTs are structured in a way where some of CEO's direct reports are executive vice presidents, some senior vice presidents, and some plain vice presidents. Hambrick et al. (2015) note that when the hierarchical distinctions are minimal in the TMT, members will see each other as part of the same social entity and their actions will hold more salience for each other. Also, Finkelstein (1992) mentions that the hierarchical rank of the TMT members indicates their level of structural power in the team, which increases in line with their effect to manage the uncertainty their firms face. The studies on TMT hierarchical structures examined mainly the impact of TMT hierarchical setups on the different facets of firm performance through a structural power or social unity lens (Cannella & Hambrick, 1993; Keck, 1997; Patel & Cooper, 2014). Additionally, some studies used TMT hierarchical structures as moderators which can influence the relationship among various CEO, TMT characteristics and firm performance (Hambrick et al., 2015; Ridge, Aime, & White, 2015). Despite these studies' valuable insights, the determinants of TMT hierarchical structures remain unexplored where prior research does not inform us fully on how and why TMTs are hierarchically structured the way they are (Radek & Menz, 2020).

Against this backdrop, the purpose of this study is to examine two interrelated questions, as what characterizes TMTs with different hierarchical structures and what drives different TMT hierarchical setups. To investigate these questions, I use an exploratory empirical research approach, which focuses on identifying the patterns in the data rather than testing hypotheses based on theory (Helfat, 2007; Oxley, Rivkin, & Ryall, 2010). This approach is effective when relatively little is known about an interesting phenomenon and/or no theory can fully explain it (Hambrick,

2007). Using data from 260 Standard & Poor firms, this study explores first the nature of TMT hierarchical setups in connection with different firm characteristics. Then, I apply a quantitative exploration of which CEO, strategic leadership, firm, environment, and performance level factors affect choices regarding TMT hierarchical structures. The findings from these analyses provide a more comprehensive understanding of TMT hierarchical structures than would have been possible using a theory testing approach with limited perspectives (Kunish, Menz, & Langan, 2020).

In my opinion, this study is important since it contributes to upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) and, specifically to the literature on TMT hierarchical structures. This paper introduces empirical insights on the hierarchical structures of TMTs which has not received considerable attention from scholars. My study reveals descriptive insights on the nature of TMT hierarchical setups as well as prescriptive insights into the factors that influence different hierarchical reconfigurations across TMTs. Thereby, my exploratory paper extends the insights provided by the studies that treated TMT hierarchies as an antecedent or a moderator to firm performance (Hambrick et al., 2015; Patel & Cooper, 2014, Cannella & Hambrick, 1993). I complement this research by demonstrating how TMTs with different hierarchical structures are designed and what drives TMT hierarchical setups. As one of the first studies to investigate the antecedents of TMT hierarchical setups, my paper establishes that CEO, strategic leadership, firm, environment, and performance related factors determine TMT hierarchical structures.

The structure of this paper follows the "just the facts" approach (Oxley et al., 2010; Menz & Barnbeck, 2017). After a brief discussion on the background of TMT hierarchy literature, I describe the study's method, present the results, and discuss how the findings inform existing knowledge and create future research opportunities.

4.2 | THEORETICAL BACKGROUND

Hambrick et al. (2015) introduced the TMT vertical interdependence concept as one of the pillars of their TMT structural interdependence framework. Vertical interdependence refers to the degree to which TMT members are peers as opposed to hierarchically separate. According to Hambrick et al. (2015) and Radek and Menz (2020), the hierarchical setup of the TMTs can show some variations. Different TMT hierarchical setups can range from "flat" TMTs with only a few hierarchical levels to those that have more levels. For example, the TMT of Abbott Pharmaceuticals in 2013 consisted of 8 members excluding the CEO and all of them were titled as Executive Vice Presidents (Abbott, 2013). On the other hand, Zimmer Biomet Holdings had 7 members in its executive team as of 2008 but there were 5 different title ranks in the TMT as Senior Vice President, Executive Vice President, President, Group President, and Chairman & President (Zimmer Biomet Holdings, 2008).

According to Hambrick et al. (2015) another factor that increases the hierarchical distinction in the TMT is the presence of a Chief Operating Officer (COO). They mention that as the COO is the second in command after the CEO (Hambrick & Cannella, 2004; Marcel, 2009), some TMT members may report to the COO which creates another sub-team in the TMT. However, Hambrick and Cannella (2004) and Rajan and Wulf (2006) found a decreasing prevalence of the COO position in TMTs within the last years. Rajan and Wulf (2006) regard the COO role as an intermediary position between the CEO and the rest of the TMT and note that firms aimed to flatten their hierarchies mainly by eliminating the COO position.

The way how TMTs are structured hierarchically can represent different dynamics across firms. Hambrick et al. (2015) connect hierarchical structures with social integration within the TMT. They mention that the hierarchical setup of the TMT has a huge influence on peer salience

and on the tendency of the TMT members to see each other as part of the same social and task entity. They argue that when there are more hierarchical distinctions in the TMT, more inner and outer circles emerge hampering the peer salience in the team. On the other hand, when hierarchical distinctions are minimal, members will think of each other as part of the same social and task entity and view each other as fellow group members. As their actions will bear more significance for each other, TMT social processes and outcomes will be affected positively.

In addition to the social unity perspective, Finkelstein (1992) associated title rankings across the TMT with the structural power of the members where CEOs have the highest structural power. The structural power allows the related TMT members to control the behaviors of the other members to some extent. Besides the CEO, the structural power among the other TMT members can vary. Finkelstein (1992) suggested that when a manager's title rank and structural power increases, his/her control over their colleagues' actions also rises, as they achieve a better dominance over uncertainty. This control can be achieved in different ways such as access to more confidential information. The structural power of the TMT members thus their significance in the TMT linked to their hierarchical grades can change due to various strategic and environmental contingencies (Ma et al., 2021). As an example, Nath and Mahajan (2011) analyzed the power levels of Chief Marketing Officers by looking at their title designations compared to the other members in the TMT depending on different factors such as firm innovation and industry stability.

The studies on TMT hierarchical structures mostly focused on how various forms of TMT hierarchical setups influenced different firm outcomes. Walsh (1988) examined whether higher or lower ranked TMT members are more likely to leave following a merger or acquisition. Similarly, Cannella and Hambrick (1993) explored how executive turnover is affected after a merger or acquisition depending on the hierarchical rank changes across executives. Keck (1997) analyzed

the relationship between the hierarchical structure of the TMT and firm performance in stable and unstable contexts. She found that reduced hierarchical distinction in the TMT is more beneficial for firm performance in more turbulent environments. This study also stressed the need of matching TMT hierarchical structures to the environmental dynamics to generate superior performance. Patel and Cooper (2014) focused on family firms and investigated how structural power balance among family and non-family members in the TMT impacts firm performance. They benefited from the hierarchical structure of the TMT through title ranks as one of the proxies to measure structural power balance. Moreover, Dunn (2004) adapted a structural power lens to model how the concentration of structural power based on the relevant title ranks influences the probability of engaging in fraudulent financial reporting.

In addition to these studies, several papers utilized the hierarchical setups of the TMTs as a moderator which influences the relationship among various TMT characteristics and firm performance. Hambrick et al. (2015) explored how TMT vertical interdependence affected the relationship between TMT tenure heterogeneity and TMT turnover as well as firm performance. They found out that when hierarchical distinctions are minimal in the TMT (greater vertical interdependence), the association between TMT tenure heterogeneity and TMT turnover, firm performance is strengthened. Furthermore, Ridge et al. (2015) examined how the power difference between the CEO and other TMT members in terms of title grades moderated the relationship between TMT pay disparity and firm performance. They discovered that when the hierarchical distinctions between the CEO and TMT members increase, the effect of TMT pay disparity on firm performance is attenuated.

Despite the valuable insights the above-mentioned studies provide, the extant knowledge about TMT hierarchical setups is limited as we lack systematic, large-scale evidence on the nature

and determinants of TMT hierarchical structures. Rajan and Wulf (2006) explored how firm hierarchies have changed and they note that they became flatter. However, they focused only on the hierarchical levels between the CEO and the divisional executives. Also, Nath and Mahajan (2011) focused on the determinants of the power of specific TMT roles such as Chief Marketing Officers through assessing their hierarchical rank with respect to the CEO and other TMT members. However, these studies take the individual roles into consideration while studying executive power based on TMT hierarchical structures. Therefore, I see a greater need to conceptualize TMTs from a broader perspective instead of focusing only on individual or sub-unit of positions while studying their hierarchical setups. Given all these backdrops, I opt for conducting a larger scale empirical analysis into the nature and characteristics of TMT hierarchical setups and into the factors that influence why TMTs are hierarchically structured the way they are.

4.3 | METHODOLOGY

Linked to the limited research on TMT hierarchical structures, I opted for an exploratory approach where I examine a comprehensive set of CEO, strategic leadership, firm, environment, and performance related factors that may affect how TMTs are structured hierarchically. I chose this abductive, data-exploring approach because, to the best of my knowledge, no other study has explored the antecedents of TMT hierarchical setups at different levels. Different from the deductive perspectives, this fact-based exploratory approach does not present any hypotheses. Abductive studies draw inferences from the data to increase our understanding and aims to provide initial thoughts and mechanisms to explain the inherent patterns (Robinson, 2019). I preferred this approach because it allows me to include different a wider set of possible determinants and does not limit me to one level of analysis. Moreover, exploratory studies are also becoming common in strategic leadership and corporate governance research to open new avenues into relatively

underexplored issues. For example, Menz and Barnbeck (2017) used an exploratory approach to analyze the antecedents and consequences of the size of the corporate strategy function. Moreover, Guldiken, Mallon, Fainshmidt, Judge and Clark (2019) looked at how strategic leaders affect female director appointments beyond the tokenistic first one through an exploratory approach. Furthermore, Kunish et al. (2020) explored the emergence, nature, and determinants of Chief Digital Officers in TMTs with an exploratory method. The utilization of an exploratory approach in those studies is justified also by the arguments of Bettis, Gambardella, Helfat and Mitchell (2014) who mention that exploratory methods are useful when existing theories provide a useful framework for developing baseline arguments but are not enough for generating robust hypotheses.

Although fact-based research is not based on hypotheses, I considered it necessary not only to describe the data and the measurement of the variables but also to explain the reasons for their inclusion, as well as the rationale for their connection with TMT hierarchical structures (Menz & Barnbeck, 2017; Kunish, et al., 2020). Accordingly, this study is indirectly guided by the contingency logic which states that contextual factors influence different firm choices, strategies, and actions (Burns & Stalker, 1961). To determine the variables that affected TMT hierarchical setups, I reviewed prior literature on TMT hierarchies and on other TMT role structures (Keck, 1997; Cannella & Hambrick, 1993; Menz & Scheef, 2014; Hambrick & Cannella, 2004; Nath & Mahajan, 2008 and 2011; Roh, Krause, & Swink, 2016; Hambrick et al., 2015; Menz & Barnbeck, 2017; Kunish, et al., 2020). After determining the variables, I constructed the empirical part of the paper based on two sections: first, the descriptive section of characteristics of different TMT hierarchical structures, and second, the analysis of the determinants of TMT hierarchical setups.

4.3.1 | Sample and Data

The sample selection started by identifying the firms in the Standard & Poor 500 Index as of 2018. Then, I identified the 2-digit SIC code for each company and included in the sample any industry that had more than 15 firms like the approach of Hambrick and Cannella (2004). I obtained data on the TMT hierarchical structures from the 10-Ks and proxy statements of firms like the other TMT studies (Hambrick & Cannella, 2004; Nath & Mahajan, 2008; Marcel, 2009; Menz & Scheef, 2014). 10-K and proxy statements of the firms include the names and the titles of all the TMT members for the respective years. I retrieved data for firm financials from Compustat and I benefited from BoardEx to gather the information about the boards of the concerned firms.

I collected the above data starting from 2007 until 2018 as there was a much higher coverage in the SEC database for TMT information after 2006. Also, I excluded the firms where there was missing data especially on TMT information and financials during this period. After that my final sample resulted in 260 firms within a 12-year period, generating 3120 balanced observations. The industries represented in the sample include Oil and Gas Extraction (SIC 13), Food and Kindred Products (SIC 20), Chemical and Allied Products (SIC 28), Industrial Machinery and Equipment (SIC 35), Electronic and Other Electric Equipment (SIC 36), Transportation Equipment (SIC 37), Instrument and Related Products (SIC 38), Electric, Gas and Sanitary Services (SIC 49), Depository Institutions (SIC 60), Security and Commodity Brokers (SIC 62), Insurance Carriers (SIC 63), Holding and Other Investment Offices (SIC 67) and Business Services (SIC 73).

The TMTs have been conceptualized in many ways within the upper echelons studies (Carpenter, Geletkanycz, & Sanders, 2004). Therefore, I used the most consistent approach like other TMT functional executive studies such as Menz and Scheef (2014), Abt and Knyphausen

(2017). In my study, TMTs include all the executives reported in the 10-Ks and proxy statements. Within my sampled firms, TMTs consist of 8 people on average and this figure stays constant over the observed years.

4.3.2 | Measures

4.3.2.1 | Dependent Variable- TMT Hierarchical Stratification

Prior studies applied different approaches to operationalize the hierarchical structures of TMTs. Hambrick et al. (2015) used two different indicators as the presence of a COO and the count of total title grades in the TMT. Similarly, Nath and Mahajan (2011) benefited from the number of total title grades and the number of titles above the focal title grade to determine the power level of Chief Marketing Officers. Although these methods provide interesting insights, they do not consider the relative distribution and size of each hierarchical rank within the TMT.

Considering the above points and to develop a more comprehensive measure for TMT hierarchical setups, I benefited from the approach of Keck (1997). While defining TMT structures, Keck (1997) used the "stratification" concept which reflects the differences in hierarchical ranks among the TMT members. Key aspects of stratification in TMTs are the number of hierarchical levels and the relative size of each level (Keck, 1997; Freeman & Kronenfeld, 1973). The distribution of TMT members among hierarchical ranks is an effective way to conceptualize stratification and this has been studied in various ways such as to analyze power issues for TMTs (Finkelstein, 1992). According to Pfeffer and Moore (1980) and Keck (1997), TMT hierarchical stratification depending on the relative weight of each hierarchical rank in the TMT is measured as below.

S= (1# in lowest rank + 2*# in next lower rank + ……. + I*# in highest rank) / total # of executives in the team*

In the above equation S is the stratification or hierarchical ranking index and I is the number of ranks. That measure provides the weighted average of the hierarchical levels by considering all individual TMT members. TMTs heavy in top titles have high values of the index (Keck, 1997). While developing the "stratification" measure as the hierarchical titular distribution in the TMT, I first went through all the titles in my database and detected the relevant title grades for all the executives in the TMTs of the sampled firms. Among my observations, the number of total title grades in the TMTs ranged from 1 to 5 excluding the CEO. In 50% of all the observations, TMTs were composed of 2 title grades such as Executive Vice President and Senior Vice President. In 31% of the observations, there were 3 title grades and 15% of the observations included 1 title grade such as all Executive Vice Presidents, showing flat TMTs.

After determining all the title grades, I constructed the stratification index based on the above formula by manually counting all the title grades and determining their relative size in the focal TMT across all years of observation. As an example, at year X, if a TMT is composed of 6 members with 2 Executive Vice Presidents, 2 Senior Vice Presidents and 2 Vice Presidents, the stratification index is 2 calculated as 2*3 (for Executive Vice Presidents) plus 2*2 (for Senior Vice Presidents plus 2*1 (for Vice Presidents) divided by 6 (total number of TMT members). Let's also assume that 2 Vice Presidents are promoted to Senior Vice Presidents and 1 Senior Vice President to Executive Vice President in the following year. In this case, stratification index becomes 1.5 calculated by 3*2 (Executive Vice Presidents) plus 3*1 (Senior Vice Presidents) divided by 6 (total number of TMT members. Between those years, total number of titles grades decreases from 3 to 2, resulting in lower stratification thus lower hierarchical distinctions in the TMT. Also, if all the members are promoted to Executive Vice President the following year, the index would become 1, representing the flattest hierarchy. Moreover, I would like to note that if there is a COO in the

TMT, I coded it as an additional hierarchical rank like Hambrick et al. (2015). Furthermore, CEO position is excluded in the above calculations.

4.3.2.2 | Explanatory Variables- Determinants of TMT Hierarchical Structures

In contemporary firms, many factors related to firms and their stakeholders affect decisions regarding the hierarchical setup of TMTs. Therefore, I explored a set of factors that may influence how TMTs are structured hierarchically. While there are many possible determinants of TMT hierarchical structures, I considered CEO, strategic leadership, firm, environment, and performance related antecedents. To identify the variables that may predict the hierarchical setup of TMTs, I relied on a structured approach inspired by prior research.

The selection of the determinants was guided by prior studies around TMT hierarchical structures (Cannella & Hambrick, 1993; Keck, 1997; Patel & Cooper, 2014; Hambrick et al., 2015, Nath & Mahajan, 2011) and by research on other dimensions of TMT structural configurations such as role structures (Hambrick & Cannella, 2004; Menz & Scheef, 2014; Guadalupe et al., 2014; Marcel, 2009; Nath & Mahajan, 2008; Menz & Barnbeck, 2017; Kunish et al., 2020). Although fact-based inquiry is not based on formal hypotheses, my selection of variables was implicitly directed by theory-based considerations such as contingency or capability perspectives, since the general literature on TMT structures employs these lenses (Menz, 2012).

In line with my approach, I found it essential to include both more general firm, performance, and environments related factors as well as more specific factors linked to CEO and TMT characteristics in my analyses. Firm, performance, strategic leadership, and environment related factors were identified as critical determinants of TMT role structures (Hambrick & Cannella, 2004; Menz & Scheef, 2014; Nath & Mahajan, 2008; Kunish et al., 2020). Additionally, CEO is the leader of the TMT and his/her characteristics have a huge influence on how TMTs are

structured (Ma & Seidl, 2018). Therefore, I decided to follow prior research in using CEO characteristics as proxies for TMT hierarchical setups (Radek & Menz, 2020).

4.3.2.2.1 | CEO Related Factors

I explored the extent to which how CEO characteristics matter for the hierarchical structure of TMTs. CEO is the leader of the TMT and scholars have shown that they make important decisions about the composition and structure of the TMTs (Ma, Seidl, & Guerard, 2015; Ma & Seidl, 2018). Therefore, I examine several CEO characteristics that may affect their decisions about the hierarchical structures of their TMTs.

CEO Tenure: Miller (1991) states that when the tenures of the CEOs increase, their power also increases. However, Hambrick, Gelatkanycz and Frederickson (1993) mention that longer tenure makes CEOs consider less strategic changes. Barker and Mueller (2002) support them by noting that CEOs like to stay in familiar patterns as their tenure increases. Also, Simsek (2007) suggests that longer-tenured CEOs strengthen their relationship with some of the TMT members. Based on these arguments, CEOs having more positional tenure may grant more incentives and privileges to some TMT members compared to others generating more hierarchical distinctions in the TMT. On the other hand, linked to the increased information-processing requirements connected with the tenure (Finkelstein, 1992), longer tenured CEOs can also limit the hierarchical designations within the TMT to create more harmony in the team to deal with these extra information-processing demands. I define CEO tenure as the natural logarithm of the time for the incumbent in the CEO position after the appointment (Menz & Scheef, 2014).

Outsider CEO: According to Finkelstein and Hambrick (1995) and Hambrick et al. (1993), outsider CEOs are characterized as more open minded, less committed to the status quo and better able to see alternative strategies and actions. They are also expected to execute more major changes

as they are less socially connected to other TMT members. On the other hand, outsider CEOs lack critical firm and industry-specific skills. Also, some members of the executive team can form a negative attitude towards the outsider CEO and even resist the changes initiated by them (Shen & Cannella, 2002). Karaevli (2007) argues that the significance of an experienced and supportive TMT is even higher until the new CEO learns about the internal and external dynamics of the firm. Looking at these advantages and disadvantages, outsider CEOs can affect the hierarchical structure of the TMT in both directions. First, as they are not socially connected to any other TMT member and less committed to the status quo, they may aim for creating a more socially unified and salient TMT by reducing the hierarchical distinctions in the team. However, as they lack knowledge about the dynamics of the firm and to eliminate the negative sentiment of some TMT members who can be crucial to orient the new CEO to the firm, they can opt for granting more power to these members by increasing their hierarchical ranks. I considered CEOs as outsiders if they joined the firm within two years before becoming the CEO (Hambrick & Cannella, 2004).

CEO Duality: CEO duality refers to the practice where a single individual serves as both CEO and board chair (Dalton, Hill, Certo, & Dalton, 2007). Scholars mention that CEO duality gives more power to the CEO and creates more task demands as well as information-processing needs (Finkelstein, 1992; Finkelstein, Hambrick, & Cannella, 2009; Sanders & Carpenter, 1998). Based on these arguments, CEO duality can be connected to the hierarchical setup of the TMTs in different ways. First, CEOs who also act as the head of the board may prefer a TMT with lower hierarchical distinctions so that there can be more social unity in the team that may support the CEO better in terms of information-processing. On the other hand, dual CEOs can add new members to the TMT such as the COO to receive more assistance for the extra task demands which

can create additional hierarchical layers in the TMT. I measure CEO duality as a dummy variable coded as 1 if the CEO is the head of the board and 0 otherwise (Zhang & Rajagopalan, 2003).

CEO Succession: Evidence shows that when there is CEO succession, there will be changes in the TMT (Shen & Cannella, 2002; Wagner, Pfeffer, & O'Reilly; 1984). Accordingly, CEO succession may affect the hierarchical setup of the TMTs in various ways. Hambrick and Cannella (2004) mention that COO is the heir-apparent to the CEO and when the COO takes over the CEO position, the COO role can be eliminated thus reducing the hierarchical designations. On the other hand, Shen and Cannella (2002) note that when a new CEO is appointed, they may decide to add certain roles which can also introduce new hierarchical levels such as the introduction of a COO position. While there could be multiple scenarios between CEO succession and TMT hierarchical structures, the baseline argument is that CEO change affects TMT hierarchical setups. I measure CEO succession as a dummy variable coded as 1 if the CEO changed at t-1 and 0 otherwise.

4.3.2.2.2 | Strategic Leadership Related Factors

Prior research suggests that a firm's strategic leadership can affect the role structure of the TMT (Hambrick & Cannella, 2004; Menz & Scheef, 2014). Therefore, I thought that similar factors can also have influence on the TMT hierarchical setups and explored several characteristics of TMTs and boards in relation to the hierarchical structures of TMTs.

First, I examined both *TMT and board sizes* related to TMT hierarchical setups. Haleblian and Finkelstein (1993) argue that larger teams have greater information-processing and decision-making capabilities than small teams. However, they are characterized by lower cohesion and slower action taking. This lower cohesion and socialization linked to the higher sizes of TMTs and boards could be reflected in the TMT through more hierarchical distinctions. Conversely, firms could wish to avoid the less cohesiveness in the TMTs and boards generated by the higher sizes

through reducing the hierarchical distinctions in the TMT to promote more social unity. TMT and board sizes are measured by taking the natural logarithm of the number of members in the TMT and boards at t-1 (Bommaraju, Ahearne, Krause, & Tirunillai, 2019; Hambrick et al., 2015).

Second, as the TMT hierarchical structure is concerned with the power distribution, I was particularly interested with the *tenure diversities of the TMT and board of directors*. As discussed for CEO tenure (Miller, 1991), when the tenure diversity of the TMT increases, members with higher tenure can assume more power and obtain a higher title grade compared to the more junior members in the TMT, thus increasing the hierarchical distinctions. Similarly, in the cases of more tenure diversity for board members, more senior board members can grant more privileges to other TMT members in terms of title grades thus creating more hierarchical designations within the TMT. On the other hand, according to Wiersema and Bantel (1992) and Ji, Peng, Sun and Xu (2020), tenure heterogeneity on the TMT and boards creates more diversity and more innovative decision-making processes. Therefore, TMTs can be structured flatter hierarchically to capitalize on this diversity and innovation through creating more social unity and peer salience. I measured TMT and board tenure heterogeneity by taking the standard deviation of the tenures of TMT and board members (Marcel, 2009).

4.3.2.2.3 | Firm Related Factors

I explored several firm characteristics that are likely to determine how TMTs are structured hierarchically. Like prior research, I examined more firm strategic characteristics like diversification and more structural characteristics such as size and divisionalization (Menz & Barnbeck, 2017).

Firm Size: Larger firms face more complexity in terms of their stakeholders, environment and they are characterized by increased information-processing demands (Henderson &

Frederickson, 1996; Carpenter & Sanders, 1998). To cope with the complexity and demands from their stakeholders, larger firms design more sophisticated coordination mechanisms (Mintzberg, 1979). As a result, some roles and functions in the TMT could gain more importance to manage this complexity and the mechanisms to deal with it. Therefore, it is possible that they receive higher title grades thus creating more hierarchical distinctions. On the other hand, firms can think that they need a more unified and behaviorally integrated TMT that can take more effective decisions to manage this complexity. Accordingly, they can reduce the hierarchical distinctions within the TMT so that the members see each other as peers and their actions impact each other more. I measured firm size as the logarithm of the number of employees (Guadalupe et al., 2014).

Diversification: The extent of a firm's business portfolio diversification increases the complexity of different tasks related to business portfolio configuration and the coordination of these different businesses to realize the synergies among them (Menz & Scheef, 2014; Geringer, Tallman, & Olsen, 2000). Linked to this increased complexity and coordination needs, firms can appoint various positions in their TMTs such as Chief Strategy Officers (Menz & Scheef, 2014) or Chief Operating Officers (Hambrick & Cannella, 2004). The presence of these kinds of roles, especially, COOs may increase the number of hierarchical layers within the TMT. On the other hand, Nath and Mahajan (2008) note that complexity for the firms may decrease as they become more diversified. They also argue that heads of business units become powerful and independent entities in more diversified firms. Therefore, firms may target to retain the control over them by balancing their power levels leading to rather hierarchically flat TMTs (Doz & Prahalad, 1991). I measured firm diversification through the Palepu entropy index (1985).

Divisionalization: Firms can be structured more around functions or divisions which may affect the hierarchical setup of its TMT. Hambrick et al. (2015) argue that more functionally

structured firms enable better collaboration among its TMT members where their actions affect each other more. Based on that, we can expect that firms can also aim to minimize the hierarchical distinctions in its TMT to make this collaboration and cooperation among the members even more sustainable. Menz (2012) mentions that divisions refer to the profit centers of firms and executives managing these divisions have a more direct impact on firm performance. In the case of more divisionalization, TMT members responsible for these units could be granted higher title grades compared to the functional executives connected to their place on the value chain of the firm, thus making the TMT more hierarchical. I calculated a firm's divisionalization as the fraction of the divisional TMT members with respect to the overall TMT members at t-1, based on the titles of the TMT members published in the 10-Ks and proxy statements (Guadalupe et al., 2014; Nath & Mahajan, 2011; Menz & Barnbeck, 2017).

4.3.2.2.4 | Environment Related Factors

Mintzberg (1973) states that TMTs represent the strategic apex of firms and are affected directly from the opportunities and challenges coming from the environment where the firm is situated. Therefore, I explored several aspects of firms' environments which may affect their TMT hierarchical structures. Different characteristics of the firm environment can affect firm behavior and structural changes linked to the higher pressures leading to the diffusion of certain behaviors (Dess & Beard, 1982).

Industry Growth: Firms in high growth industries often face more task complexity, abundance of resources and sudden swings in demands (Dess & Beard, 1984; Prahalad & Hamel, 1994). Hambrick and Cannella (2004) mention that CEOs might appoint a second in command, COO, to deal with those extra task demands which then introduces another hierarchical layer in the TMT. However, Keck (1997) states that problem solving becomes more crucial in more

growing and turbulent contexts. Accordingly, reducing the hierarchical distinctions in the TMT might create more social unity and peer salience contributing to better problem solving (Hambrick et al., 2015) that can support them to deal with the increased turbulance. The industry growth is measured as the total revenue growth for the respective 2-digit SIC code between t-2 and t-1 (Kunish et al., 2020). I would like to note that I considered the 2-digit SIC codes to define the industries like the approach of Wiedeck and Engelen (2018).

Industry Dynamism: Firms operating in dynamic industries face more uncertainty and pressures from the environment that creates additional information processing needs (Henderson & Fredrikson, 1996). When the level of uncertainty is high, firms may delegate additional power to the TMT members who have more influence to manage that uncertainty thus introducing more hierarchical distinctions to the TMT. On the other hand, TMTs may need to plan and act fast in harmony to deal with the information-processing requirement introduced by the dynamic environments. Therefore, reduced hierarchical distinctions in the TMT might increase the social unity supporting them with the challenges around information-processing and decision-making. I measured industry dynamism as the absolute value of the difference in the industry growth rate between t-2 to t-1 and t-1 to t (Hambrick & Cannella, 2004).

Industry Concentration: As the industry concentration increases, industries are dominated by larger and fewer firms where industries with lower concentration have a relatively higher number of competitors and are more heterogenous (Porter, 1980). In more competitive industries, firms might need more unity and collaboration among the TMT to manage the threats coming the competition. Therefore, they can choose a TMT with lower hierarchical designations so that the members see each other as peers and work accordingly (Hambrick et al., 2015). On the other hand, some TMT members such as the Chief Marketing Officer can be granted more power in terms of

hierarchical title ranks since they have a better ability to manage the information-processing needs arising from the competitive environment (Nath & Mahajan, 2011), which then increases the hierarchical distance among the TMT members. I measured industry concentration by looking at the Herfindahl-Hirschmann Index through considering the revenue share of each firm within the industry based on the 2-digit SIC codes (Nath & Mahajan, 2008). After that I took the inverse of those values so that increasing values represent more competitive industries.

4.3.2.2.5 | Performance Related Factors

Lastly, I considered firm performance as a potential factor that may influence TMT hierarchical configurations. Although some studies investigated how different TMT hierarchical structures affected firm performance (Keck, 1997; Patel & Cooper, 2014), I thought that this relationship can be reversed based on some considerations. First, poorly performing firms could reduce the hierarchical distinctions in the TMT to promote more unity and social cohesion among the members that can lead to more effective decision-making mechanisms and improved performance in return (Hambrick et al., 2015). On the other hand, firms can increase the hierarchical distinction in the TMT and provide more power to some roles that are more crucial to recover performance such as divisional executives who are responsible for controlling the revenue streams (Menz, 2012). At the same time, well-performing firms could have the resources to promote the lower ranked TMT members and level the title distribution to keep people more motivated. On the other hand, they may choose the reward the TMT members whom they perceive to have more impact on the strong performance. They may be given higher rewards and title levels compared to the other members thus creating more hierarchical distinctions in the TMT.

I measured firm performance based on the methodology of Auh and Menguc (2005). They classify performance among efficient performance represented as return on assets, return on

equity, etc. and effective performance operationalized as sales growth or market shares. In line with that approach, I used *return on assets (ROA)* in t-1 to represent efficient performance. For effective performance, I utilized *sales growth* from t-2 to t-1.

4.4 | RESULTS

4.4.1 | Descriptive Results

To better explore the development across TMT hierarchical setups, I first analyze how average TMT hierarchical stratification alters in connection with TMT sizes within the years of observation. Figure 1 shows that while TMT sizes are stable between 2007 and 2018 including around 7 people excluding the CEO, TMT hierarchical stratification drops significantly by 0.17 points from 1.66 to 1.49. These results show us that TMTs became less hierarchically disparate with more equal distribution among title grades. When the stratification value is between 1 and 2, it means that there are 2 title grades in the TMT excluding the CEO such as Executive Vice Presidents and Senior Vice Presidents or Senior Vice Presidents and Vice Presidents. The value of 1.49 in 2018 is very close to 1.5 meaning that TMTs opted for a more equal distribution among the title grades. In the previous years, the number of higher titles grades was slightly more compared to the one of lower grades.

[Insert Figure 1 around here]

I had mentioned that there were 13 industries represented in the sample. As to make a more streamlined analysis, I grouped these 13 industries under 5 larger groups namely Oil & Gas, Chemical, Manufacturing, Technology and Financial Services. Figure 2 displays the development for TMT hierarchical stratification across these industry groups between 2007 and 2018. According to this figure, all industry groups show decreased TMT hierarchical stratification thus

becoming hierarchically flatter among those years. Manufacturing firms have the highest decrease by 0.28 points followed by technology firms by 0.23 points.

[Insert Figure 2 around here]

Figure 3 demonstrates TMT hierarchical stratification against firm size. It illustrates that there is substantial variance in TMT hierarchical stratification across firms, ranging from 1 to 3.24, indicating a positive correlation between TMT stratification and firm size. The geometric mean for TMT stratification is 1.52 and median TMT stratification value is 1.50.

[Insert Figure 3 around here]

Table 1 displays the differences in TMT hierarchical stratification across industry groups. Looking into this table, I can say that there are relatively small differences within different industry groups where oil & gas (average of 1.68) and manufacturing industries (average of 1.67) tend to have more hierarchically stratified TMTs compared to the others. On the other hand, technology (average of 1.47) and financial services (average of 1.50) industries are dominated by firms with relatively hierarchically flatter TMTs.

[Insert Table 1 around here]

Table 2 shows the differences in TMT hierarchical stratification across different TMT sizes, firm sizes and divisionalization levels. The average TMT stratification increases considerably with the size of the TMT where small TMTs are relatively flat in their hierarchies (1.44 average) and the proportion of higher title grades increase in larger sized TMTs (1.67 average). The results for firm size are identical to the ones for TMT sizes where smaller firms have less hierarchically stratified TMTs (1.45 average) and larger firms are characterized by more hierarchically stratified TMTs (1.63 average). The variance for TMT hierarchical stratification across different levels of TMT divisionalization is considerable, ranging from 1.43 on average for

firms employing relatively more functional executives and 1.72 on average concerning firms having more general managers in their TMTs.

[Insert Table 2 around here]

In Table 3, I distinguish between firms operating in different industries with various growth and concentration levels and among firms having different levels of sales growth. Different from the analysis presented above focusing on industry groups, this table considers industries at the original 2-digit SIC levels. Firms functioning in more growth industries are characterized by slightly lower levels of TMT hierarchical stratification (1.55 average) compared to the ones that operate in relatively low growth industries (1.58 average). For industry concentration, firms present in industries with more modest levels of competition have the most hierarchically stratified TMTs (1.60 average). On the other hand, there are not many differences concerning TMT hierarchical stratification among firms operating in industries with lower and higher levels of competition. Furthermore, firms characterized by more medium levels of sales growth have more hierarchically stratified TMTs (1.57 average) compared to firms achieving lower levels of sales growth (1.52 average). However, there are not many differences concerning TMT hierarchical stratification among firms with medium and higher levels of sales growth.

[Insert Table 3 around here]

Table 4 shows the descriptive statistics and correlations for all variables. Since the correlations are below 0.5, multicollinearity was not an issue in my analysis. Also, the variance inflation factors (VIFs) did not exceed 1.57, verifying the lack of major multicollinearity.

[Insert Table 4 around here]

4.4.2 | Determinants of TMT Hierarchical Structures

To explore the antecedents of TMT hierarchical structures, I benefited from tobit regression. The main reason why I used to tobit was that my dependent variable was censored at the value of 1 as the lowest measure. There was a considerable amount of value 1 as the measure of TMT hierarchical stratification in my dataset and the rest of the values showed a rather normal distribution. Therefore, I utilized tobit model by clustering the errors at the firm level to estimate the linear relationship between TMT hierarchical stratification and other variables. Moreover, I lagged all the independent variables to avoid reverse causality and included year dummies to demonstrate the related effects.

Table 5 presents the results of the analysis of the determinants of TMT hierarchical setups. model 1 includes only the CEO level factors. Strategic leadership related factors are added in model 2, firm related in model 3, environment related in model 4 and performance related in model 5. In discussing the results, I refer to Model 5 where all the variables are included. According to the F-statistic values, all these models turned out to be significant ($p<0.01$).

[Insert Table 5 around here]

First, two CEO related factors are significant related to TMT hierarchical stratification. When a firm has an outsider CEO, its TMT hierarchical stratification decreases ($ß=-0.09$, $p<0.05$). Additionally, when a CEO acts as the chair of the board of directors, s/he opts for having a more hierarchically stratified TMT ($ß=0.10$, $p<0.01$). Moreover, CEO tenure has a negative effect on TMT hierarchical stratification across Models 1 and 2 but that effect diminishes later. These results suggest that outsider CEOs prefer to create socially unified and integrated TMTs by minimizing the hierarchical distinctions with the aim of obtaining stronger support from their TMTs to accelerate their orientation into the organization. Also, in the cases of duality, CEOs may prefer to provide to grant additional structural power to some of the TMT members or create a COO position

to cope with the demands of acting as both CEO and head of board of directors at the same time, which then increases the hierarchical stratification within the TMT.

Second, only one strategic leadership related factor is related to the level of TMT hierarchical stratification. TMT size has a positive effect on TMT hierarchical stratification (ß=0.01, $p<0.10$), whereas board size, TMT and board tenure heterogeneity do not affect it. These findings suggest that as TMTs grow, some members may be granted higher title grades compared to the others to cope with the increasing task demands more effectively.

Third, two firm level factors determine TMT hierarchical stratification. The firm size (ß=0.04, $p<0.01$) and divisionalization (ß=0.51, $p<0.01$) are positively related to TMT hierarchical stratification whereas diversification does not affect it. These results show that when the size of a firm increases, its complexity also increases thus creating more complexity and hierarchical layers also on its TMT. Additionally, when the proportion of general managers increases compared to functional managers in the TMT, the hierarchical stratification also increases as those general managers may have been granted higher title grades compared to the functional managers since they have a more direct influence on firm performance linked to their profit center responsibility.

Fourth, two of the three industry related factors are strongly associated with TMT hierarchical stratification. Industry growth is negatively related to TMT hierarchical stratification (ß=-0.29, $p<0.01$) whereas industry concentration has a positive effect (ß=0.00, $p<0.05$). These results show that firms aim to make their TMTs more salient and unified by reducing the hierarchical designations to better manage the uncertainty and information-processing requirements coming from higher industry growth. On the other hand, firms may choose to increase the title level of some of the TMT members such as Chief Marketing Officers (Nath &

Mahajan, 2011) whom they think can better cope with the uncertainty arising from the increased competition within the industry, thus creating higher stratification.

Lastly, with respect to the performance related determinants, sales growth has a slight positive effect (ß=0.01, $p<0.10$) on TMT hierarchical stratification but return on asset does not have any significant influence. When a firm grows in revenue, some TMT members such as the divisional managers can be elevated in titles to reward their impact on the growth and to better manage the complexity for generating more sustainable performance going forward.

Table 6 provides a summary of the empirical findings and effect sizes (based on Model 5 in Table 5). The table indicates the average effect of a 1-unit change in each of the predictor variables on TMT hierarchical stratification. For example, a 1-unit increase in firm size is associated with 0.06 points increase in TMT hierarchical stratification. Similarly, if a firm has an outsider CEO, its TMT hierarchical stratification decreases by 0.05 points.

[Insert Table 6 around here]

4.5 | DISCUSSION AND CONCLUSIONS

Motivated by a lack of research on the characteristics and determinants of TMT hierarchical setups, I studied what characterizes TMTs with different hierarchical structures and which factors drive different hierarchical configurations in TMTs. While this exploratory analysis of the characteristics and antecedents of TMT hierarchical structures allows me to shed light on a relatively untapped dimension of TMT structures, as discussed in the following, the results call for future theoretical studies to help us improve our understanding and knowledge of the various facets of TMT hierarchical setups.

4.5.1 | Explanation of the Empirical Findings

I motivated this study's exploratory approach with various possible theoretical perspectives, none of which can fully explain the TMT hierarchical setups. In particular, I view the contingency perspective useful to explain the effect of more firm level determinants, upper echelons theory for the effect of CEO and strategic leadership related antecedents, structural power and behavioral integration insights for rather environmental factors and executive reward arguments concerning performance related antecedents of TMT hierarchical structures. However, all these perspectives are particularly useful and complementary while they provide a more nuanced explanation of different TMT hierarchical reconfigurations.

Contingency perspective: Overall, this study's findings suggest that the TMT hierarchical stratification is related to firm size, divisionalization, industry growth and concentration. Contingency theory states that firms' structural choices depend on the organizations' internal and external contexts (Burns & Stalker, 1961), which can offer a possible explanation into these findings. Specifically, my study introduces insights into how internal and external contingencies affect the level of hierarchical stratification across TMTs. Internal factors such as increased size and divisionalization could create more task demands and organizational complexity leading to more complex hierarchical arrangements within the TMT. Also, external factors at the industry level such as growth and concentration may play different roles on the extent of TMT hierarchical stratification in connection with different motivations.

Upper echelons perspective: My findings also indicate that several CEO characteristics such as being an outsider, assuming an additional role as the head of board of directors and TMT characteristics such as its size play an important role in determining the hierarchical setups of TMTs. Hambrick and Mason (1984) and Hambrick (2007) state that firms' strategic choices are

highly influenced by the values and cognitive biases of powerful actors which are shaped by their observable characteristics such as education, work experience, etc. Based on these viewpoints, CEOs' experiences outside of their current organization as well as their additional responsibilities as the chair of the board could influence TMT hierarchical setups to a large extent. Additionally, Hambrick (2007) had called for additional research into the structure dimension of TMTs. Accordingly, TMT size as a structural feature of TMTs depending on the classification of Radek and Menz (2020) provides additional explanations into the hierarchical structure of TMTs, next to the CEO characteristics.

Structural power perspective: In the contingency section above, I had discussed the impact of industry level factors such as concentration on TMT hierarchical setups. The decreased concentration and increased levels of competition in the industry also increases the uncertainty for firms. According to Finkelstein (1992), TMT members who are in a better position to manage the uncertainty firms face could acquire more structural power through higher title grades compared to the others. Therefore, several members in the TMT, such as Chief Marketing Officer (Nath & Mahajan, 2011), who can more effectively manage the competitive environment could increase their relative structural power, leading to higher levels of stratification. My findings suggest that several internal and external factors may influence the level of uncertainty firms face, which then creates different levels of structural power in the TMT with the adjustment of title grades.

Behavioral integration perspective: Apart from the findings concerning industry concentration, I had discovered that industry growth affects TMT hierarchical stratification negatively where TMTs become flatter hierarchically in more growth industries. Hambrick et al. (2015) mention that when hierarchical distinctions are minimal in the TMT, members see each other as part of the same social entity, and they become more salient towards each other, which

eventually translates into better decision-making processes. So, firms can also choose to reduce the hierarchical distinctions in the TMT to create better behavioral integration which can better support them to tackle challenges around information processing or uncertainty generated by excessive growth in the industry. Accordingly, my findings display that firms can also aim to increase the social unity and behavioral integration in the TMT to deal with the external challenges coming from their industries, through minimizing the hierarchical distinctions.

Executive reward perspective: Finally, my study revealed that sales growth positively impacts the level of hierarchical stratification in TMTs. When firms perform well, it is natural that they would like to reward their employees for the strong performance outcomes. In connection with the arguments around pay for performance (for a detailed review please refer to Devers, Cannella, Reilly, & Yoder, 2007), executives that have a more direct impact on firm performance can be granted higher title grades compared to the others, which then translates into higher compensation package and potentially more motivation for them. Therefore, one plausible argument around different levels of TMT hierarchical stratification becomes the firm motivations to reward their executives who have more influence on the strong performance, by elevating them on the hierarchy and providing more benefits.

4.5.2 | Contributions

There has been a growing interest in TMT structures recently; however, with limited attention to TMT hierarchical structures. Therefore, in this study I focused on TMT hierarchical setups by analyzing their characteristics and determinants. This study's contribution is mainly empirical as it increases our understanding of the different characteristics of TMT hierarchical setups and the factors that influence TMT hierarchical structures.

My study contributes to upper echelons theory and more specifically, to the literature on TMT hierarchical structures, which has focused on the outcomes of TMT hierarchical setups in the past (Cannella & Hambrick, 1993; Haleblian & Finkelstein, 1993; Keck, 1997; Patel & Cooper, 2014). I complement this research by increasing our knowledge and understanding of how TMTs with different hierarchical structures are designed and by displaying what drives TMT hierarchical stratification. As the first study to analyze the antecedents of TMT hierarchical structural configurations at different levels (CEO, strategic leadership, firm, environment, performance), my study establishes that CEO duality, outsider CEOs, TMT size, firm size, divisionalization, industry growth, industry concentration and sales growth determine TMT hierarchical stratification.

Moreover, this study shows that contingency perspective is useful for explaining firms' decisions related to the hierarchical structure of their TMTs. While other TMT structure studies focused on the presence of various roles in TMTs such as Chief Operating Officers, Chief Strategy Officers, or Chief Marketing Officers (Hambrick & Cannella, 2004; Menz & Scheef, 2014; Nath & Mahajan, 2008), this study suggests that contingency perspective is also useful for exploring the hierarchical setup of TMTs. At the same time, my study discovers the significance of additional explanations, such as those offered by upper echelons, structural power, behavioral integration, and executive reward perspectives.

My results suggest that most of the explanatory variables have a positive impact on TMT hierarchical stratification except industry growth. Depending on this finding, I add to the study of Hambrick et al. (2015) who argue about the benefits of more vertically interdependent TMTs with limited hierarchical distinctions. I show that firms reduce the hierarchical stratification in their TMTs to create more social unity to deal with the uncertainty and information-processing needs arising out of high industry growth. On the other hand, variables such as firm size, industry

concentration, etc. had a positive impact on TMT hierarchical stratification. This shows that some members in the TMTs, who can be more effective in dealing with the complexity and information-processing demands generated by larger size and competition, can gain additional structural power in terms of higher title grades. By that way, I complement the arguments of Hambrick (1981) and Finkelstein (1992) who mention that executives who are more influential in dealing with the uncertainties become more powerful. My study highlights that extra complexity, uncertainty and information-processing demands linked to changing internal and external factors could affect the hierarchical structure of TMTs in different directions where firms may choose between a more behaviorally integrated TMT or as one where some members become more powerful.

This study also contributes into CEO literature specifically to CEO succession and CEO duality literatures. While there are considerable number of studies on how outsider CEOs or CEOs with board chair responsibility change the composition of their TMTs (Lin & Rababah, 2014; Buyl, Boone, Hendricks, & Matthyssens, 2011), the way how they change the hierarchical structure of the TMTs was relatively unexplored. Even though, Ma and Seidl (2018) mention that CEOs could face some constraints while they are changing their TMT structures, this seemed to be less challenging for outsider and dual CEOs in my study considering the hierarchical structures.

Furthermore, executive reward scholars were divided between the tournament explanations and pay dispersion arguments while discussing the antecedents and consequences of executive compensation (Devers et al., 2007). Even though, this study did not focus on executive pay, it indirectly shows that hierarchical ranks in the TMT are also indicative of the compensation and benefits of TMT members. Accordingly, I illustrate that strong performance like sales growth could lead some executives being rewarded more compared to others leading to different

configurations in the hierarchical setup of the TMT which may then reflect itself within the benefit structure as well.

4.5.3 | Limitations and Future Research

Of course, this study has several limitations, which also present new opportunities for future research. First, this study takes a group of large Standard and Poor 500 firms as its sample in line with many studies around TMTs (Hambrick & Cannella, 2004; Menz & Scheef, 2014; Kunish et al., 2020). On the other hand, it is challenging to say whether those findings are generalizable to rather small and medium enterprises as their TMT structures and hierarchical configurations can be different by nature. Also, the firms included in my sample are US based firms. Therefore, I encourage further research that considers different country specific institutional factors, corporate governance structures, etc. which can affect TMT hierarchical setups.

Second, my study focuses on the determinants TMT hierarchical structures. As such, I purposefully leave out the consequences of different TMT hierarchical setups. As prior studies indicate that TMT hierarchical setups matter, future research could examine the impact of TMT hierarchical reconfigurations on different performance outcomes as well as their effect on various TMT processes such as decision making, strategy formulation, etc. Moreover, future studies can also analyze the boundary conditions and moderators under which different TMT hierarchical structures can be more influential on different dimensions of firm outcomes.

Third, even though this exploratory study considers a range of factors related to CEO characteristics, strategic leadership, firm characteristics, environment and firm performance, there are many other determinants of TMT hierarchical structures. Therefore, I encourage researchers to extend this study by exploring other theoretical lenses. For example, there could be institutional forces and imitative pressures that may cause TMT hierarchical setups of firms resemble each

other (DiMaggio & Powell, 1978; Meyer & Rowan, 1977). While adjusting their hierarchical structures, firms can follow and imitate their peers so that they can increase their legitimacy and send signals to their different stakeholders.

Fourth, this study did not analyze in depth which roles or individuals in the TMTs have higher title grades compared to the others; therefore, influencing hierarchical stratification. As discussed, connected to the level of divisionalization, general managers may already have higher title grades compared to functional managers linked to their effect on firm performance. Also, within the functional executives, some roles such as Chief Marketing Officer, Chief Financial Officer, etc. might have a higher title designation compared to others linked to many factors. Moreover, some TMT members who are older or have more tenure in the TMT may acquire higher hierarchical grades irrespective of their roles. Therefore, exploring how and why hierarchy differs within a certain sub-unit of roles in TMTs as well as how and why individual specific factors affect TMT hierarchical structures offer promising research avenues.

Fifth, I used the stratification measure of Keck (1997) in this study to operationalize the TMT hierarchical setups. Future studies can consider other measures that can reflect the hierarchical structures of TMTs such as the TMT vertical interdependence metric of Hambrick et al. (2015) which looks the presence of a COO and total number of title grades in the TMT. Also, as Hambrick et al. (2015) suggest that other possible measures for TMT hierarchical setups can include between level pay ratios or other measures for hierarchical closeness or separation like the method of Nath and Mahajan (2011). Furthermore, scholars can also benefit from survey research to validate the possible measures for TMT hierarchical configurations and even utilize configurational analysis tools such as fsQCA to systematize the evidence and draw inferences. This method can also enable them to identify stronger indicators for TMT hierarchical setups.

4.5.4 | Conclusion

This study suggests that TMT hierarchical setups can be affected from a variety of factors at different levels such as CEO, strategic leadership, firm, environment, and performance. Accordingly, it indicates that TMTs can vary in terms of their hierarchical configurations and identifies the criteria that guide the decisions of firms on the appropriate level of TMT hierarchical stratification. I hope this study will support decision makers while they are designing the hierarchical setup of their TMTs by offering insights on how and when to (re)design the hierarchical structure of their TMTs. Since the hierarchical structure of TMTs can be a great interest to academicians and practitioners, I trust that this study will encourage further research in this area.

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4.7 | FIGURES AND TABLES

Figure 1. TMT size and TMT hierarchical stratification development

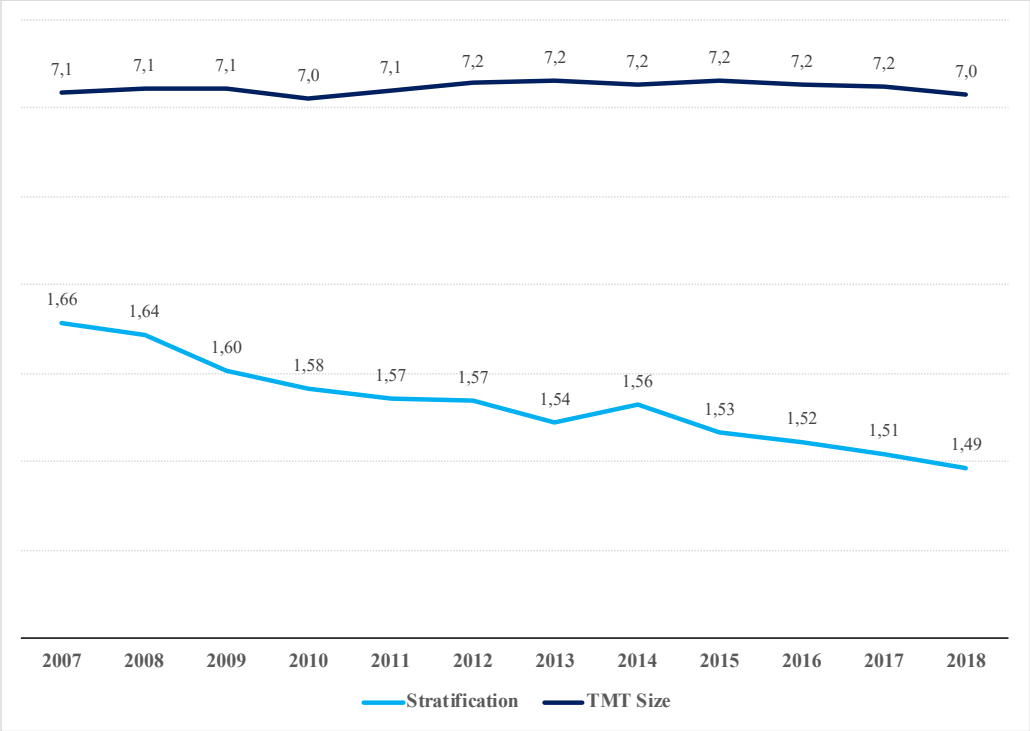

Figure 2. TMT hierarchical stratification development per industry groups

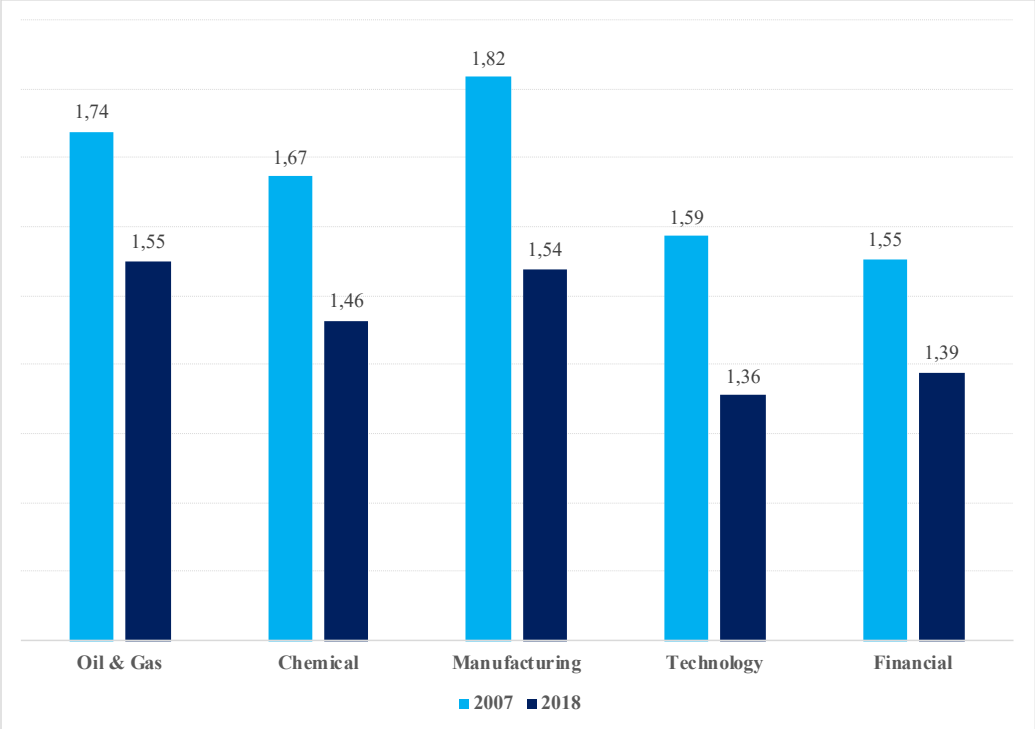

Figure 3. Scatter diagram of TMT hierarchical stratification against firm size

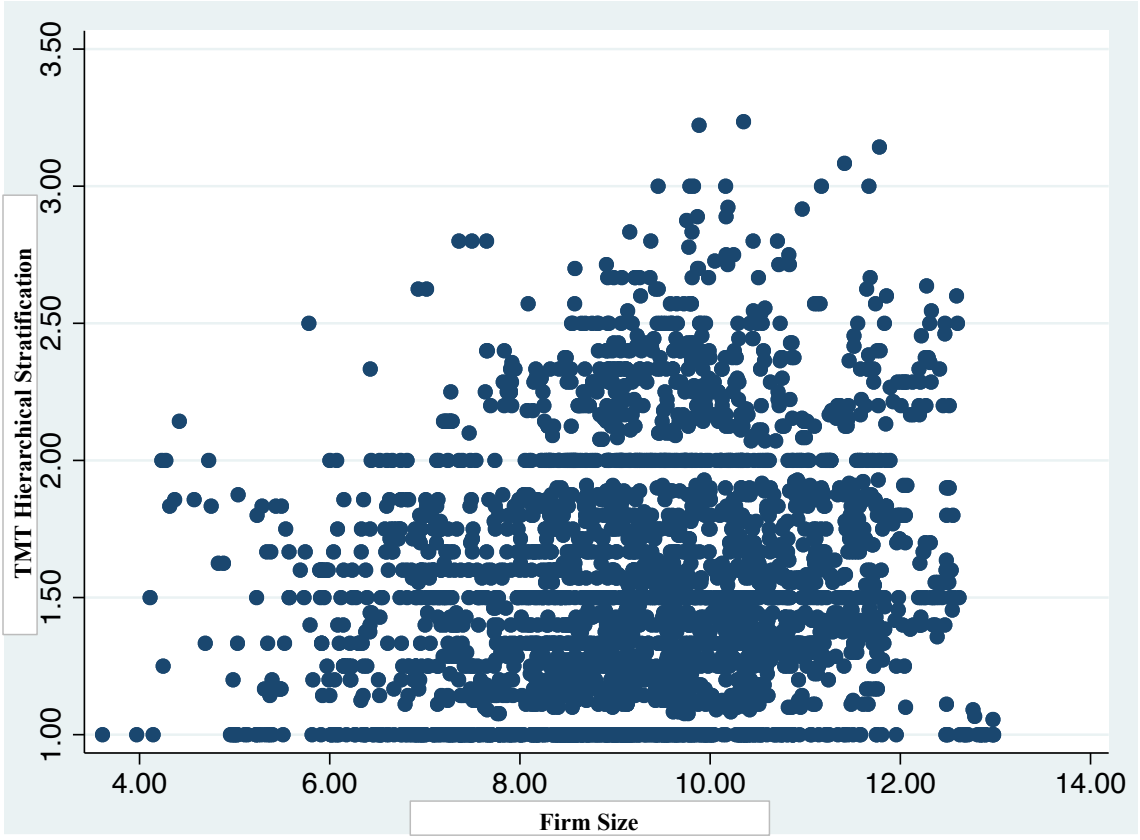

Table 1. Descriptive information on TMT hierarchical stratification on different industry groups

	INDUSTRY					
	Total	**Oil & Gas**	**Chemical**	**Manufacturing**	**Technology**	**Financial**
Number of observations	3120	420	540	612	660	888
Number of firms	260	35	45	51	55	74
Stratification						
Arithmetic mean	1,57	1,68	1,59	1,67	1,47	1,50
Geometric mean	1,52	1,61	1,52	1,60	1,41	1,46
Maximum	3,24	3,22	3,24	3,00	2,92	2,63
Minimum	1,00	1,00	1,00	1,00	1,00	1,00
Percentiles						
10%	1,00	1,00	1,00	1,00	1,00	1,00
50%	1,50	1,60	1,50	1,60	1,38	1,50
90%	2,20	2,33	2,25	2,33	2,00	2,00

Table 2. Descriptive Information on TMT Hierarchical Stratification on different levels of TMT size, firm size and divisionalization

TMT SIZE				
	Total	**Small**	**Medium**	**Large**
Number of observations	3120	507	2044	569
Number of firms	260	42	170	48
Stratification				
Arithmetic mean	1,57	1,44	1,57	1,67
Geometric mean	1,52	1,61	1,52	1,60
Maximum	3,24	2,50	3,22	3,24
Minimum	1,00	1,00	1,00	1,00
Percentiles				
10%	1,00	1,00	1,00	1,10
50%	1,50	1,50	1,50	1,58
90%	2,20	2,00	2,25	2,34

FIRM SIZE				
	Total	**Small**	**Medium**	**Large**
Number of observations	3120	855	1434	831
Number of firms	260	71	120	69
Stratification				
Arithmetic mean	1,57	1,45	1,60	1,63
Geometric mean	1,52	1,40	1,53	1,58
Maximum	3,24	3,00	3,22	3,24
Minimum	1,00	1,00	1,00	1,00
Percentiles				
10%	1,00	1,00	1,00	1,10
50%	1,50	1,40	1,50	1,56
90%	2,20	2,00	2,30	2,22

DIVISIONALIZATION				
	Total	**Low**	**Medium**	**High**
Number of observations	3120	611	1790	719
Number of firms	260	51	149	60
Stratification				
Arithmetic mean	1,57	1,43	1,55	1,72
Geometric mean	1,52	1,38	1,50	1,65
Maximum	3,24	2,70	3,14	3,24
Minimum	1,00	1,00	1,00	1,00
Percentiles				
10%	1,00	1,00	1,00	1,00
50%	1,50	1,40	1,43	1,60
90%	2,20	2,00	2,17	2,40

Table 3. Descriptive Information on TMT Hierarchical Stratification on different levels of industry growth, market concentration and sales growth

INDUSTRY GROWTH				
	Total	**Low**	**Medium**	**High**
Number of observations	3120	932	1478	710
Number of firms	260	78	123	59
Stratification				
Arithmetic mean	1,57	1,58	1,57	1,55
Geometric mean	1,52	1,52	1,50	1,49
Maximum	3,24	3,00	3,24	3,08
Minimum	1,00	1,00	1,00	1,00
Percentiles				
10%	1,00	1,00	1,00	1,00
50%	1,50	1,50	1,50	1,50
90%	2,20	2,20	2,25	2,17

MARKET CONCENTRATION				
	Total	**Low**	**Medium**	**High**
Number of observations	3120	474	1680	966
Number of firms	260	40	140	81
Stratification				
Arithmetic mean	1,57	1,52	1,60	1,53
Geometric mean	1,52	1,46	1,54	1,47
Maximum	3,24	2,80	3,24	3,22
Minimum	1,00	1,00	1,00	1,00
Percentiles				
10%	1,00	1,00	1,00	1,00
50%	1,50	1,50	1,50	1,50
90%	2,20	2,14	2,29	2,14

SALES GROWTH				
	Total	**Low**	**Medium**	**High**
Number of observations	3120	912	1467	741
Number of firms	260	76	122	62
Stratification				
Arithmetic mean	1,57	1,52	1,57	1,58
Geometric mean	1,52	1,47	1,51	1,52
Maximum	3,24	3,08	3,24	3,22
Minimum	1,00	1,00	1,00	1,00
Percentiles				
10%	1,00	1,00	1,00	1,00
50%	1,50	1,50	1,50	1,50
90%	2,20	2,14	2,20	2,29

Table 4. Descriptive statistics and correlation coefficients

	Variable	Mean	S.D.	1	2	3	4	5	6
1	TMT Stratification	1.57	0.44	1					
2	CEO Tenure	1.45	0.98	-0.05**	1				
3	Outsider CEO	0.37	0.48	-0.09***	0.06**	1			
4	CEO Duality	0.49	0.50	0.11***	0.28***	0.05**	1		
5	CEO Succession	0.11	0.31	0.02	-0.42***	-0.04*	-0.21***	1	
6	TMT Size	8.12	2.68	0.13***	-0.05**	-0.11***	0.12***	-0.01	1
7	TMT Tenure Diversity	3.01	1.61	-0.04*	0.20***	-0.10***	-0.01	-0.02	0.02
8	Board Size	2.32	0.38	0.03	-0.04*	-0.16***	0.03	0.01	0.22***
9	Board Tenure Diversity	5.65	2.66	0.01	0.10***	-0.08***	-0.06**	-0.01	-0.02
10	Firm Size	9.29	1.55	0.17***	-0.11***	-0.16***	0.15***	0.03	0.37***
11	Diversification	0.46	0.53	0.04*	-0.08***	0.03	0.01	0.01	0.04*
12	Divisionalization	0.40	0.17	0.21***	-0.03	-0.05**	0.06**	0.01	0.16***
13	Industry Growth	0.04	0.11	-0.04*	0.04*	0.04*	-0.02	-0.03	-0.02
14	Industry Stability	9.23	10.7	0.00	0.05**	-0.05**	0.07***	-0.01	-0.03
15	Industry Concentration	8503	679	0.03	-0.05*	-0.06**	0.02	0.00	-0.08***
16	Return on Assets	0.05	0.09	0.04*	0.03	-0.03	0.012	-0.05**	0.03
17	Sales Growth	0.10	0.91	-0.00	0.05**	0.02	-0.04*	-0.00	-0.03

N=3120 "* p<0.1 ** p<0.05 *** p<0.01"

All independent and control variables are one year lagged

	Variable	Mean	S.D.	7	8	9	10	11	12
1	TMT Stratification	1.57	0.44						
2	CEO Tenure	1.45	0.98						
3	Outsider CEO	0.37	0.48						
4	CEO Duality	0.49	0.50						
5	CEO Succession	0.11	0.31						
6	TMT Size	8.12	2.68						
7	TMT Tenure Diversity	3.01	1.61	1					
8	Board Size	2.32	0.38	-0.02	1				
9	Board Tenure Diversity	5.65	2.66	0.18***	0.26***	1			
10	Firm Size	9.29	1.55	-0.05**	0.26***	0.03	1		
11	Diversification	0.46	0.53	-0.12***	0.03	-0.04*	0.28***	1	
12	Divisionalization	0.40	0.17	0.01	0.04*	-0.01	0.16***	0.15***	1
13	Industry Growth	0.04	0.11	-0.06***	-0.01	-0.02	-0.06***	-0.01	0.00
14	Industry Stability	9.23	10.7	0.02	0.01	-0.01	-0.09***	-0.08***	0.00
15	Industry Concentration	8503	679	-0.01	0.05**	-0.01	-0.09***	0.06***	-0.07***
16	Return on Assets	0.05	0.09	0.06***	0.02	0.05*	0.15***	0.04*	0.03
17	Sales Growth	0.10	0.91	-0.01	-0.03	-0.01	-0.09***	-0.04*	-0.03

N=3120 "* p<0.1 ** p<0.05 *** p<0.01"

All independent and control variables are one year lagged

	Variable	Mean	S.D.	13	14	15	16	17
1	TMT Stratification	1.57	0.44					
2	CEO Tenure	1.45	0.98					
3	Outsider CEO	0.37	0.48					
4	CEO Duality	0.49	0.50					
5	CEO Succession	0.11	0.31					
6	TMT Size	8.12	2.68					
7	TMT Tenure Diversity	3.01	1.61					
8	Board Size	2.32	0.38					
9	Board Tenure Diversity	5.65	2.66					
10	Firm Size	9.29	1.55					
11	Diversification	0.46	0.53					
12	Divisionalization	0.40	0.17					
13	Industry Growth	0.04	0.11	1				
14	Industry Stability	9.23	10.7	0.02	1			
15	Industry Concentration	8503	679	-0.14***	-0.15***	1		
16	Return on Assets	0.05	0.09	0.10***	-0.02	-0.11***	1	
17	Sales Growth	0.10	0.91	0.11***	-0.00	0.01	-0.04*	1

N=3120 "* p<0.1 ** p<0.05 *** p<0.01"

All independent and control variables are one year lagged

Table 5. Results of tobit regression analyses for TMT hierarchical stratification

	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	1.66***	1.49***	1.07***	1.58***	1.56***
	(0.04)	(0.15)	(0.16)	(0.33)	(0.33)
Year	Incl.	Incl.	Incl.	Incl.	Incl.
CEO Characteristics					
CEO Tenure	-0.04**	-0.03*	-0.02	-0.02	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Outsider CEO	-0.13***	-0.11***	-0.09**	-0.09**	-0.09**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
CEO Duality	0.14***	0.13***	0.10***	0.09***	0.10***
	(0.01)	(0.04)	(0.04)	(0.04)	(0.04)
CEO Succession	-0.00	0.01	0.00	0.01	0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Strategic Leadership					
TMT Size		0.02***	0.01**	0.01*	0.01*
		(0.01)	(0.01)	(0.01)	(0.01)
TMT Tenure Diversity		-0.01	-0.01	-0.01	-0.01
		(0.01)	(0.01)	(0.01)	(0.01)
Board Size		-0.01	-0.04	-0.05	-0.05
		(0.06)	(0.06)	(0.05)	(0.05)
Board Tenure Diversity		0.01	0.01	0.01	0.01
		(0.01)	(0.01)	(0.01)	(0.01)
Firm					
Firm Size			0.04***	0.04***	0.04***
			(0.02)	(0.02)	(0.02)
Diversification			-0.02	-0.03	-0.03
			(0.04)	(0.04)	(0.04)
Divionalization			0.50***	0.51***	0.51***
			(0.12)	(0.12)	(0.12)
Environment					
Industry Growth				-0.27***	-0.29***
				(0.09)	(0.10)
Industry Stability				0.00	0.00
				(0.00)	(0.00)
Industry Concentration				0.00**	0.00**
				(0.00)	(0.00)
Performance					
Return on Assets					0.18
					(0.17)
Sales Growth					0.01*
					(0.01)
Number of Observations	3120	3120	3120	3120	3120
Number of Firms	260	260	260	260	260
F	3.79***	3.36***	4.05***	4.49***	4.26***

Standard errors are in paranthesis. All independent and control variables are lagged by one year

"* p<0.1 ** p<0.05 *** p<0.01"

Table 6. Summary of the results and effect sizes

Factors influencing the degree of TMT stratification	Average Effect	-1 SD	+1 SD
CEO Characteristics			
CEO Tenure	No significant effect		
Outsider CEO	-0.08	+0.04	-0.05
CEO Duality	+0.10	-0.05	+0.04
CEO Succession	No significant effect		
Strategic Leadership			
TMT Size	+0.01	-0.03	+0.03
TMT Tenure Diversity	No significant effect		
Board Size	No significant effect		
Board Tenure Diversity	No significant effect		
Firm			
Firm Size	+0.04	-0.06	+0.06
Diversification	No significant effect		
Divisionalization	+0.51	-0.09	+0.09
Environment			
Industry Growth	-0.29	0.03	-0.03
Industry Stability	No significant effect		
Industry Concentration	+0.01	-0.04	+0.04
Performance			
Return on Assets	No significant effect		
Sales Growth	+0.01	-0.01	+0.01