

Top Management Team Size: An Exploration of Characteristics and Determinants

Elisabeth Radek

Abstract: This article uses an exploratory approach to examine the various characteristics of top management teams (TMTs) of different sizes and what drives TMT size. Although TMTs have been expanding over the past 30 years, we still know relatively little about the drivers. Determining the size of a TMT is a key organizational decision as TMT size influences TMT processes and organizational outcomes. Based on a sample of S&P 500 firms from 2011 to 2014, the results show that TMT size ranges from two to 21 executives and that TMTs of different sizes differ little with regard to TMT composition but strongly in terms of TMT structure. Furthermore, we find that TMT size is influenced by firm size, firm growth, and TMT horizontal interdependence. It is not influenced by the environmental conditions and CEO characteristics that were tested. We contribute to the TMT literature by highlighting the characteristics of different TMT sizes and providing new insights into the determinants of TMT size. Our study exposes the power of information-processing theory to explain these determinants.

Keywords: Top management teams, TMT size, TMT structure, upper echelons

Introduction

Along with the chief executive officer (CEO), the top management team (TMT) bears “overall responsibility for the organization” (Mintzberg, 1979: 24) and is responsible for formulating and implementing strategy (Finkelstein, Hambrick, & Cannella, 2009). TMTs differ in composition and structure, and over the past 30 years, the rich body of upper echelons research has demonstrated that these characteristics matter when it comes to organizational outcomes (Hambrick, 2007). The size of TMTs is an important structural feature and a key organizational design choice (Beckman & Burton, 2008; Guadalupe, Li, & Wulf, 2014). Prior research has focused on the outcomes of TMT size or used it as a control variable (Bantel & Jackson, 1989). This stream of research has shown that TMT size matters for outcomes on an individual executive level (Boeker, 1997; Henderson & Fredrickson, 1996; Plambeck & Weber, 2010), as well as team processes like TMT conflict (Amason & Sapienza, 1997), TMT agreement (Iaquinto & Fredrickson, 1997), and behavioral integration (Simsek, Veiga, Lubatkin, & Dino, 2005), and organizational outcomes such as growth (Eisenhardt & Schoonhoven, 1990), profitability (Haleblian & Finkelstein, 1993), and strategic change (Boeker, 1997). Much less attention has been devoted to the drivers of TMT size. Two prior studies have contributed to our knowledge of TMT size determinants: Sanders & Carpenter (1998) show that TMT size relates to complexity arising from internationalization, while Guadalupe et al. (2014) focus on exploring the phenomena of changed TMT structures, information technology investments, and changes in firm diversification and find that the latter influences TMT size. However, neither of the studies center their research on understanding the characteristics of different TMT sizes and their drivers. Thus, there is a need to develop a more comprehensive understanding of TMT size and its antecedents. This paper aims to explore – for the very first time, to the best of our knowledge – a broad spectrum of different factors that might be related to TMT size on three levels: environment, firm, and CEO.

Determining TMT size is not straightforward as large and small TMTs have benefits and disadvantages that need to be weighed against each other. First, on the positive side, larger TMTs are referred to as being richer in resources and competencies, thereby supporting information processing and leading to better decision-making (Haleblian &

Finkelstein, 1993). This is in line with Hambrick and D'Aveni's (1992) argument that "at a basic level, the resources available on a team result from how many people are on it. Just as a sports team is at some disadvantage if it has fewer than the allowed number of players on the field, so may an organization be at a disadvantage if it has a smaller top management team than other firms in the same industry" (p. 1449). Second, larger teams with higher cognitive capabilities are likely to experience greater cognitive conflict. Cognitive conflict is positively regarded as facilitating the exchange of information and improving strategic decision-making (Amason & Sapienza, 1997).

On the negative side, however, several disadvantages of larger TMTs have been observed. First, adding one more person to a team does not necessarily result in better group performance, as described by the Ringelmann effect: In an experiment in which men were asked to pull on a rope, tug-of-war style, group performance gradually decreased as more individuals were added to the group. This reduced individual effort resulted in decreased group performance, a phenomenon later dubbed "social loafing" (Karau & Williams, 1993). Second, larger teams are associated with more coordination and communication problems (Haleblian & Finkelstein, 1993). While cognitive conflict has positive effects, larger teams are also associated with more affective conflict (Amason & Sapienza, 1997). Affective conflict relates to suspicion, distrust, and hostility and leads to obstructed information exchange and poorer decision-making (Amason & Sapienza, 1997). Third, top executives can be both valuable and expensive resources. For example, a Tripadvisor executive who was added to the team in 2014 earns almost \$1 million a year in cash and more than \$3 million in total compensation (Tripadvisor, 2015). The cost can be substantial, especially when a firm adds several executive roles to the top, as Procter & Gamble did in 2013 when it added 10 top executives (Procter&Gamble, 2013, 2014). The cost and benefits of adding top executives need to be considered carefully.

Given the previous evidence that TMT size matters for organizational outcomes and that large and small teams come with costs and benefits, we are interested in knowing what drives TMT size and what characterizes TMTs of different sizes. Besides the importance of TMT size for TMT processes and organizational outcomes, it is a phenomenon worth exploring for two reasons. First, TMT size varies significantly across firms, and second, it has changed over time. For example, in S&P 500 firms, the smallest firm has a TMT of only two members, while the largest has a TMT of 21 members. One

study shows that TMT size has changed significantly as the average TMT size has doubled over 20 years from an average of five in 1986 to an average of 10 in 2006 (Guadalupe et al., 2014). However, there are also circumstances where TMTs are decreasing, as Hambrick & D'Aveni (1992) show with failing firms that abruptly shrink their TMTs.

Because little is known about the phenomenon of varying TMT size, we heed Helfat's (2007) call to empirically explore phenomena first before testing theory. We chose an exploratory, abductive approach to expand our knowledge of the phenomenon. This approach aims to identify facts and patterns instead of relying on formal hypothesis testing (Helfat, 2007; Menz & Barnbeck, 2017; Oxley, Rivkin, & Ryall, 2010). This study's goal is to surface the phenomenon of varying TMT size and shed light on the drivers of TMT size. We do this by providing rich descriptions of different TMT size types and empirically analyzing possible antecedents of TMT size. Integrating descriptive and analytical results expands our knowledge and understanding of the phenomenon. With an archival dataset of S&P 500 firms covering four years and 767 firm-year observations, this study explores the extent to which environment-, firm-, and CEO-level factors determine TMT size. We complement prior studies on the determinants of TMT size (Guadalupe et al., 2014; Sanders & Carpenter, 1998) and contribute to the understanding of varying TMT size. Our hope is for this work to motivate further empirical and theory-testing studies on TMT size and, more broadly, on TMT structure and composition.

The structure of our paper follows prior exploratory work (Menz & Barnbeck, 2017; Oxley et al., 2010). Following an introduction, we describe the method of our study and explain the variables. Next, we present the results of the descriptive analysis of TMT characteristics and the regression results of TMT size determinants. We conclude by discussing our findings and opportunities for future research on the size of top management teams.

Method

This study's empirical research design is a fact-based research approach (Hambrick, 2007; Lyngsie & Foss, 2017; Menz & Barnbeck, 2017) with two empirical parts: a

descriptive analysis to enhance our understanding of TMT size heterogeneity and a regression analysis to explore the drivers of TMT size. We chose this abductive, data-exploring approach because, to the best of our knowledge, no other study has extensively explored TMT size antecedents on different levels. TMT size is generally used as a control variable in TMT studies and has been studied as an outcome variable. While focused on other topics, two prior studies address TMT size antecedents (Amason & Sapienza, 1997; Guadalupe et al., 2014) but not on multiple levels as we do. Contrary to deductive approaches, this fact-based research approach does not specify hypotheses. Abductive studies reason from data to increase our understanding and aim to provide initial suggestions and possibly even mechanisms attempting to explain observed patterns (Robinson, 2019). We chose this approach because it allows us to include a wide array of possible determinants and does not limit us to one theoretical perspective. To identify variables that influence TMT size, we reviewed prior literature on TMT size (Guadalupe et al., 2014; Sanders & Carpenter, 1998) and other TMT structural features (see Article I of this dissertation). Furthermore, we not only studied firms from our sample whose TMT size had changed during our observation period but also analyzed press releases for the reasons behind the change in TMT size. We follow Menz & Barnbeck's (2017) approach going beyond describing the data and measuring the variables included in the regression by explaining the reasons for including the variables in our study and elaborate on how each variable¹ may be associated with TMT size. The empirical part of our paper consists of two sections: first, the descriptive section of TMT characteristics of different TMT size groups, and second, the regression analysis of the determinants of TMT size.

Sample and Data

The study's sample consists of S&P 500 firms², between 2011 and 2014. Following prior research, we obtained information on the TMT from Form 10-Ks, firm proxy statements, and annual reports (Marcel, 2009; Menz & Scheef, 2014). Financial data and other firm information were collected from the Thomson Financial database.

¹ For a complete list of variables, including the descriptive section, please see APPENDIX .

² Financial service firms were excluded because this industry has different revenue reporting standards.

Industry concentration data was collected from the U.S. Census Bureau's Economic Census.³ Our sample consists of 1,409 firm-year observations for the descriptive results and 767 firm-year observations for the regression results.⁴

Measures

We follow Menz & Barnbeck (2017) in their approach of explaining the rationale of variables, although this is not typical for fact-based, explorative studies. We chose to explore TMT size determinants on three levels – environment, firm, and CEO – by making use of extensive literature research (see Article I of this dissertation) and examining firms' press releases. All measures and their variables are summarized in Appendix 1. The measures for the regression analysis are discussed and described in detail in the next section.

TMT size. Prior research has defined top management teams and their size in various ways. Smaller and survey studies often let CEOs define their TMT members (e.g. Amason & Sapienza, 1997; Barrick, Bradley, Kristof-Brown, & Colbert, 2007; Iaquinto & Fredrickson, 1997; Ling, Simsek, Lubatkin, & Veiga, 2008; Simsek et al., 2005; Smith et al., 1994). Other studies include everyone who reports directly to the CEO in their TMT definition (e.g. Boeker, 1997; Guadalupe et al., 2014). Probably the narrowest definition of TMTs, which is mostly used for compensation studies, is “the five highest-paid executives” (e.g. Dunn, 2004; Patel & Cooper, 2014; Ridge, 2015). However, this definition is less feasible for our study of determinants of TMT size and does not reflect the growing number of TMT members (Guadalupe et al., 2014). To allow for variance in TMT size, we use the frequently used definition of TMT size in the field of TMT structure and composition, which defines TMTs as all executives with a vice president title or above as reported in the firm's Form 10-K (Beckman & Burton, 2008; Cannella & Hambrick, 1993; Ferguson, Cohen, Burton, & Beckman, 2015; Hambrick & D'Aveni, 1992; Hambrick, Humphrey, & Gupta, 2015; Keck, 1997; Virany, Tushman, &

³ We also tested all models without industry concentration, which yielded a larger sample of 1,020 firm observations. The results were similar.

⁴ The number of observations is reduced for the regression analysis as we lagged our independent variables by one year.

Romanelli, 1992). We measure TMT size at the end of each year. A practical example demonstrates how multiple factors can affect TMT size. When a new CEO joined Air Products in 2014, he reduced the TMT's size from seven to five and restructured it "with the goal of regaining industry leadership" (AirProducts, 2014). There can be multiple reasons why firms lose industry leadership (e.g., environmental level due to increased competition; firm level due to decreasing sales or firm performance). The example demonstrates that CEO characteristics (e.g. CEO succession) also matter when it comes to initiating changes in TMT size.

Environmental factors. The TMT is located at firms' strategic apex (Mintzberg, 1973) and faces the challenges and opportunities of the environment that the firm is directly exposed to. The TMT needs to process information and react accordingly (Henderson & Fredrickson, 1996; Sanders & Carpenter, 1998; Tushman & Nadler, 1978). A large TMT may be beneficial for absorbing and processing large amounts of information. However, a large TMT may be an obstacle to good and fast decision-making. By contrast, the implementation of decisions made and strategies agreed upon by a large team can benefit the entire organization. We considered three environmental factors that may influence TMT size: (1) industry sales instability (also referred to as industry dynamism), (2) industry sales growth (also referred to as munificence), and (3) industry concentration (Dess & Beard, 1984). We chose these three environmental factors because they recurrently appear in prior top management research (e.g. Haynes & Hillman, 2010; Wiersema & Bantel, 1992).

Industry sales instability. Firms operating in unstable, dynamic industries face more uncertainty, and their TMTs have a higher load of information to process and more decisions to make. Increased uncertainty and higher loads of information that have to be processed will affect organizational structure (Dess & Beard, 1984; Galbraith, 1973) and TMT structures, specifically the size. If the environment is stable, TMTs can develop standard procedures and rules to deal with the environment. In contrast, in an unstable environment, the development of standard procedures is not feasible because TMTs will experience uncertainty, and it is challenging for administrators to plan accordingly. The greater the uncertainty, the greater the requirements for processing information (Tushman & Nadler, 1978) by the TMT. Thus, industry sales instability may influence decisions

about the number of resources in the TMT necessary to process information. Industry sales instability was calculated as the standard deviation of the median sales growth of the respective three-digit SIC industry in the years $t-1$ and t (Hambrick & Cannella, 2004).

Industry sales growth. Firms active in growing industries face higher levels of task complexity, which may affect the number of top executives needed to absorb and process information (Eisenhardt & Bourgeois III, 1988). Also, firms in growing industries may have the abundance of resources (Dess & Beard, 1984) to afford a larger TMT. By contrast, firms in declining industries often have fewer resources and may opt to have smaller TMTs. This is in line with Hambrick & D'Aveni's (1992) finding that failing firms have smaller TMTs. *Industry sales growth* is the mean sales growth of the three-digit SIC industry over the past three years (Hambrick & Cannella, 2004).

Industry concentration. Whether firms are active in industries with few competitors (high concentration) or many competitors (low concentration) may influence TMT size. Industries with more competitors usually have a more complex environment. Firms in industries with a low concentration and many competitors may need a larger TMT because larger TMTs may bring more diverse skills and perspectives to cope with complex environments. In such competitive industries, however, competition for suitable top executives might be higher, and it might be more challenging for firms to fill the TMT roles that are needed (Hendricks, Hora, & Singhal, 2015). Therefore, TMTs could be smaller, too. In less competitive industries, firms might not need large TMTs because there are lower information-processing demands. *Industry concentration* is measured as the four-firm market concentration ratio (Nath & Mahajan, 2008) with each three-digit SIC code segment in $t-1$.

Firm level factors. We examine several firm characteristics that are likely to determine the necessity and means for a certain TMT size. Since numerous firm level factors may influence TMT size, we explore classical firm characteristics like size and performance, as well as firm strategy characteristics, such as diversification and firm structure.

Firm size. Firm size is likely to influence the size of a firm's TMT. Larger firms require more complex processes and have higher information-processing demands

(Henderson & Fredrickson, 1996; Sanders & Carpenter, 1998). Larger and more complex firms may require task division and specialization on the executive level (Hambrick & Cannella, 2004). Besides, larger firms can probably afford more high-paid executives. Thus, firm size is expected to matter for TMT size. Following prior research, we measure firm size as the logarithm number of employees (Guadalupe et al., 2014; Sanders & Carpenter, 1998).

Prior firm performance. Prior firm performance may influence decisions on TMT size. Recalling the high costs of top managers, firm profitability is likely connected to the ability to sustain a certain TMT size. Also, we know that failing firms decrease their TMT size (Hambrick & D'Aveni, 1992). Thus, it is likely that the prior performance determines the size of its TMT. To measure prior firm performance, we used return on assets (ROA) in $t-1$.

Firm sales growth. Firm sales growth is likely to influence TMT size because TMT tasks in firms with growing sales are more complex. Firms with growing sales face a wider variety of markets, customers and products, which results in a need for larger TMTs to deal with this complexity. As firms grow, they might decide to divide tasks on the TMT level and split roles, which increases TMT size. For example, after Adobe's digital marketing revenue had been growing, the TMT size increased through the addition of a new role responsible for the growing product lines in digital marketing (Adobe, 2013). We measure sales growth as the percentage change in sales from year $t-1$ to year t (Crossland & Hambrick, 2007).

Firm diversification. A firm's corporate diversification strategy is likely to influence its TMT size as task demands, task complexity, and information-processing needs differ according to a firm's level of diversification. *Diversification (total)* indicates how many businesses a firm is active in (Ramanujam & Varadarajan, 1989). We may expect that the more diversified firms are, the larger their TMT will be because the firm is active in more businesses that need to be managed. When a firm's *diversification* is *unrelated*, TMT task demands and task complexity are lower, and information processing happens more on the business unit level. When a firm's diversification is unrelated, TMT task requirements are mostly financial and performance monitoring (Michel & Hambrick, 1992). This means fewer resources are needed on the corporate level to absorb and process information. However, if businesses are related, task demands are high

(Hambrick & Cannella, 2004) and the need for executives to process information at the corporate level is higher (Tushman & Nadler, 1978). When task complexity and interdependence for the corporation are minor due to unrelated diversification, and synergies are mainly financial, we may expect smaller top teams. We calculated both unrelated and total diversification by using Palepu's (1985) entropy measure in t-1 (Hambrick & Cannella, 2004; Wiersema & Bantel, 1992)

Organizational design. Different organizational design structures will likely influence the size of the TMT. Since the "executive team is a reflection of the organization" (Guadalupe et al., 2014: 1), our study follows prior research in using TMT structural characteristics as proxies for the organizational design (Beckman & Burton, 2011; Nath & Mahajan, 2008, 2011). Practical examples show that TMT structures, a proxy of organizational design, 1) vary significantly and 2) are not constant. For example, in 2013, Procter & Gamble "reorganized [its] Global Business Unit (GBU) structure, which resulted in changes to [its] reporting segments" and, thus, also changed the TMT structure (Procter&Gamble, 2014: 73). In 2012, Procter & Gamble had a TMT of 10 executives and a purely functional structure. By 2014, it had added 10 general managers and an additional functional manager, thereby increasing its TMT size to 21 (Procter&Gamble, 2012, 2013). The case demonstrates how TMT structures reflect the organizational structure and that both are subject to change.

TMT horizontal interdependence reflects the extent to which top executives' tasks and responsibilities bear on each other (Hambrick et al., 2015). Essentially, this measure indicates the degree of the functional structure of the TMT and, more broadly, of the organization. Taking this to the organizational level, it indicates how centralized or divisionalized a firm is. The functional or divisional structure of a firm is likely connected to its TMT size. More functionally structured firms might have larger TMTs, as found in the study by Guadalupe et al. (2014), which attributed the growth of TMT size to the addition of more functional managers (functional centralization). However, more divisionally structured firms also give us reason to expect a larger TMT size. Firms with multiple regions and/or business units are likely to have larger TMTs. TMT horizontal interdependence is computed by standardizing and averaging (1) the proportion of executives with titles that indicate primarily a functional role and (2) a dummy variable coded as 1 when the TMT consists only of functional executives and 0 otherwise

(Hambrick et al., 2015). We chose the measure introduced by Hambrick et al. (2015) over TMT divisionalization⁵ (Nath & Mahajan, 2008, 2011) because it indicates the degree of functionalization with greater precision.

TMT vertical interdependence reflects the extent to which top executives are hierarchical peers. Essentially, this indicates how hierarchical a TMT is. Since the TMT is a reflection of the firm, we take this measure as a proxy for how hierarchical a firm is. Some TMTs, like Apple (Apple, 2014) and Alphabet (Google, 2014), have as few as two hierarchical levels, while others have many more. Nike, for example, has five hierarchical levels (Nike, 2014). TMT vertical interdependence also indicates whether the TMT has a chief operating officer (COO). The presence of a COO often indicates an additional hierarchical level, and several top executives report to the COO rather than the CEO. We expect vertical interdependence to matter for TMT size. Intuitively, one would expect TMTs with multiple hierarchical levels to be larger; however, an example like Apple demonstrates that medium-sized TMTs may have few hierarchical levels. Thus, this relationship needs further exploration. TMT vertical interdependence is created by standardizing and averaging two indicators for each year and then reversing them: (1) The number of distinct hierarchical levels was created by counting the number of title gradations in the TMT each year (always including a CEO, a TMT could also include a COO, executive vice presidents (EVPs), senior vice president (SVPs), and possibly even vice presidents (VPs)), and (2) the presence of a COO reflected whether there was this additional level in the TMT (Hambrick et al., 2015). Instead of simply measuring the number of hierarchical levels, we chose this measure because it entails the presence of a COO, which is important in reflecting the hierarchical complexity of firms.

CEO-level factors. Lastly, we examine the extent to which CEO characteristics matter for TMT size. Decisions about the size of a TMT fall under the purview of the CEO; therefore, we examine several CEO characteristics that may influence decisions about TMT size. Several studies have shown that new CEOs usually change both the composition and the structure of their TMTs (Hutzschenreuter & Horstkotte, 2013; Ma

⁵ We tested both measures in our regression analysis and the results were similar.

& Seidl, 2018; Ma, Seidl, & Guérard, 2015). Knowing that CEOs make changes to their TMTs, we explore the following CEO variables that may influence decisions about TMT size.

CEO duality. CEO duality is when a CEO also acts as chair of the board (COB) (Dalton, Hitt, Certo, & Dalton, 2007). Scholars agree that CEO duality reflects higher CEO power (Finkelstein et al., 2009; Krause, Semadeni, & Cannella, 2013). Also, CEO duality indicates higher task demands and more information-processing needs for the CEO (Sanders & Carpenter, 1998). There are two reasons why CEO duality is likely connected to TMT size. First, a CEO who is also the COB may choose a larger TMT as a symbol of power. By contrast, they may also opt for a smaller TMT because they do not want to share power. Second, a CEO who is also the COB may need a larger team to support CEO tasks and information-processing so that the CEO can fulfill both roles. A CEO who is also the COB may need a larger TMT to cope with the complexity of their dual role (Sanders & Carpenter, 1998). For example, a CEO who is also the COB may add a COO or chief strategy officer (CSO) for support. On the other hand, having a larger team likely means more coordination work (Smith et al., 1994), which is why a CEO who is also the COB chair of the board may opt for a smaller team. We measure CEO duality as a dummy variable coded as 1 if the CEO is also the COB and as 0 otherwise (Zhang & Rajagopalan, 2003).

CEO position tenure. CEO tenure is commonly used as an indicator and measure for CEO power (Miller, 1991; Zhang & Rajagopalan, 2003). Thus, CEO position tenure and TMT size might be linked in a similar way as in the case of CEO duality. CEOs with a longer position tenure may choose to have a larger TMT because they have the power to do so. However, prior research (Hambrick, Geletkanycz, & Fredrickson, 1993) finds CEO tenure linked to top management's commitment to the status quo. Therefore, it might be more difficult for a CEO with a long position tenure to add new roles or remove roles from their TMT when the team holds onto the status quo. Thus, we expect CEO tenure and TMT size to be associated, but we do not predict a direction. We also controlled for CEO age, which is likely to matter for TMT size in a similar way.

CEO succession. Anecdotal evidence and research show that CEO succession is often followed by TMT turnover (Barron, Chulkov, & Waddell, 2011; Coyne & Coyne, 2007; Keck, 1997; Shen & Cannella, 2002) and a change in TMT composition (Wagner,

Pfeffer, & O'Reilly III, 1984). Different scenarios related to CEO succession may affect TMT size. For example, when a CEO leaves a firm, other top executives also leave (Barron et al., 2011); when a CEO is promoted from inside the firm, their previous position needs to be filled, and TMT size may change temporarily; when a CEO comes from outside the firm, they often bring new top executives with them (Shen & Cannella, 2002) and may decide to add or remove certain roles. While there can be multiple reasons for TMT turnover following CEO succession, the bottom line is that CEO succession may influence TMT size. We measure CEO succession as a dummy variable coded as 1 if the CEO changed in a given year and 0 otherwise.

CEO outsiders. The origin of the CEO – i.e., whether they come from inside or outside the firm – has been proposed as an important antecedent (Shen & Cannella, 2002). CEOs from outside the firm are usually hired when firms performing poorly and there is a need for strategic change (Brady & Helmich, 1984). Thus, outside CEOs are likely to initiate a change in the way the TMT is structured and composed. For example, if a CEO used to have a CSO on their previous TMT and is expected to bring strategic change, they may add this role to the TMT. By contrast, outside CEOs rely more heavily on firm-specific information, which is why they may want to retain TMT members from the previous team. CEO outsiders are likely to affect TMT size; however, they can influence TMT size in different directions. The example of Bed, Bath & Beyond illustrates this. When new CEO Mark Tritton was an external hire, he not only restructured the TMT and combined previously separated roles, which decreased the size of the TMT (Bed Bath & Beyond, 2019), but five top executives left the company. CEO outsider is coded as 1 if the CEO is an outsider and as 0 otherwise. Following prior research, CEOs are considered outsiders if they joined the firm within two years before becoming CEO (Hambrick & Cannella, 2004).

Results

Descriptive results

To better understand different types of top management team sizes, we split the TMTs into three size categories, as shown in Table 1. As a robustness check, we also

compared the results of different possible TMT categorization (e.g., based on terciles, quartiles) with each other.

Table 1. TMT size categories.

TMT size	Number of executives	% of total sample
Small TMTs	< 5	14.60
Medium TMTs	5 to 10	64.24
Large TMTs	> 10	21.16

The results are similar across different categorizations. The majority of S&P 500 firms have medium-sized TMTs with five to 10 executives, as Figure 1 also shows. Figure 1, which depicts TMT size against firm size, further demonstrates the variance in TMT size, ranging from two to 21 TMT members.

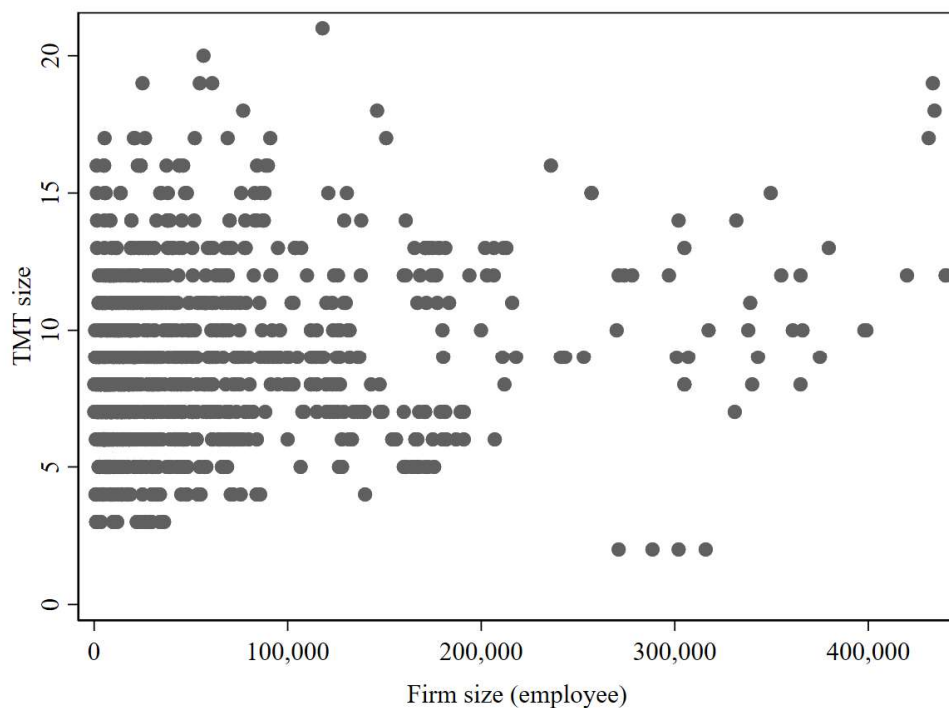


Figure 1. Scatter plot of TMT size against firm size (employees)

Table 2 shows the differences in TMT size (in absolute values, per 1,000 employees and per \$1 billion in sales) across different firm sizes. Overall, the average TMT size in our sample is 8.32 top executives per team. The average TMT size shows only small

differences across different firm sizes, increasing slightly with firm size (7.48 for small firms, 8.05 for medium firms, and 9.16 for large firms). However, when looking at TMT size per 1,000 employees, we observe considerable differences between different firm sizes. TMT size per 1,000 employees is 17 times larger for small than for large firms (TMT size per 1,000 employees: 2.44 TMT members for small firms, 0.48 for medium firms, and 0.14 TMT members for large firms). When looking at TMT size in absolute numbers, TMT size increases with firm size; when looking at TMT size per 1,000 employees, it decreases. Analyzing TMT size per \$1 billion in sales yields similar results as with firm size (per 1,000 employees): Small firms have bigger TMTs with 2.56 top executives per \$1 billion in sales, whereas large firms have only 0.52 TMT members per \$1 billion in sales. In a subsequent analysis (not displayed in the tables to save space), we controlled for the number of employees (TMT size per 1,000 employees) and found that, in large firms, one top executive is responsible for significantly more employees and sales volume (7,143 employees \$1.78 billion in sales) than their counterparts in small firms (410 employees and \$0.4 billion in sales).

In Table 2, we also distinguish between different industries based on two-digit SIC codes: mining, utilities & construction; manufacturing; wholesale trade & retail trade; services; others. We also compare absolute TMT size, TMT size per 1,000 employees, and TMT size per \$1 billion in sales. The differences in TMT size (in absolute numbers) are relatively small (ranging from 7.54 top executives, on average, in mining, utilities & construction to 8.87 in manufacturing). Again, when comparing different industries with each other, the number of TMT members per 1,000 employees and \$1 billion in sales differs substantially. The largest TMT size, both per 1,000 employees and per \$1 billion in sales, is found in mining, utilities & construction, followed by services, then manufacturing, others, and wholesale trade & retail trade (for details, see Table 2).

Table 3 displays the differences in TMT size (in absolute values, per 1,000 employees and per \$1 billion in sales) across firms with different levels of profitability (return on assets/ROA), as well as for diversification (total and unrelated). The average TMT size (absolute) increases slightly with higher levels of ROA and with higher levels of diversification. However, our results show that when controlling for firm size (number of employees) and sales volumes, we see that non-diversified firms have larger TMTs than highly diversified firms, which have smaller TMTs.

Table 2. Descriptive information on TMT size for different firm size and industries.

	Firm size*				Industry				
	All	Fewer than 10,000	10,000 - 30,000	More than 30,000	Mining, Utilities, Construction	Manufacturing	Wholesale Trade & Retail Trade	Services*	Others**
<i>TMT size</i>									
Number of observations	1409	432	412	565	228	660	175	266	80
Arithmetic mean	8.32	7.48	8.05	9.16	7.54	8.87	8.12	7.85	7.99
Minimum	2	3	3	2	3	3	2	3	4
Maximum	21	17	19	21	17	21	20	19	15
Percentiles 10%	5	5	5	5	4	5	5	5	6
50%	8	7	8	9	7	8	8	7	8
90%	12	11	12	13	11	13	12	12	11
<i>TMT size per 1,000 employees</i>									
Number of observations	1409	432	412	565	228	660	175	266	80
Arithmetic mean	0.94	2.44	0.48	0.14	2.77	0.65	0.27	0.67	0.51
Minimum	0.00	0.31	0.10	0.00	0.03	0.03	0.00	0.03	0.03
Maximum	101.27	101.27	1.17	0.44	101.27	6.94	1.43	4.69	2.94
Percentiles 10%	0.07	0.71	0.24	0.04	0.21	0.08	0.03	0.05	0.08
50%	0.40	1.21	0.45	0.12	0.91	0.37	0.19	0.41	0.19
90%	1.71	3.91	0.73	0.27	6.01	1.47	0.70	1.47	1.50
<i>TMT size per \$1 billion in sales</i>									
Number of observations	1409	432	412	565	228	660	175	266	80
Arithmetic mean	1.36	2.56	1.23	0.52	1.57	1.32	0.71	1.69	1.32
Minimum	0.01	0.09	0.03	0.01	0.10	0.01	0.01	0.06	0.17
Maximum	17.94	17.94	4.30	6.86	10.21	12.06	3.57	17.94	12.95
Percentiles 10%	0.16	0.69	0.37	0.09	0.35	0.17	0.08	0.17	0.19
50%	0.89	2.03	1.07	0.39	1.02	0.97	0.37	1.27	0.68
90%	3.09	4.98	2.38	1.14	3.68	2.87	2.13	3.57	2.47

* Firm size was divided into three groups based on terciles.

** "Services" includes: Information; Finance and Insurance; Professional, Scientific, and Technical Services; Administrative and Support and Waste Management and Remediation Services; and Arts, Entertainment, and Recreation; Educational Services; Accommodation and Food Services and Other Services.

** "Others" includes: Agriculture, Forestry, Fishing and Hunting; Transportation and Warehousing; and Health Care and Social Assistance.

Table 3. Descriptive information on TMT size and different return on investment and diversification categories.

	ROA*				Diversification total**			Diversification unrelated***		
	All	Low	Med	High	Zero	Low	High	Zero	Low	High
<i>TMT size</i>										
Number of observations	1409	356	814	398	447	385	823	1007	263	471
Arithmetic mean	8.29	8.11	8.28	8.47	8.06	8.16	8.44	8.18	8.17	8.47
Minimum	2	2	2	3	3	3	2	3	3	2
Maximum	21	19	21	19	17	20	21	18	20	21
Percentiles 10%	5	5	5	5	5	5	5	5	5	5
50%	8	8	8	8	7	8	8	8	8	8
90%	12	12	12	13	12	12	12	12	12	15
<i>TMT size per 1,000 employees</i>										
Number of observations	1409	349	89	382	430	380	804	984	248	455
Arithmetic mean	1.08	2.15	0.72	0.85	2.35	0.66	0.86	1.42	1.55	1.01
Minimum	0.00	0.01	0.00	0.02	0.02	0.01	0.00	0.01	0.00	0.01
Maximum	101.27	101.27	13.16	11.58	101.27	9.15	98.77	101.27	98.77	98.77
Percentiles 10%	0.07	0.08	0.07	0.06	0.08	0.06	0.07	0.08	0.07	0.06
50%	0.40	0.59	0.32	0.46	0.59	0.42	0.34	0.50	0.37	0.28
90%	1.74	2.04	1.48	2.40	3.65	1.38	1.25	2.44	1.59	1.19
<i>TMT size per \$1 billion in sales</i>										
Number of observations	1409	341	811	383	432	382	795	978	250	454
Arithmetic mean	1.37	1.47	1.20	1.65	2.00	1.30	1.09	1.59	1.13	1.12
Minimum	0.01	0.01	0.01	0.01	0.06	0.02	0.01	0.02	0.02	0.01
Maximum	17.94	17.94	11.12	12.95	17.94	7.21	7.83	17.94	7.83	7.83
Percentiles 10%	0.16	0.23	0.14	0.22	0.26	0.13	0.16	0.25	0.09	0.13
50%	0.92	0.94	0.84	1.13	1.15	1.09	0.74	1.06	0.76	0.80
90%	3.11	2.96	2.80	3.68	4.66	2.64	2.47	3.63	2.60	2.48

*ROA: categorization along quartiles. Low < 25%, medium 25–75% and high > 75%

**Diversification – total: low and high were split along the median of diversification.

*** Diversification – unrelated: low and high were split along the 75th percentile (median was still zero).

Table 4. Descriptive information on TMT composition for different TMT size categories.

	<i>TMT outsider (%)</i>				<i>TMT outsider no.</i>			
	All	Small TMT	Medium TMT	Large TMT	All	Small TMT	Medium TMT	Large TMT
	1,409	204	903	302	1,409	204	903	302
Mean	0.27	0.35	0.27	0.23	2.14	1.53	2.05	2.86
Minimum	0.00	0.00	0.00	0.00	0	0	0	0
Maximum	1.00	1.00	1.00	1.00	11	4	11	9
Percentiles 10%	0.00	0.00	0.00	0.00	0	0	0	0
50%	0.23	0.29	0.22	0.18	2	1	2	2
90%	0.60	0.75	0.57	0.50	5	3	5	6

	<i>TMT female (%)</i>				<i>TMT female no.</i>			
	All	Small TMT	Medium TMT	Large TMT	All	Small TMT	Medium TMT	Large TMT
	1,409	204	903	302	1,409	204	903	302
Mean	0.13	0.10	0.13	0.16	1.18	0.44	1.04	2.11
Minimum	0.00	0.00	0.00	0.00	0	0	0	0
Maximum	0.67	0.50	0.67	0.67	8	2	8	6
Percentiles 10%	0.00	0.00	0.00	0.00	0	0	0	0
50%	0.13	0.00	0.13	0.15	1	0	1	2
90%	0.30	0.25	0.30	0.31	3	1	2	4

	<i>TMT age heterogeneity</i>				<i>TMT age average</i>			
	All	Small TMT	Medium TMT	Large TMT	All	Small TMT	Medium TMT	Large TMT
	1,409	204	903	302	1,409	204	903	302
Mean	0.10	0.11	0.10	0.10	53.46	53.87	53.42	53.33
Minimum	0.01	0.01	0.03	0.03	39.5	40.25	39.9	47
Maximum	0.23	0.23	0.23	0.18	74.5	74.5	62.5	61.36
Percentiles 10%	0.06	0.05	0.07	0.07	49.78	48.80	49.70	50.33
50%	0.10	0.10	0.10	0.10	53.44	53.40	53.50	53.37
90%	0.14	0.18	0.14	0.13	57.20	59.00	56.89	56.31

	<i>TMT position tenure heterogeneity</i>				<i>TMT position tenure average</i>			
	All	Small TMT	Medium TMT	Large TMT	All	Small TMT	Medium TMT	Large TMT
	1,409	204	903	302	1,409	204	903	302
Mean	1.01	0.89	1.03	1.03	3.66	5.45	3.43	3.14
Minimum	0.00	0.00	0.00	0.00	0.11	0.20	0.11	0.23
Maximum	3.61	2.24	3	3.61	33.00	33.00	13.71	13.36
Percentiles 10%	0.52	0.32	0.54	0.65	1.17	1.25	1.167	1.15
50%	0.94	0.83	0.95	0.97	3.14	4.00	3.14	2.87
90%	1.56	1.48	1.65	1.45	6.33	10.80	5.89	5.55

	<i>TMT firm tenure heterogeneity</i>				<i>TMT firm tenure average</i>			
	All	Small TMT	Medium TMT	Large TMT	All	Small TMT	Medium TMT	Large TMT
	1,409	204	903	302	1,409	204	903	302
Mean	0.64	0.60	0.64	0.66	14.33	13.85	13.97	15.72
Minimum	0.00	0.05	0.00	0.00	1.00	1.00	1.00	1.00
Maximum	1.80	1.32	1.80	1.80	35.50	35.50	35.50	35.50
Percentiles 10%	0.31	0.28	0.30	0.37	6.66	6.50	6.33	8.33
50%	0.61	0.57	0.61	0.63	13.33	12.40	13.00	15.43
90%	1.01	0.99	1.03	0.99	24.00	23.40	23.88	24.18

Table 5. Descriptive information on TMT structure measures for different TMT size categories.

	<i>Ratio general managers</i>				<i>General managers per TMT in no.</i>			
	All	Small TMT	Medium TMT	Large TMT	All	Small TMT	Medium TMT	Large TMT
	1,409	204	903	302	1,409	204	903	302
Mean	0.29	0.13	0.30	0.38	2.35	0.49	2.03	4.54
Minimum	0	0	0	0	0	0	0	0
Maximum	1.00	0.75	1.00	1.00	16	3	7	16
Percentiles 10%	0.00	0.00	0.00	0.18	0	0	0	2
50%	0.30	0.00	0.33	0.36	2	0	2	4
90%	0.60	0.50	0.60	0.60	5	2	4	8
	<i>Ratio functional managers</i>				<i>Functional managers per TMT in no.</i>			
	All	Small TMT	Medium TMT	Large TMT	All	Small TMT	Medium TMT	Large TMT
	1,409	204	903	302	1,409	204	903	302
Mean	0.71	0.87	0.70	0.62	5.97	3.98	5.67	8.24
Minimum	0.00	0.25	0.00	0.00	1	2	1	1
Maximum	1.00	1.00	1.00	1.00	14	5	10	14
Percentiles 10%	0.40	0.50	0.40	0.40	3	3	4	6
50%	0.70	1.00	0.67	0.64	6	4	6	8
90%	1.00	1.00	1.00	0.82	9	5	8	11
	<i>TMT hierarchical levels</i>							
	All	Small TMT	Medium TMT	Large TMT				
	1,409	204	903	302				
Mean	3.2	2.9	3.2	3.4				
Minimum	2	2	2	2				
Maximum	5	5	5	5				
Percentiles 10%	2	2	2	2				
50%	3	3	3	3				
90%	4	4	4	4				

To better understand the characteristics of different TMT size groups, we included several classical TMT composition characteristics in our descriptive analysis, as shown in Table 4: outsider executives, female executives, age heterogeneity and average, position tenure heterogeneity and average, and firm tenure heterogeneity and average. *TMT outsider (%)* indicates the percentage of top executives on the TMT from outside the firm and *TMT outsider average* is the average number of top executives on the TMT from outside the firm. The descriptive results show that small TMTs have, on average, a higher percentage of outsiders (35%) than medium (27%) and large (23%) teams, which translates into around 1.53 outsiders for small, 2.05 for medium, and 2.86 for large TMTs. The *percentage of female top executives* is low across all sizes and ranges from 10% for small TMTs to 13% for medium and 16% for large TMTs, which translates into 1.18 female top executives on average per TMT. Concerning average age, we see that TMTs have similar average ages (53.5 years). Position tenures differ across TMT size, with managers staying longer in their positions in smaller teams (5.45 years) than in medium (3.43 years) and large (3.14 years) teams. Regarding firm tenures managers have worked

longer in the firm when they are in larger teams (15.72 years) than in medium (13.97 years) and small teams (13.85 years).

To improve our understanding of the characteristics of different TMT size categories, we include the following TMT structural characteristics in Table 5: ratios of general manager roles (GM) and functional manager roles (FM), as well as the number of hierarchical levels. The *ratio general manager* indicates how many general managers are on the team, while *general managers per TMT in numbers* indicates the average number of general managers on the team. The *ratio functional managers per TMT* indicates how many functional managers are on the team, while *functional manager per TMT in numbers* shows the average number of functional managers on the executive team. Regarding the ratios of GMs per TMT, small TMTs have only 13% general managers on their team, which means they are largely functionally structured (FM: 87%). However, medium-sized TMTs have fewer general managers (GM: 30%) and more functional managers (FM: 70%), similarly to large TMTs – 38% of which consist of general managers, with functional managers making up 62%. *TMT hierarchical levels* measures the average number of hierarchical levels based on the titles of top executives. We also learn that larger TMTs have more hierarchical levels. On average, TMTs have 3.2 hierarchical levels, ranging from 2.9 for small TMTs, 3.2 for medium, and 3.4 for large teams. Table 6 summarizes the main findings of the descriptive analysis.

Table 6. Characteristics of small, medium, and large TMTs.

Small TMTs (2–5 top executives)	Medium TMTs (6–10 top executives)	Large TMTs (11–21 top executives)
• 1.5 outsiders (35%) • 0.5 women (10%) • 53.9 years average age • 5.5 average position tenure • 13.9 years average firm tenure • 0.5 general managers (13%) • 4 functional managers (87%) • 2.9 hierarchical levels • Examples: Tripadvisor and Alphabet	• 2 outsiders (27%) • 1 woman (13%) • 53.4 years average age • 3.4 average position tenure • 14 years average firm tenure • 2 general managers (30%) • 5.7 functional managers (70%) • 3.2 hierarchical levels • Examples: Nike and Walmart	• 2.9 outsiders (23%) • 2 women (16%) • 53.3 years average age • 3.1 average position tenure • 15.7 years average firm tenure • 4.6 general managers (38%) • 8.1 functional managers (62%) • 3.4 hierarchical levels • Examples: 3M and Procter & Gamble

Determinants of TMT size

To explore the antecedents of TMT size, we used random-effects GLS regression, and to verify our analysis, we calculated fixed-effect regressions. We tested for normal distribution, which was supported. To support causality, all independent variables are lagged by one year. Table 7 summarizes correlations of all variables and shows that all correlations are below 0.44, indicating that multicollinearity was not a problem in our analysis. Table 8 shows the results of the analysis of TMT size determinants. Model 1 contains determinants on the environmental level, Model 2 on the firm level, and Model 3 adds variables on the CEO level and is the complete model. We find consistent results if we put the set of variables individually or collectively into the regression. Below, betas and p-values are reported for the full model (Model 3).

First, the environmental variables – industry sales, industry sales instability, and industry concentration – are not significant across all models. Second, on the firm level, we find a significant positive effect on firm size across all models (Model 3: $\beta = 0.623$; $p < 0.001$). Prior firm performance (in terms of ROA) does not have a significant effect on TMT size. We find a significant positive effect for firm sales growth across all models (Model 3: $\beta = 0.167$; $p < 0.05$). Firm diversification (total and unrelated) does not have a significant effect on TMT size. TMT horizontal interdependence, an indicator for functional structure, is strongly negatively related to TMT size (Model 3: $\beta = -0.59$; $p < 0.001$). This means the more functionally structured a TMT/firm is, the smaller the TMT size will be. TMT vertical interdependence, which indicates a firm's hierarchical structure, does not have a significant effect on TMT size. Third, at the CEO level we find no significant effects for CEO duality, CEO position tenure, CEO outsider, and CEO succession.

Table 7. Correlation table coefficients.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.00														
2	-0.03	1.00													
3	-0.05	0.61 ***	1.00												
4	0.01	-0.07 *	-0.02	1.00											
5	0.24 ***	-0.11 ***	-0.04	0.25 ***	1.00										
6	0.02	0.00	0.07 *	-0.09 **	-0.01	1.00									
7	-0.05	0.07 *	0.02	-0.01	-0.08 **	0.12 ***	1.00								
8	0.09 **	0.01	-0.05	-0.03	0.19 ***	-0.06 *	-0.07 *	1.00							
9	0.06 +	0.08 *	0.03	-0.01	0.19 ***	-0.09 **	-0.08 **	0.37 ***	1.00						
10	-0.39 ***	0.02	0.09 **	0.08 **	-0.12 ***	0.04	0.09 **	-0.17 ***	-0.13 ***	1.00					
11	-0.08 **	0.14 ***	0.04	0.01	-0.04	-0.08 **	-0.02	-0.05	0.03	-0.04	1.00				
12	0.10 ***	-0.03	-0.10 **	0.00	0.13 ***	-0.03	-0.01	0.10 ***	0.10 **	-0.09 **	-0.08 **	1.00			
13	-0.16 ***	-0.04	0.01	-0.01	0.01	0.10 **	0.04	0.03	0.04	0.06 *	-0.13 ***	0.19 ***	1.00		
14	-0.02	-0.07 *	-0.01	0.02	0.07 *	0.06 +	-0.02	-0.04	-0.02	0.00	-0.01	-0.11 ***	-0.10 ***	1.00	
15	-0.11 ***	0.08 **	0.05	-0.03	-0.07 *	-0.13 ***	0.08 **	-0.10 ***	-0.08 **	0.11 ***	0.06 *	-0.01	0.26 ***	-0.10 *	1.00
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001															
1	TMT size					6	Prior firm performance					11	TMT vertical interdependence		
2	Industry sales instability					7	Firm sales growth					12	CEO duality		
3	Industry sales growth					8	Firm diversification (total)					13	CEO position tenure		
4	Industry concentration					9	Firm diversification (unrelated)					14	CEO succession		
5	Firm size					10	TMT horizontal interdependence					15	CEO outsider		

Table 8. Results of random-effects GLS regression analyses for TMT size.

	Model 1	Model 2	Model 3
Constant	8.476 *** 0	2.061 -0.11	2.461 -0.054
Industry sales instability	-0.149 -0.912	0.154 -0.908	0.246 -0.857
Industry sales growth	1.317 -0.216	1.108 -0.29	1.047 -0.303
Industry concentration	-0.00147 -0.868	-0.00607 -0.471	-0.00616 -0.453
Firm size (employees)		0.639 *** 0	0.623 *** 0
Prior firm performance (ROA)		0.759 -0.37	0.767 -0.373
Firm sales growth		0.165 * -0.035	0.167 * -0.036
Firm diversification (total)		-0.00707 -0.687	-0.00845 -0.629
Firm diversification (unrelated)		-0.385 -0.18	-0.391 -0.168
TMT horizontal interdependence		-0.583 *** 0	-0.59 *** 0
TMT vertical interdependence		0.0255 -0.815	-0.00599 -0.959
CEO chairman			-0.0361 -0.886
CEO position tenure			-0.0171 -0.436
CEO succession			-0.103 -0.882
CEO outsider			-0.473 -0.193
N	767	767	767
N_g	279	279	279
chi2	1.579	62.21	79.89
p	0.664	1.38E-09	2.96E-11

p-values in parentheses

* p<0.05, ** p <0.01, *** p<0.001

Discussion

This study set out to explore what characterizes differently sized TMTs and what drives their size. As discussed below, our exploratory study's contribution is mainly empirical. It increases our understanding of the phenomenon of varying TMT size and informs us about the drivers of TMT size. It outlines opportunities for future studies and encourages the next step of theory-testing studies to enhance our knowledge of different aspects of TMT size.

Interpretation of the findings

Our first insights are drawn from the descriptive analysis. We observe that the average TMT size is 8.3 and that almost two-thirds of S&P 500 firms have medium-sized TMTs. The average TMT size in absolute numbers is relatively stable across different firm sizes, industries, profitability, and levels of diversification. However, when controlling for the number of employees (TMT size per 1,000 employees), the TMT size differs significantly depending on firm size, industry, profitability (in terms of ROA), and diversification. Specifically, we find that smaller firms have 20 times more executives per 1,000 employees and four times more executives per \$1 billion in sales (when controlling for sales volume) than larger firms do. This means that in large firms, one TMT member is responsible for considerably more employees than in small firms (one top executive responsible for 7,143 employees in large firms and 352 employees in small firms) and also for larger sales volumes (one top executive responsible for \$1.78 billion in sales volume in large firms and for \$0.4 billion in sales volume in small firms). These results demonstrate that even though top executives in small firms are more expensive in relative terms, in absolute terms firms seem to require a certain number of TMT members to operate successfully. When looking at the industry differences and controlling for firm size, we see that certain industries, like mining, utilities, and construction, have fewer top executives per 1,000 employees than manufacturing, for example. This means that in the more people-intense industries like manufacturing and wholesale trade & retail, a top executive is responsible for many more employees than their counterparts in mining, utilities, and construction.

When looking at TMT size per 1,000 employees and splitting firms across different levels of profitability (in terms of ROA) (Table 3), we find that less profitable firms also have larger TMTs (2.15 top managers, on average, per 1,000 employees), whereas highly

profitable firms have less than half (0.85 top managers, on average, per 1,000 employees). Together, these results suggest it is more expensive for small firms to have top executives. Our finding that highly profitable firms (i.e., with a high ROA) have neither the largest nor the smallest number of top executives per 1,000 employees indicates that a larger TMT (TMT per 1,000 employees) is not necessarily performing better. The finding that firms with no diversification have larger TMTs per 1,000 employees than highly diversified ones suggests that tasks in non-diversified firms may be more centralized at the TMT level, whereas highly diversified firms are likely to perform these tasks more on the business unit level (Hambrick & Cannella, 2004; Hill & Hoskisson, 1987).

Controlling for firm size (TMT size per 1,000 employees) and sales volume (TMT size per \$1 billion in sales) shows that TMT size differs depending on firm size, industry, profitability (in terms of ROA), and diversification, albeit less when controlling for sales volume. This finding underlines the importance of controlling for firm size when studying TMT size and suggests that the number of employees can explain differences in TMT size better than sales volume.

While the size of TMT varies significantly (from two to 21 members), we do not find large differences in the demographic composition (number of outsiders, female executives, position and firm tenure heterogeneity, and age heterogeneity and averages), but there are some interesting nuances. Intuitively, we would expect demographic heterogeneity to increase with TMT size. Our findings show, however, that this is not the case in general, but it depends on each demographic aspect. On average, the percentage of outsiders decreases with TMT size, while the absolute number of outsiders increases. This means that larger TMTs recruit more outsiders than smaller TMTs. Larger TMTs with more roles probably need to rely on outsiders because the pool of internal candidates might be limited. While the percentage of female managers is low across all TMT sizes, it increases slightly with TMT size (on average). The ages of top managers in TMTs are relatively widely distributed, with the oldest above 70 and the youngest under 40; however, TMT age heterogeneity and average age do not differ meaningfully across TMT sizes. Our results indicate that 80% of top managers are between 50 and 57 years old, with women comprising an average of 13% of top managers, which is in line with prior research that top management jobs are mostly performed by older men (Richard & Shelor, 2002). We conclude that gender and age diversity are not a matter of TMT size.

This is surprising because one would expect larger TMTs to have more variety with regard to composition as they simply have more “spots” on the team that can be filled by executives with a different demographic profile.

The differences in TMT position tenure heterogeneity and firm tenure heterogeneity are small across TMT sizes, but the averages of position tenure and firm tenure differ depending on TMT size: In smaller TMTs, top executives stay longer in their position than in medium and large TMTs, and in smaller TMTs top executives have shorter firm tenures than in medium and large TMTs. This means that, on average, top executives advance into the top positions sooner in smaller TMTs without needing to stay in the focal firm as long as top executives advancing to larger TMTs. A subsequent analysis (not displayed to save space) shows that, on average, top executives enter their top position in a small TMT after serving 8.5 years in the firm, compared with 10.4 years in medium-sized TMTs, and 12.6 years in large TMTs. A possible explanation for why top executives in small TMTs enter the top position more than four years earlier than in larger TMTs could be that smaller TMTs usually steer smaller firms, and in smaller firms employees face less competition and a smaller talent pool to fill the top positions than in large firms. In large firms, competition for top positions might be higher, and it might be more difficult and take longer for employees to climb the corporate ladder. In smaller TMTs, top executives stay longer in their position than in larger TMTs. This can be explained from a resource-based theory perspective, which assumes that a firm’s strategic decisions and activities are a function of the shared experience of top executives (Kor, 2006; Mahoney, 1995; Penrose, 1959). Since smaller teams have fewer resources on the TMT, it might be more important for them to retain these valuable resources for longer.

Regarding TMT structure, we observe significant differences across TMT sizes. The smaller TMTs are, the more functionally structured they are, whereas larger TMTs have higher numbers and ratios of general managers. The number of hierarchical levels also increases with size. These findings show that TMT structure matters for TMT size and suggest that, depending on their size, TMTs need to be structured differently. Notably, we observe more differences in the structure of TMTs than in their demographic composition when analyzing different TMT sizes.

The next insight refers to the determinants of TMT size. The regression results indicate that when deciding about TMT size, environmental conditions seem to matter

less than firm characteristics. The environmental variables tested in our study – industry instability, industry sales growth, and industry concentration – do not determine TMT size. These environmental factors are frequently used in prior research; however, since all were non-significant, it would be worthwhile for future studies to further investigate whether other environmental conditions matter more for TMT size or whether we can conclude that environmental conditions matter less for structural decisions. Our finding is in line with prior studies of structural and size decisions. For example, Menz and Barnbeck (2017) find that environmental conditions matter less for decisions involving the size of corporate development and strategy function size. Also, Nath and Mahajan (2008) and Hambrick and Cannella (2004) find that industry characteristics do not influence having a chief marketing officer (CMO) or a COO, which are factors that could lead to increased TMT size.

However, our study reveals that firm size and firm sales growth are positively associated with TMT size and suggests that larger firms and growing firms require larger TMTs to cope with their complexity. This finding supports an information-processing perspective for explaining TMT antecedents and is in line with Carpenter and Sander's (1998) findings that firms cope with complexity (resulting from internationalization) by increasing TMT size, along with higher CEO long-term pay and a separation between the roles of CEO and chair of the board. We suggested that larger firms may be able to afford larger TMTs. However, prior firm performance does not have a significant effect on TMT size, which indicates that firm performance does not influence decisions about TMT size in general. Hambrick & D'Aveni (1992) find that failing firms abruptly shrank their TMTs, so in the extreme case of failing, firms could be forced to decrease the size of their TMTs. For the firms in our sample, the substantial costs of top executives do not seem to play a big role, unlike in failing firms.

Furthermore, the results of our study show that firm diversification (total and unrelated) is not related to TMT size. Interestingly, Guadalupe et al. (2014) find firm diversification (unrelated) to positively influence TMT size change overall (positive effect on general managers, negative effect on product functional managers, and no effect on admin functional). The fact that we explore TMT size overall, while Guadalupe et al. (2014) explore the change of TMT size and differentiate roles, might explain our different

findings. Other reasons might be the differences in TMT size definition,⁶ different sample, and different time of study. The time period of the sample of Guadalupe et al. was characterized by corporate restructuring (Ruigrok, Pettigrew, Peck, & Whittington, 1999) – specifically, a major reduction in firm diversification. Informed by prior research (Menz, 2012) that TMTs are affected by changes in organizational structure, this could be another reason why Guadalupe et al. (2014) find a positive relationship between diversification and TMT size change.

Our study discovers that TMT horizontal interdependence, which essentially reflects the degree of functional structure, is negatively related to TMT size. This means that the more horizontally interdependent or functionally structured TMTs are, the smaller they will be (also shown in our descriptive data). Guadalupe et al. (2014), by contrast, explain the growth of TMT size with the phenomenon of firms adding functional roles to the TMT, which they call “functional centralization.” Again, Guadalupe et al. (2014) and our study explore differing constructs, namely TMT size vs. TMT size change. But it is still important to consider both studies together. A comparison between these studies shows that the drivers for TMT size and the change in TMT size need to be explored separately because their drivers are different and time periods play an important role. Furthermore, these findings show it is worthwhile not only to consider diversification, which reflects a firm’s strategy, but also to explore TMT structures as proxies for organizational design. Diversification and horizontal and vertical interdependence are important variables for TMT studies, and studying them can help to answer open questions.

Our study does not find support for CEO characteristics influencing TMT size. Based on a power-theory perspective, we expected that CEOs who are also COB and have been in their position for a long time would be able to influence TMT size. Power-theory arguments are not supported, and our study shows that CEOs considered to be more powerful are limited in how much they can influence TMT size. Also, despite our expectation that CEO successions and CEO outsiders would influence TMT size, we did not identify a significant relationship. This can be explained, at least in part, by the

⁶ Our study defines TMT size as “executives with vice president title or above.” Guadalupe et al. (2014) define it as the team that “reports directly to the CEO.”

observations of Ma and Seidl (2018), who find that new CEOs are initially often constrained in reconfiguring their TMT. The study shows that CEOs may lack the power to change both TMT composition (e.g., a focal TMT member may have a powerful relationship with a board member, and the CEO cannot change that TMT member's position) and TMT structure (e.g., the board prohibits the creation of new roles). For studies focusing on the change of TMT composition and TMT structure, both our findings and the study of Ma and Seidl (2018) underline CEOs' limitations and the importance of the board. Overall, our study demonstrates that the information-processing perspective mostly explains the differences and determinants of TMT size, while power-theory arguments are not supported.

Contributions

Scholarly interest in changing top management team structures has increased recently (see Article I of this dissertation). Presumably, the reason is that TMT structures, specifically regarding size, have changed significantly over the past few decades (Guadalupe et al., 2014). Our study's contribution is mainly empirical as it increases our understanding of the characteristics of different TMT sizes and the factors that influence TMT size.

Our study contributes to upper echelons theory and, more specifically, to the literature on TMT size, which has focused on the outcomes of TMT size in the past (Amason & Sapienza, 1997; Boeker, 1997; Eisenhardt & Schoonhoven, 1990; Halebian & Finkelstein, 1993; Henderson & Fredrickson, 1996; Iaquinto & Fredrickson, 1997; Plambeck & Weber, 2010; Simsek et al., 2005). We complement this research by increasing our knowledge and understanding of how TMTs of different sizes are designed and by demonstrating what drives TMT size. As the first study to analyze the determinants of TMT size on three levels (environment, firm, and CEO), our study establishes that firm size, firm sales growth, and TMT horizontal interdependence determine TMT size.

Specifically, we add to the study of Sander and Carpenter (1998), who find support for their arguments that TMTs deal with complexity arising from internationalization and firm governance by increasing TMT size. Our study supports this information-processing perspective since we find that firm size and firm sales growth, which bring complexity, are related to TMT size. However, the environmental conditions, which matter from an

information-processing perspective, are not supported. Also, we contribute more to our understanding of diversification and TMT size. Guadalupe et al. (2014) find that diversification influences TMT size change positively, but we find no effect on TMT size. While several factors may explain this, the time observed in their study was characterized by a “significant reduction in firm diversification” (Guadalupe et al., 2014: 2). This underlines that firm diversification strategies and TMT structures go through periods of change.

We also contribute to the CEO literature – specifically, to CEO duality and succession literature. The lack of support for any CEO-level variable appears to show that CEO characteristics do not play such a big role in decisions about TMT size. We had expected that new CEOs (outsiders and insiders) would influence TMT size, but that was not the case, a finding that is in line with Ma and Seidl (2018), who wrote that new CEOs face constraints in changing TMT structures (Ma & Seidl, 2018).

Given that there are more differences in TMT structural characteristics than in TMT composition when comparing different TMT sizes with each other, our study confirms the importance of distinguishing between TMT structure and composition and the potential explanatory power of TMT structures as highlighted by Hambrick et al. (2015).

The design of our study did not focus on one theoretical lens and, therefore, did not limit our choice of variables and explanations for the determinants of TMT size. Beyond the empirical findings, our study also contributes by emphasizing multiple approaches explaining the determinants of TMT size. As discussed above, we provide explanations for our findings and non-findings from two different theoretical perspectives: information processing and power theory. We contribute to each of these theories and encourage further research with formal hypothesis testing by using one or competing theoretical lenses, as well as other research methods. Specifically, our study contributes to information-processing theory as it shows that for TMT size, the complexity arising from organizational design and firm characteristics seems to matter more than environmental complexity.

Practical implications

The results of our study offer guidance to business practitioners – particularly CEOs – designing their TMT and deciding about its size. Our study informs business practitioners that TMTs need to have a certain number of top executives. While

environmental conditions do not seem to matter for the size of the TMT, certain firm characteristics do: large and growing firms require large TMTs. Through our, and prior TMT size research, practitioners may recognize and acknowledge that “TMT size matters”. Furthermore, it encourages and enables CEOs to benchmark their TMTs with firms of similar characteristics and conditions and with competitors. Through this benchmarking, CEOs may realize whether their TMTs are structured the same way as competitors or whether they might have unique, possibly advantageous TMT structures. Business practitioners and CEOs may reflect about how they have adjusted TMT size, or more generally TMT structure, in the past. They may ask themselves who and what triggered decisions about TMT size (e.g., environmental conditions, change in firm characteristics or change in firm strategy) and compare it to our findings. For example, CEOs may reflect how dynamically they may or may not have reacted to changes of the environment or to adjustments of corporate strategy. Based on this benchmarking, business practitioners and CEOs can evaluate the decisions and processes retrospectively and thus learn for the future.

Furthermore, our findings may help CEOs who intend to change the TMT structure, in particular its size. While we expected that the characteristics of a CEO would play a role in their ability to influence TMT size, we did not find significant effects for any of the CEO variables. Our findings suggest that being a chair of the board, holding a position for a long time, or being an external hire does not make it easier or more difficult to change the TMT structure. This means that CEOs who are not chair of the board and do not have a long tenure at the firm, or are not external hires, must not be discouraged to influence TMT structures. Their influence over TMT structures seems to be no different from that of CEOs who have these putatively powerful characteristics.

For individuals aiming to reach top executive positions, it might be useful to know that executives reach these positions sooner in firms with smaller TMTs than in firms with large TMTs. Also, on average, executives in small TMTs remain longer in their positions. Aware of these findings, it is important for CEOs to avoid undesirable outcomes such as TMT members keeping the size of the TMT artificially small by opposing TMT size increase in order to keep their positions longer.

Limitations and future research

The findings of our study need to be viewed in the context of its limitations, which offer fruitful avenues for future research. First, we acknowledge that the main point of concern regarding our study is potential issues with endogeneity caused by reverse causality or simultaneity between our dependent and independent variable (Wooldridge, 2003). For example, firms that perform well might be able to afford a larger TMT, and firms with a larger TMT might perform better. As recommended by the literature, we addressed this concern by lagging independent variables (Boppel, 2013; Greene, 1997). Endogeneity is also a concern for the TMT variables; however, solving this issue is beyond the scope of our study and leaves room for future research.

Second, the list of antecedents our study explores is non-exhaustive and offers several opportunities for future research. For example, our study did not find support for several CEO characteristics; informed by the work of Ma and Seidl (2018) regarding the obstacles new CEOs face, we find it a promising avenue for future research to study how boards of directors influence TMT size. Our study did not find support for environmental measures having an impact on TMT size. Even though we tested two common and established environmental dimensions, for future studies it is worth exploring other environmental conditions that may play a role in TMT size – both as antecedents and as moderators. This would enable us to conclude whether or not environmental conditions play a role in TMT size or – more broadly – TMT structures. Furthermore, it would be interesting to explore additional firm characteristics, like the ownership and legal structures, as well as the organizational structures. Exploring Mintzberg's five organizational structure types and TMT size is a promising avenue for future research and highly relevant for practitioners to benchmark their organization (Mintzberg, 1993). Furthermore, firms' strategic engagement, like acquisition and alliance activities, might also have an impact on TMT size. Firms that have acquired other firms and merged may increase the TMT to manage the newly merged firms.

Third, additional research methods would certainly enrich and develop our understanding of TMTs. Future research may use other methods like surveys and interviews to explore the dimensions playing into decision-making that are not easily observed. Interviews, in particular, would allow moving beyond the proxies our study relied on, namely observable CEO and TMT characteristics. Furthermore, since

regression analysis is limited to two- or (at most) three-way interactions and TMT size decisions might be more complex than direct effects or interactions, configurational analysis may offer promising research methods to explore the phenomenon further. Studying the constellation of multiple variables will explain decisions about TMT size more comprehensively.

Fourth, the next step after an exploratory study is replication studies and theory testing (Helfat, 2007). Our study introduced a categorization of different TMT sizes. Future studies may contribute by further validating these categories and studying the performance effects of different TMT size groups. Also, since our study is limited to the context of large US firms, replication studies in other cultural and firm contexts (e.g., smaller firms, younger firms) would enrich our knowledge.

In light of the exploratory character of our study, the concerns regarding potential endogeneity, and the limitations of our sample, we recommend taking our results and interpretations as suggestions and hope to motivate future research. Both for researchers and practitioners, the most important question is how the optimal TMT size can be determined. Our study and the outlined research opportunities will contribute to answering this question.

Conclusion

In conclusion, this study suggests that TMT and CEO characteristics seem to matter in TMT size decisions, while environmental factors do not. Furthermore, it proposes that TMTs of different sizes vary more in their structure than in their composition. Our study indicates that firms require a certain number of TMT members. We hope our study will help managers design and benchmark their TMTs for others of the same size and that it enhances CEOs' understanding of the conditions when and how to (re)design the structure of their TMT. We are confident that our study will motivate further research in this field.

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APPENDIX

Variable overview.

- 1 **TMT size.** Measured as all executives with a vice president title or above as reported in the firm's Form 10-K.

Environment

- 2 **Industry sales instability.** Calculated as the standard deviation of the median sales growth of the respective three-digit SIC industry in years t-1 and t.
- 3 **Industry sales growth.** Calculated as the average sales growth of the three-digit SIC industry over the past three years.
- 4 **Industry concentration.** Calculated as the four-firm market concentration ratio with each three-digit SIC code segment in t-1.

Firm

- 5 **Firm size.** Measured as the logarithm number of employees.
- 6 **Prior firm performance.** Measured as return on assets (ROA) in t-1.
- 7 **Firm sales growth.** Measured as the percentage change in sales from year t-1 to year t.
- 8 **Firm diversification (total).** Calculated using SIC codes based on Palepu's (1985) entropy measure.
- 9 **Firm diversification (unrelated).** Calculated using SIC codes based on Palepu's (1985) entropy measure.
- 10 **TMT horizontal interdependence.** Calculated by standardizing and averaging (1) the proportion of executives with titles that indicate primarily a functional role and (2) a dummy variable coded as 1 when the TMT consists only of functional executives and 0 otherwise.
- 11 **TMT vertical interdependence.** Calculated by standardizing and averaging two indicators for each year and then reversing them: (1) The number of distinct hierarchical levels was created by counting the number of title gradations in the TMT each year (always including a CEO, and a TMT could also include a COO, EVPs, SVPs, and possibly even VPs), and (2) the presence of a COO reflected whether there was this additional level in the TMT.

TMT compositional measure

- 12 **TMT position tenure heterogeneity.** Calculated as the standard deviation of the TMT's position tenure divided by the mean.
- 13 **TMT position tenure average.** Measured as the average position tenure of the TMT members.
- 14 **TMT firm tenure heterogeneity.** Calculated as the standard deviation of the TMT's firm tenure divided by the mean.
- 15 **TMT firm tenure average.** Measured as the average firm tenure of TMT members.
- 16 **TMT age heterogeneity.** Calculated as the standard deviation of the TMT members' ages divided by the mean.
- 17 **TMT age average.** Measured as the average age of TMT members.

TMT structural measures

- 18 **Ratio general managers.** Measured as the number of general managers divided by TMT size.
- 19 **General managers per TMT in numbers.** Measured as the average number of general managers per TMT.
- 20 **Ratio functional managers.** Measured as the number of functional managers divided by TMT size.
- 21 **Functional managers in numbers.** Measured as the average number of functional managers per TMT.

CEO

- 22 **CEO duality.** Calculated using a dummy variable coded as 1 if the CEO was also chair of the board in a given year and 0 otherwise.
- 23 **CEO position tenure.** Measured as the position tenure of CEOs.
- 24 **CEO succession.** Calculated using a dummy variable coded as 1 if the CEO changed in a given year and 0 otherwise.
- 25 **CEO outsiders.** Calculated using a dummy variable coded as 1 if the CEO was an outsider and 0 otherwise.