RISK INFLUENCES OF CEO-DEPENDENT TOP MANAGERS

CO-OPTION AND THE COST OF EQUITY CAPITAL

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Abstract:

This thesis aims to explore the research gap in existing literature on top management connectedness toward the CEO, from the perspective of equity stakeholders of the firm. It sheds light on how equity investors perceive firms with executives that are co-opted by the current CEO, in terms of firm risk. The thesis contributes to the existing equity capital markets and corporate governance literature by examining the association between top management team (hereafter, TMT) co-option, defined as the proportion of a firm's top management team that has been appointed during the current CEO's tenure, and the cost of equity capital, estimated on an ex-ante basis. Using data on U.S. firms between 1996-2020, through an OLS regression analysis, we find TMT co-option to be positively associated with the cost of equity capital. The findings support the notion that TMT co-option increases the perceived firm riskiness, resulting in equity investors requiring a higher risk premium. These findings are robust when testing an alternative measure of TMT co-option and controlling for CFO co-option. Furthermore, through a cross-sectional analysis, we distinguish between firms with high vs. low quality of corporate governance and do not find any significant difference in the coefficients for the relation between TMT co-option and the cost of equity capital.

Keywords:

Top management team co-option, ex-ante cost of equity capital, firm risk, corporate governance

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Contents

1. INTRODUCTION 4

2. PREVIOUS LITERATURE 8

2.1. TMT influence and co-option 8

2.2. Corporate governance 11

2.3. Equity investors' perspective on firm risk 13

2.4. Corporate governance and the cost of equity capital 13

3. HYPOTHESES 16

4. RESEARCH DESIGN 19

4.1. OLS regression models 19

4.2. Variables 20

4.2.1. Cost of equity capital 20

4.2.2. TMT co-option 21

4.2.3. Control variables 22

5. DATA SAMPLE 26

6. EMPIRICAL RESULTS 29

6.1. Descriptive statistics 29

6.2. Correlation analysis 30

6.3. Main results 32

6.4. Additional analyses 36

6.5. Robustness checks 39

6.5.1. Alternative measure of TMT co-option 39

6.5.2. CFO co-option 40

6.6. Endogeneity 41

7. CONCLUSIONS 42

8. REFERENCES 44

9. APPENDIX 51

1. Introduction

"A key to achieving success is to assemble a strong and stable management team"

– Vivek Wadhwa[1]

It is well known among both practitioners and researchers that a well-composed TMT and stringent monitoring are crucial to prevent CEOs of firms that are publicly traded on capital markets to take detrimental actions, such as fraud and earnings management, at the expense of their shareholders. In the absence of that, CEOs may act in a manner that promotes personal gain rather than serving the shareholders of the firm (Landier et al., 2013). One example is recent events in the global technology firm Samsung. The company has come under scrutiny by the media due to the continuous hiring of family members to both the TMT and board of directors, which has been linked to bribery, embezzlement, and perjury, with suboptimal outcomes for shareholders of the firm (Choi, 2001). Following a recent prison scandal, Jay Y. Lee, grandchild of the Samsung founder, promised to improve shareholder value by turning to the most competent professional managers instead of hiring friends and family (Ricker, 2020).

To successfully create shareholder value, a competent and diverse TMT and board of directors are crucial. Previous research has shown that independent top managers, with dissimilar perspectives and norm-challenging opinions, enhance governance and guide the decisions made by the CEO to be more shareholder-friendly (Landier et al., 2009). However, the CEO is often involved in hiring immediate subordinates, potentially resulting in an appointment-based interdependency (Khanna et al., 2015). The academic literature suggests that a widely co-opted TMT, defined as the proportion of a firm's TMT that has been appointed during the current CEO's tenure, diminishes the effectiveness of internal controls (Campbell et al., 2022), impairs corporate performance (Landier et al., 2013), and heightens the risk of corporate fraud (Khanna et al., 2015). However, prior literature addressing the implications of TMT co-option has primarily focused on internal factors such as decision-making and corporate investments. What is yet scarcely

[1] Vivek Wadhwa is a well-known academic and entrepreneur, academically affiliated with Harvard Law School, Carnegie Mellon University, Emory University, Duke University, Stanford Law School, UC Berkeley, and Singularity University. In 2015, as an example of his numerous recognitions, he was recognized by The Financial Times as among "top men worth emulating", ranking number two on the list.

researched is the perception of external parties on TMT co-option. Campbell et al. (2022) pioneer the research on external stakeholders' perspectives by finding evidence for higher audit prices as an effect of increased audit effort and heightened litigation risk associated with TMT co-option. Hence, examining the perspectives on TMT co-option by external parties even further by investigating its impact on additional stakeholders is highly relevant for the accounting literature.

As far as our knowledge goes, no previous research has been dedicated to exploring how TMT co-option is perceived by equity investors in terms of firm risk, specifically the potential interplay between TMT co-option and the cost of equity capital. However, the association between board co-option and the cost of equity capital has been studied by Bhuiyan et al. (2021). They find board co-option to be negatively associated with the cost of equity capital, which is an unexpected result based on literature suggesting that board co-option is associated with higher corporate risk-taking and lower credit ratings (Lee et al., 2021), as well as less thorough monitoring and more actions of corporate misconduct (Zaman et al., 2021).

The somewhat contradictory findings by Bhuiyan et al. (2021) further spur interest in investigating the association between TMT co-option and the cost of equity capital, and if the association differs depending on the quality of a firm's corporate governance. Furthermore, it is relevant to explore TMT co-option specifically since top managers, in contrast to board members, have access to inside information and are better able to monitor the CEO than independent board members who are constrained by the information provided to them. Additionally, top managers' "skin in the game" is high as all their human capital is invested into one firm, compared to independent board members who may disperse their human capital between several firms, which creates a high incentive to monitor the CEO. Thus, co-opted top managers may potentially be of higher significance for investors than co-opted board directors, and the phenomenon is therefore important to study to complement Bhuiyan et al.'s (2021) findings. Hence, this study intends to fill the identified research gap in existing literature by answering the following research questions: *How do equity investors perceive TMT co-option in terms of risk? Does the association between TMT co-option and the cost of equity differ between firms with high vs. low quality of corporate governance?*

Using a sample of U.S. firms during the period 1996-2020, we develop an OLS regression model to investigate the relation between TMT co-option and the cost of equity capital and find a statistically significant positive association between the two. Moreover, in a cross-sectional analysis, we distinguish between firms with high and low quality of corporate governance and do not find the association between TMT co-option and the cost of equity capital to be significantly different between these two categories of firms. Furthermore, our results are robust when testing for an alternative measure of TMT co-option as well as for CFO co-option.

To address the limitations of our study, we acknowledge that we cannot establish causality in the regressions due to the nature of such archival study. Regarding the statistical estimation model of the study, the construction of TMT co-option as a regression variable has not been vastly studied in previous literature, and there is no consensus on its exact construction through ExecuComp data. However, we mitigate the risk of error in its measurement by testing the regression's robustness for another variable construction, similar to Campbell et al. (2022) and Landier et al. (2013). Furthermore, in constructing the cost of equity capital measurements, we make several assumptions (detailed in Appendix A), which are commonly made in previous finance literature.

This study contributes to existing research in three ways. First, it answers Campbell et al.'s (2022) call for exploration of the perception of additional external parties on TMT co-option, partially filling the research gap in how external stakeholders perceive TMT co-option. The stakeholder group that this study specifically addresses is equity investors, which sheds light on one part of the financing perspective while leaving room for further research to address lenders and investors of debt capital to capture the perception of TMT co-option from financing stakeholders completely. Second, the thesis contributes to the corporate governance literature in the sense that it provides an indication of whether the quality of a firm's corporate governance practices impacts the extent of the effect that TMT co-option has on the perception of firm risk among equity investors. Third, it contributes to the literature on the ex-ante cost of equity capital risk factors in connection with corporate governance practices by assessing the impact of the connectedness of top-level managers to the CEO.

The disposition of the thesis is structured as follows. Section 2 reviews prior literature on TMT influence and co-option, corporate governance, equity investors' perception of firm risk, and the relation between corporate governance and the cost of equity capital. Section 3 develops our hypotheses. Section 4 describes the research design for our statistical model. Section 5 provides a detailed description of the sampling process. Section 6 presents and analyzes this study's empirical results and robustness tests. Finally, section 7 concludes our findings and propose potential areas for future research.

2. Previous literature

In the following section, we provide an overview of relevant existing literature, structured as follows. First, we examine prior research in the TMT's influence on organizational outcomes and TMT co-option. Second, we shed light on relevant corporate governance literature. Third, we assess how equity investors view firm risk. Finally, we examine the relationship between corporate governance and the cost of equity capital.

2.1. TMT influence and co-option

Organizational outcomes are highly dependent on the TMT, which is evident in previous literature. For example, Cheng et al. (2016) show that internal governance from the TMT influences real earnings management. Previous research (e.g., Bills et al., 2017; Dyreng et al., 2010; Malmendier & Tate, 2008) has mainly centered around how key individuals of the TMT influence organizational outcomes. Bills et al. (2017) assess stakeholders' perception of financial reporting risk related to CEO succession and find that appointing a new CEO is associated with higher audit fees. However, decision-making within a firm is not only an outcome of the CEO as it requires data and perspectives from all executives within the TMT (Hambrick, 1994; Hambrick & Mason, 1984). A central theory within TMT interplay is the upper echelons theory, which proposes that organizations are shaped by the characteristics of the top managers and that organizational outcomes are the result of collective efforts from the TMT, not solely actions of individual managers (Hambrick, 2007; Hambrick & Mason, 1984). Furthermore, the values and perceptions of top managers are regarded as important factors influencing an organization (Carpenter et al., 2004).

In influencing organizational outcomes, previous research has shown that the CFO and its characteristics plays an important role, in addition to the CEO. Barua et al. (2010) show that female CFOs are associated with a higher quality of accounting accruals, and Mishra et al. (2019) show that internally appointed CFOs may reduce market risk in a firm as they significantly reduce information asymmetry, in comparison with externally appointed CFOs. Hence, the characteristics of the CFO may have a significant impact on the actions of the TMT.

TMT characteristics have been extensively studied in the management literature but have, until recently, been scarcely studied in the accounting literature (Zhang, 2019). Building on fundamental theories, such as the upper echelons theory, accounting researchers have now started to increasingly pay attention to how characteristics and interrelations of the entire TMT affect organizational outcomes (Campbell et al., 2022). Previous research has studied observable TMT characteristics' (e.g., tenure, education, and past employment) impact on organizational outcomes, such as internationalization, innovation, and competitive responsiveness (Hambrick et al., 1996; Tihanyi et al., 2000; West & Anderson, 1996). However, limited research has been conducted on how characteristics of individual top managers impact the cost of equity capital specifically. Nevertheless, Nguyen (2020) finds that a higher ratio of female directors is associated with a lower cost of equity capital, suggesting that the characteristics of key individuals in a firm impact the cost of capital from the perspective of equity investors.

Researchers have recently started to study how TMT co-option influences internal events such as decision-making and outcomes such as performance (Dikolli et al., 2021; Khanna et al., 2015; Kim & Lu, 2018; Landier et al., 2013). Khanna et al. (2015) distinguish between appointment-based CEO connectedness and CEO connectedness based on earlier connections from the career, education, or social networks, and find that only appointment-based CEO connectedness increases the risk of fraud and other behaviors of misconduct. The lack of influence of the other form of CEO connectedness might be due to a lack of loyalty as the connectedness is solely based on network ties, compared to the loyalty attributed through gratitude for actively accelerating one's career (Khanna et al., 2015).

The phenomenon that Khanna et al. (2015) refer to as appointment-based CEO connectedness has shown to reduce the TMT's internal checks and efforts aimed at reducing wrongdoing. In addition, Zhang (2019) finds it to be negatively correlated with financial reporting quality, and Landier et al. (2013) find it to be associated with lower stock returns and profitability post acquisitions. Even though TMT consensus can have a positive effect on efficiency and minimize conflict, it can lead to collusion in activities that are suboptimal for shareholders, such as earnings management and hesitancy towards correcting faults in financial reporting processes (Zhang, 2019).

As the CEO is often involved in the appointment of top executives, the CEO is likely to hire executives with similar values and perspectives, thereby increasing TMT homogeneity (Landier et al., 2013; Kim & Lu, 2018). This tendency is in line with homophily theory, which suggests that individuals tend to bond and associate themselves with similar others in terms of factors such as gender, age, and organizational position (Kets & Sandroni, 2019). Hence, TMT co-option most likely entail appointment of homogeneous top managers who have a shared vision with the CEO.

Within research on team heterogeneity, team performance is impacted by two primary processes (Zhang, 2019). First, from a social categorization perspective, diversity in a team tend to result in subgroups due to team members classifying each other as either similar or dissimilar (Williams & O'Reilly, 1998). In contrast, team homogeneity facilitates assimilation, adherence, and consensus (Knight et al., 1999; Lott & Lott, 1965; O'Reilly et al., 1989; Priem, 1990). Thus, homogenous TMTs are more devoted to nurture relations and have a social pressure from the team to agree with consensus in common goals and internal norms (Daboub et al., 1995; O'Reilly et al., 1989). Hence, team homogeneity facilitates the obedience or consignment needed for fraud and successful concealment (Khanna et al., 2015). Second, from an information perspective, diversity can enhance a team's ability to gather and process information, and ultimately improve the collective capability of solving problems (Bantel & Jackson, 1989; Hoffman & Maier, 1961; Keck, 1997; van Knippenberg & Schippers, 2007). Furthermore, diverse perspectives mitigate the risk of making too hasty decisions within the team as it encourages debate, and it helps in taking note of past mistakes and correcting them (Jehn et al., 1999; Schippers et al., 2007).

A common denominator for previous TMT co-option studies, with Campbell et al. (2022) as an exception, is that they all assess internal outcomes. Campbell et al. are the first to explore how external parties view TMT co-option by examining whether auditors recognize and price the risk related to TMT co-option. Using a sample of U.S. firms between 2001-2018, they find that TMT co-option is positively associated with higher auditing fees due to increased inherent risk, control risk, and auditor litigation risk. However, it remains unclear whether TMT co-option is associated with changes in the cost of equity capital. Although equity investors' view on TMT co-option has not been

investigated, Bhuiyan et al. (2021) have studied the association between board co-option and the cost of equity capital (see further elaboration in section 2.4.).

2.2. Corporate governance

One of the most important theoretical perspectives within corporate governance literature is the agency theory (Daily et al., 2003), which addresses the relationship between principals and agents in circumstances where the agent is expected to act in a way that is in the best interest of the principal. However, due to self-interest, an agent might act in a manner that is suboptimal for the principal, which may result in conflicts arising (Eisenhardt, 1989). In an organizational context, the agency theory suggests that the managers of a firm bear the responsibility of being agents of the shareholders in their actions. When investing, shareholders entrust their capital to the board of directors and the TMT, but if managers engage in self-interested behavior and prioritize their own interests at the expense of shareholders, agency problems occur, which may result in intra-organizational conflicts and financial losses (Daily et al., 2003).

Corporate governance mechanisms aim to ensure shareholders that the TMT work to achieve shareholder-friendly outcomes (Shleifer & Vishny, 1997). To harmonize the interests of shareholders and managers, both internal and external corporate governance mechanisms are in place in a firm (Walsh & Seward, 1990). Among the internal mechanisms are the board structure (e.g., independent directors), compensation systems that are aligned with the incentives of shareholders, and the ownership structure. External mechanisms involve debt financing (managerial performance monitored by capital markets) and the markets for management labor and corporate control (Agrawal & Knoeber, 1996). Typically, the external mechanisms are enforced when the internal ones have failed to protect shareholder interests (Daily et al., 2003). However, using the board of directors as a corporate governance mechanism to align managerial and shareholder interests generates an agency problem in itself, commonly expressed as a question of "*who monitors the monitors*" (Agrawal & Knoeber, 1996, p. 380). A current area of research has shown that highly co-opted boards, meaning boards with a high proportion of directors appointed after the current CEO entered office, are less effective at mitigating agency conflicts and are associated with a higher degree of corporate misconduct, which negatively impacts shareholder wealth (Bhuiyan et al., 2021).

The stewardship theory complements and deviates from the agency theory in the sense that the agency theory views managers as self-interested while the stewardship theory refers to them as having similar goals as shareholders since managers have realized that serving shareholders' interests also favor their own interests. For instance, managers' reputations are interlinked with the firm's performance. Hence, maximizing organizational performance (and indirectly shareholder return) favors the perception of their individual performance. Consequently, the stewards are improving their own careers simultaneously as they are improving shareholder wealth (Lane et al., 1998).

A third theory that assesses the potential conflict between managers, the board of directors, and shareholders, is the power perspective (Jensen & Warner, 1988). Within the formal hierarchies of a firm, the board of directors is more powerful than the CEO. However, certain factors have been shown to increase CEO power in relation to the board of directors, including the CEO's ability to dismiss potential successors (Cannella Jr & Shen, 2001) and co-opt board members, since directors appointed during the current CEOs tenure might be less inclined to inquest the CEO as they feel like they owe gratefulness due to their appointment to the position (Monks & Minow, 1991, as cited in Daily et al., 2003). Similarly, when assessing power relations within TMTs, existing research has identified a relatively narrow pay gap between the CEO and other top executives as an indicator of other top executives being relatively influential (Cheng et al., 2016).

As previously mentioned, insufficient governance practices may result in shareholder-detrimental outcomes due to organizational misconduct (Daily et al., 2003). Some examples of destructive managerial actions include earnings management, empire building, overconsumption of perks, and suboptimal investment decisions (Bhuiyan et al., 2021; Chen et al., 2021; Cheng et al., 2016; Gantchev et al., 2020). Earnings management refers to managers manipulating accounting practices, such as inflating or deflating earnings, when preparing the financial records to present a more favorable picture of a firm's operations and financial position, to meet investors' pressure on short-term financial targets and superiors' pressure related to job security (Cheng et al., 2016). Empire building refers to managers scaling the company in a self-interested manner in order to gain influence and power, even if it might be value-destructive or in any other way not in the best interests of shareholders and the firm (Gantchev et al., 2020).

2.3. Equity investors' perspective on firm risk

In financial theory, capital markets are transactional marketplaces in which capital is supplied from financiers, such as investors and banks, to recipients in need of capital. In the context of this study, we focus on equity investors as financiers and corporations as recipients of capital. Issuing shares to equity capital markets is a common means to raise capital, and the market value of the shares, reflected in the share price, represents the present value of expected future cash flows for shareholders discounted for time and risk (Gebhardt et al., 2001). The cost of equity capital can be defined as the minimum rate of return required by equity investors for the provision of financing (Berk & DeMarzo, 2017; Botosan, 2006) or as the internal rate of return applied by the market to determine the current market value of a firm's future cash flows (El Ghoul et al., 2011). In its basic form, through the Capital Asset Pricing Model (CAPM), the cost of equity capital of a specific firm is equal to the cost of time (the risk-free rate) and the cost of systematic risk, i.e., non-diversifiable risk (Laghi & Di Marcantonio, 2016).

Equity investors require compensation for risk, and two critical factors impacting the cost of equity capital are firm riskiness and uncertainty regarding future cash flows (El Ghoul et al., 2011; Gebhardt et al., 2001). Furthermore, prior research has shown that information plays an essential role in determining a firm's cost of equity capital (Botosan, 1997; Botosan & Plumlee, 2002; Francis et al., 2003; Francis et al., 2005; Hail, 2002; Leuz & Verrecchia, 2000). Firms with a higher disclosure quality have been shown to experience a lower cost of equity capital (Botosan, 1997). Moreover, Peng He et al. (2006) examine the relationship between information asymmetry and the cost of equity capital for ASX 200 Index firms and find a significant positive relation between information asymmetry and investors' ex-ante required rate of return.

2.4. Corporate governance and the cost of equity capital

Regarding investors' perception of firm riskiness, numerous researchers have explored the association between corporate governance aspects and the cost of equity capital. Several empirical studies have shown that more extensive corporate governance practices are associated with a lower cost of equity capital (e.g., Byun et al., 2008; Chen et al., 2003; Reverte, 2009; Skaife et al., 2004). As previously mentioned, the agency theory

suggests that information asymmetry issues between investors and managers arise as a consequence of ownership and control being uncoupled. That makes it difficult for investors to get a sense of how good managers are and how well they are committed, as well as the firm's true economic value. Hence, the information asymmetry results in agency risk, which is the risk of managers making choices that benefit their own interests at the expense of shareholders. As a further result, rational investors require a risk premium to compensate for the uncertainties, which consequently increases the cost of equity capital. Internal corporate governance mechanisms can be used as a tool to diminish the agency risk and lower the cost of equity capital (Mazzotta & Veltri, 2014).

One crucial internal corporate governance mechanism is the board of directors, which is a governing body elected to represent shareholders' interests and mitigate agency risk. The board of directors is in place both for management advisory and monitoring (Bhuiyan et al., 2021). However, dysfunctional and co-opted boards and their implications have recently gained attention (Zaman et al., 2021). Co-opted directors of the board are defined as directors who have been appointed subsequent to the current CEO (Bhuiyan et al., 2021). Previous research indicates that co-opted directors show loyalty to the CEO and are not as rigorous in their monitoring (Harris & Erkan, 2021), and that highly co-opted boards tend to be inefficient in reducing agency conflicts (Jiraporn & Lee, 2018). Moreover, it can be argued that the concept of having independent (unaffiliated) directors is undermined when the CEO participates in the decision-making process of selecting these (Carcello et al., 2011). With that critique in consideration, external stakeholders can be convinced that the directors are independent, as it is their formal label, while they are co-opted by the CEO and have a social connection with the TMT (Westphal & Graebner, 2010).

Based on the reasoning above, one could expect board co-option to be positively associated with the cost of equity capital. However, Bhuiyan et al. (2021) find support for an association in the opposite direction. Studying Australian publicly listed companies between 2001-2015, they find that board co-option is negatively associated with the cost of equity capital. Their findings indicate that board co-option is a facilitator of a relationship between the CEO and the board that fosters corporate growth and reduces myopia within the management team. This is in line with a stream of previous research showing that board co-option is positively associated with R&D investments and

innovation, which hints on favorable future financial outcomes (Chintrakarn et al., 2016; Nguyen et al., 2021). Furthermore, Nguyen et al. (2021) argue that the time horizon in investments that managers in firms with co-opted directors make tends to be longer as the managers have more confidence in that the board is patient and, consequently, that they are unlikely to be removed. The rather unexpected association between board co-option and the cost of equity capital further spurs interest in assessing the unexplored association between TMT co-option and the cost of equity capital. Hence, this study aims to fill this identified gap in the corporate governance and equity capital markets literature.

3. Hypotheses

As discussed in the previous section, the fundamental drivers of the cost of equity capital are how risky and uncertain the organization's future cash flows are perceived to be (El Ghoul et al., 2011; Gebhardt et al., 2001). Prior research has shown that TMT co-option increases agency cost and inherent risk due to non-CEO top executives who are appointed during the current CEO's tenure feel obligated to the CEO and are more willing to comply with the CEO's misconduct and self-interested behavior as a means to, in broad terms, return the favor. Given that co-opted executives are less likely to act as a whistleblower, a higher degree of TMT co-option decreases the effectiveness of an organization's internal control system and increases the probability of corporate fraud (Khanna et al., 2015). Since equity investors have shown to price firm riskiness into their required rate of return, it is reasonable to expect equity investors to take TMT co-option into pricing consideration as it is likely to contribute to organizational risk.

Another reason why equity investors could require a higher rate of return on equity as a consequence of TMT co-option is impaired financial reporting quality, as prior research shows that TMT homogeneity is associated with lower quality of financial reporting (Zhang, 2019), which impacts the reliability of expected future cash flows (Penman, 2013). Zhang (2019) argues that the financial reporting quality is impacted by data quality from the input of each division and their accounting department, but also the TMT monitoring any level of the reporting process. According to the upper echelons theory, an organization can be viewed as a mirror of its TMT (Hambrick & Mason, 1984), so when reviewing the consolidated financial statements, central tendencies may prevent errors from being revealed (Zhang, 2019). Hence, as a highly co-opted TMT is likely to be relatively homogeneous, impaired quality of financial disclosure is another reason why equity investors can be expected to require a higher rate of return from firms with co-opted executives.

On a contrary note, it could be the case that TMT co-option lacks correlation with the cost of equity capital as equity investors already consider the agency risk associated with the division of ownership and control as suggested by the agency theory (Eisenhardt, 1989). If equity investors already base their required rate of return on the assumption that

managers tend to favor their own interests at the expense of shareholder returns, TMT co-option could be less important when determining the cost of equity capital. Similarly, if shareholders assume the stewardship theory to hold, one could also expect the cost of equity capital to be uncorrelated with TMT co-option since managers (co-opted or not) are assumed to serve shareholders' interests as it also favors their own interests (Lane et al., 1998). Hence, even though a predominant stream of research indicates that TMT co-option should be positively associated with the cost of equity capital, there is also support for a different outcome.

Putting all together, given that TMT co-option is associated with principal-conflicting managerial behavior, increases the riskiness of organizational outcomes, and decreases the reliability of expected future cash flows, we expect equity investors to require a higher rate of return when the fraction of co-opted top managers is high since these are factors that all are positively associated with the cost of equity capital. In accordance, our main hypothesis is stated as follows, in alternative form:

H1: *TMT co-option is positively associated with the cost of equity capital.*

Furthermore, Bhuiyan et al.'s (2021) unexpected findings of a negative association between board co-option and the cost of equity capital highlight the relevance of corporate governance mechanisms in the context of co-option. Hence, a cross-sectional analysis is performed to investigate whether a potential association between TMT co-option and the cost of equity capital differs between firms classified as having high or low quality of corporate governance. As explained in section 2.2., corporate governance mechanisms aim to reduce potential conflict of interest between shareholders and managers, to ultimately arrive at shareholder-friendly outcomes. Shleifer and Vishny (1997) state that, according to the agency theory, which is the most eminent theory within the corporate governance literature (Daily et al., 2003), managerial and shareholder interests are misaligned, and corporate governance mechanisms are needed to mitigate agency costs. Thus, based on the reasoning by Shleifer and Vishny (1997) and the fact that several empirical studies have shown that more extensive corporate governance practices are associated with a lower cost of equity capital (Byun et al., 2008; Chen et al., 2003; Reverte, 2009; Skaife et al., 2004), one could expect equity investors to require a higher rate of return when the quality of corporate governance is low since fewer mechanisms

exist to ensure that the interests of shareholders are prioritized in the presence of TMT co-option.

On the contrary, in line with the agency theory, it could be the case that equity investors of firms with low quality of corporate governance already expect the TMT to have misaligned interests and, therefore, do not add additional premia to the cost of equity capital in the presence of TMT co-option. In addition, for firms with high quality of corporate governance, they might add to the risk premia if they initially had confidence that the strong corporate governance practices had aligned shareholder and managerial interests, which is disrupted by TMT co-option. Furthermore, there could also be no significant effect of the quality of corporate governance on the relation between TMT co-option and the cost of equity capital if one reason in line with the stewardship theory. It suggests that managerial and shareholder interests are aligned since managers gain personal benefits, such as reputation enhancement and career advancement, by maximizing shareholder wealth. Therefore, it could be that equity investors are indifferent to the quality of corporate governance in connection with TMT co-option as they might be under the impression that there is no related effect that they need to take into account.

As different perspectives theorize different outcomes, it is not clear-cut if, and in that case in what direction, the quality of corporate governance impact how risky equity investors perceive the firm to be in the presence of TMT co-option and, hence, how the interplay impacts the cost of equity capital. However, the agency theory is generally more eminent than the stakeholder theory, and several empirical studies have shown more comprehensive corporate governance mechanisms to be associated with a lower cost of equity capital. In accordance, we expect the association between TMT co-option and the cost of equity capital to depend on a firm's quality of corporate governance. Therefore, our second hypothesis is stated as follows:

H2: *The effect of TMT co-option on the cost of equity capital differs between firms with high vs. low quality of corporate governance.*

4. Research design

In the following section, we describe our research design. First, we present the statistical models that we use. Then, we describe all variables used and their respective relevance and contribution to the models. We divide the variable descriptions into dependent variable (TMT co-option), independent variable of interest (cost of equity capital), and control variables. In Appendix B, we summarize all variables together with each individual description, construction, and data source.

4.1. OLS regression models

For our main test (H1), the impact of TMT co-option on the cost of equity capital is empirically tested with panel data by estimating an ordinary least squares (OLS) regression model according to the following model specification:

$$r_{it} = \beta_0 + \beta_1 CO\_OPT_{it} + \beta_{2-10} CONTROLS_{it} + INDUSTRY\ FE + YEAR\ FE + \varepsilon_{it} \quad (1)$$

where *i* is the observed firm, *t* is the observed fiscal year, *r* is the implied cost of equity capital, *CO_OPT* is a proxy of the extent of TMT co-option, *CONTROLS* is a vector of the control variables, *INDUSTRY FE* is fixed effects for industry, *YEAR FE* is fixed effects for time (observed year), and ε is the error term.

For our cross-sectional tests (H2), we estimate two OLS regression models similar to our main model as specified above but with an interaction term as an additional independent variable that accounts for the interaction between TMT co-option and corporate governance quality. We estimate these OLS regression models according to the following model specifications:

$$\begin{aligned} r_{it} = \beta_0 + \beta_1 CO\_OPT_{it} + \beta_2 BOARD\_IND\_DUMMY_{it} + \beta_3 CO\_OPT_{it} \\ \times BOARD\_IND\_DUMMY_{it} + \beta_{4-11} CONTROLS_{it} \\ + INDUSTRY\ FE + YEAR\ FE + \varepsilon_{it} \end{aligned} \quad (2)$$

$$\begin{aligned} r_{it} = \beta_0 + \beta_1 CO\_OPT_{it} + \beta_2 E\_INDEX\_DUMMY_{it} + \beta_3 CO\_OPT_{it} \\ \times E\_INDEX\_DUMMY_{it} + \beta_{4-12} CONTROLS_{it} \\ + INDUSTRY\ FE + YEAR\ FE + \varepsilon_{it} \end{aligned} \quad (3)$$

where *BOARD_IND_DUMMY* and *E_INDEX_DUMMY* are dummy variables that distinguish between firms with high or low quality of corporate governance.

4.2. Variables

4.2.1. Cost of equity capital

In the regression model of this study, the cost of equity capital is used as the dependent variable for which we investigate the impact of TMT co-option on. The cost of equity capital is a forward-looking measure and is not directly observable; hence, it needs to be estimated (Botosan, 2006). There are two types of estimation models for the cost of equity capital in academia: ex-ante and ex-post (Qiu & Sun, 2021). Ex-post measurement (i.e., post-event) typically comprise three calculation models: the CAPM, the Fama-French three-factor model, and the Arbitrage Pricing Theory (APT) model (Saci & Jasimuddin, 2021).

CAPM is heavily dependent on the calculation of the β coefficient and strict assumptions. However, these assumptions are seldom fulfilled in reality, resulting in significant deviations in the estimations. The APT model is slightly broader in application than CAPM, but fails to derive the final result meticulously due to a high degree of uncertainty in several factors. The three-factor model is the most comprehensive one among the three ex-post models, adding both size and value premium risk factors to the market risk factor assessed in CAPM (Saci & Jasimuddin, 2021). However, Fama and French (1997) argue that both the CAPM and three-factor model are imprecise and highlight two potential issues when using ex-post returns to derive risk premia, in addition to the problem of determining which asset pricing model to use. First, inaccuracy in estimating risk loadings is an issue as these are time-variant, and industry-based coefficients do not give the full picture of an individual firm. Second, inaccuracy in estimating factor risk premia is an issue as historical risk premia are not fully representative of future risk premia, given large standard errors in its estimations.

An investor needs to decide on a required rate of return before determining the investment amount, but this pre-decided rate of required return may deviate from the actual realized rate. Furthermore, investors need to base their investment decisions on expected, not realized, capital gains and losses. Hence, using ex-post models implies that all pre-stated assumptions are materialized (Oulton, 2007). This supports using ex-ante models since the assumption of perfect certainty that is implied in ex-post measurements is not reasonable.

This study uses an ex-ante approach to estimate the implied cost of equity capital, which is obtained by solving for the internal rate of return implied in analyst forecasts of forward earnings, estimated on the basis of market prices. However, existing research does not have a clear consensus on the optimal construction of the ex-ante cost of equity capital variable, and therefore use various proxies. Four prominent constructions are widely used, presented by Claus and Thomas (2001), Gebhardt et al. (2001), Easton (2004), and Ohlson and Juettner-Nauroth (2005), for which some prior studies (e.g., Bhuiyan et al., 2021; Hail & Leuz, 2006) use the average of as a way to mitigate their idiosyncratic measurement error, while other studies (e.g., Francis et al., 2005; Peng He et al., 2006) choose only one of the proxies. These constructions are special cases of the abnormal earnings growth valuation model (Easton, 2004; Ohlson & Juettner-Nauroth, 2005) and the residual income valuation model (Claus & Thomas, 2001; Gebhardt et al., 2001). Following previous literature, we use the average of the four estimation models described above as a proxy for the cost of equity capital. A detailed description of each model and its respective construction and assumptions are explained in Appendix A.

4.2.2. TMT co-option

Following existing research measuring the extent of TMT co-option (Campbell et al., 2022; Kim & Lu, 2018; Khanna et al., 2015; Landier et al., 2013), the test variable is measured as the fraction of the top four highest paid non-CEO executives that are hired after the current CEO. To determine if a non-CEO executive was hired during the current CEO's tenure, we compare the date when the non-CEO executive was hired (defined in ExecuComp through "JOINED_CO") with the date when the current CEO started its tenure (defined in ExecuComp through "BECAMECEO"). For firms with less than four non-CEO executives, we include them all and adjust the denominator to match the number of non-CEO executives. Defining a co-opted executive based on when the individual joined the firm has its limitations as it does not capture internal promotions for the executive position, but ExecuComp does not provide data on the appointment date for the specific position. On the premise of availability of data, Campbell et al. (2022) and Landier et al. (2013) use the date of joining the firm as a proxy. Following Campbell et al. (2022), we check the robustness of the results by also regressing another measurement of TMT co-option that requires a different sampling procedure.

4.2.3. Control variables

In selecting control variables for the OLS regression, we follow existing research (e.g., Bhuiyan et al., 2021; Duong et al., 2021; Gode & Mohanram, 2003) and use commonly applied controls that influence the cost of equity capital. These are risk factors based on both the market and the firm. For each observation, all firm-financial inputs for the control variables are measured as of lagged fiscal year-end to capture publicly available financial information on which forecasts are based. We also include controls for board and CEO characteristics as those may influence the TMT composition. Finally, we include fixed effects for industry and year.

Market-based risk factors

Firm size (*SIZE*) captures several cross-sectional differences in firm characteristics, such as information asymmetry, measured as the lagged natural log of the market value of equity. The book-to-market (*BM*) ratio is a proxy for growth opportunities (La Porta et al., 2002), measured as the book value of equity scaled by the market value of equity. Beta (*BETA*) is a proxy for systematic risk, which is suggested through CAPM to be correlated with the cost of equity capital. It is calculated in accordance with CAPM as shown by Sharpe (1964) and Lintner (1965), for which we regress daily stock returns against the CRSP value-weighted index over 12 months, similar to Richardson et al. (2021). The association between these variables and the cost of equity capital is shown by Fama and French (1992; 1993; 1996), based on which we expect the cost of equity capital to be negatively related to firm size and positively related to beta and the book-to-market ratio.

Firm-based risk factors

Leverage (*LEV*) is shown by Modigliani and Miller (1958) to affect the cost of equity capital, which we measure as the lagged book value of long-term debt scaled by the market value of equity. Using the market value of equity in determining leverage is motivated by Fama and French (1992) showing its positive correlation with realized stock returns. In accordance, we expect the cost of equity capital to be positively related to leverage, which controls for financial risk. Return on assets (*ROA*) is commonly used to control for firm risk characteristics (e.g., Byun et al., 2008; Richardson et al., 2021), which we measure as the lagged ratio of income before extraordinary items to the

beginning of year total assets. It serves the purpose of controlling for differences in profitability. Return on assets is expected to be negatively associated with the cost of equity capital as high levels of profitability is a sign of a healthy firm, which is less risky as an investor compared to a firm with low profitability.

The long-term growth in expected earnings (*LTG*) is by Gebhardt et al. (2001) found to affect the cost of equity capital as an effect of optimism bias embedded in forecasts, although it is unclear in what direction the association holds. As it is a proxy for growth firms, which tend to have more risky cash flow characteristics, we expect it to be positively associated with the cost of equity capital. It is measured as the mean long-term earnings growth rate from analyst consensus estimates in December of each year. If that data is not available for individual observations, we follow Dhaliwal et al. (2005) and Gebhardt et al. (2001) in using the ratio of two-year-ahead forecasted earnings to one-year-ahead forecasted earnings as a proxy instead and exclude observations with negative values of one- or two-year-ahead forecasted earnings.

To include proxies for the information environment, we include analyst forecast dispersion in earnings per share (EPS) estimates (*DISP*) and the extent of coverage on firms through analyst following (*ANALYST*). Previous literature (e.g., Dhaliwal et al., 2006; El Ghoul et al., 2011; Gode & Mohanram, 2003) find evidence of a positive relation between the dispersion in analyst forecasts, constructed as the standard deviation of one-year-ahead EPS forecasts in analyst consensus data, and the implied cost of equity capital. Consequently, we expect the analyst forecast dispersion in EPS estimates to be positively associated with the cost of equity capital in our empirical tests. We use analyst forecast data from estimates made in December of each year. Furthermore, existing literature (Botosan, 1997; Diamond & Verrecchia, 1991; Healy et al., 1998) find that greater disclosure has a negative association with the cost of equity capital, which can be measured as the extent of analyst coverage. In accordance, we use analyst following as a proxy for analyst coverage, measured as the natural log of the number of unique analysts covering a firm for the calendar year. Greater analyst coverage conventionally leads to greater disclosure and, consequently, lower information asymmetry between the firm and its investors. Thus, we expect the number of analysts following the firm to be negatively associated with the cost of equity capital.

Board and CEO characteristics

We include controls for governance-related characteristics as the CEO and board of directors are effectively monitoring mechanisms for the benefit of shareholders. Skaife et al. (2004, p. 12) describe the role of the board of directors as "*to provide independent oversight of management and hold management accountable to shareholders for its actions,"* which can be linked to potential agency costs that shareholders account for in the cost of equity capital. In our regression, we control for CEO tenure (*TENURE*) and board independence (*BOARD_IND*).

In the sampling process, which is explained in section 5, we remove the effect of CEO turnover by excluding firm-year observations with CEO turnover. Therefore, we implicitly control for that factor as well, which is important as CEO turnover years are quite noisy. CEO tenure is constructed as the time between the current calendar year-end date and the date of becoming CEO and, then, following Campbell et al. (2022) and Shen and Zhang (2020), we take the natural log of the difference. Board independence is measured as the fraction of independent directors of the board. The proxy used for director independence is the "CLASSIFICATION" flag for individual directors in the Institutional Shareholder Services (ISS) database. Bhuiyan et al. (2021) find a positive association between the fraction of independent board directors and the implied cost of equity capital. In accordance, we expect the relation to be positive in our regression.

The relation between CEO tenure and the cost of equity capital is uncertain as most prior literature of our knowledge (e.g., Hu & Lin, 2014; Shen & Zhang, 2020) do not find any statistically significant relation between the two variables. However, Adebambo et al. (2019) find a positive association using a limited subsample of observations with less than or equal to 3 years long CEO tenure, indicating that the relation, if any, may be positive. In predicting the relation between CEO tenure and the cost of equity capital, we do not expect to find any statistically significant association, similar to the majority of previous literature.

Fixed effects

To control for industry effects is relevant based on the premise that Fama and French (1997) show that, across industries, there is substantial variation in risk loadings in CAPM and three-factor estimations of the cost of equity capital. Furthermore, Gebhardt et al.

(2001) find economically significant differences across industries for the implied risk premium in the cost of capital. We follow prior research (e.g., Dhaliwal et al., 2005; Gebhardt et al., 2001; Gode & Mohanram, 2003) and use the 48 industry classifications per the framework of Fama and French (1997) to apply industry fixed effects to the model. The industry classifications are determined using each firm's respective SIC code retrieved from ExecuComp. Furthermore, we include fixed effects for year in the model to control for variance in the cost of equity capital across years that is common across firms.

5. Data sample

There are various sources from which data is obtained for this study. Through Wharton Research Data Services (WRDS), we collect panel data from the databases I/B/E/S, ExecuComp, Compustat, CRSP, and ISS, using a sample period between 1996-2020. Although ExecuComp data is available from 1992, our data starts from 1996 as it is the starting period of ISS data for our relevant controls. 2020 is the latest available year with necessary data for all regression variables. For the sake of data availability, we study U.S. firms. The data on executives from ExecuComp cover S&P1500 firms during our whole sample period. Although we use a sample period between 1996-2020, we process and report ExecuComp data between 1992-2021 before excluding observations that are missing control variable data, for comparability in the sample selection process with existing and future research. Extracting executive employee raw data covering 1992-2021 from ExecuComp yields 322,863 individual observations on executives (executive-firm-year), which make 57,013 firm-year observations for 3,906 firms.

In trimming this data for factors needed to calculate our proxy for TMT co-option, several exclusions are made. First, we exclude firm-year observations that are missing CEO identities (i.e., missing the annual CEO flag "CEOANN"). However, following Landier et al. (2013), we save 3,039 firm-year observations by identifying the annual CEO using "BECAMECEO" as a proxy when "CEOANN" is missing. Next, we exclude executive-firm-year observations for which we cannot determine seniority in terms of the date of becoming CEO or the date of joining the firm as a non-CEO executive, which is needed to determine whether an executive is co-opted by the current CEO. These are identified as missing both "BECAMECEO" and "JOINED_CO". We save 65,453 executive-firm-year observations by identifying whether each non-CEO executive (through the firm-specific executive identifier "EXECID") with missing "JOINED_CO" exists in the dataset before the CEO for each firm-year was appointed to the position, which would tell that the executive was not co-opted. Similarly, we check whether non-CEO executives with missing "JOINED_CO" first appear in the dataset after the CEO for each firm-year

was appointed,[2] which tells that the executive was co-opted if they do, and save another 107,052 executive-firm-year observations. However, this creates left censorship in the data as we cannot determine the seniority for executives employed before 1992[3] for firms with a CEO that came to its position before that year. To check the robustness of our results, we perform a regression using data that requires at least one CEO turnover for each firm during the observable years of data, which is detailed further in section 6.5.1.

As a further sampling step, we only keep firm-year observations that contain at least one non-CEO executive. That narrows down to a total of 52,882 firm-year observations, corresponding to 272,521 executive-firm-year observations. Among these, 4,579 firm-year observations contain only one non-CEO executive. That is both a significantly smaller portion and absolute number than Landier et al. (2013) present for their main regression, which can be explained by the action to save a significant amount of executive-firm-year observations with missing "JOINED_CO" but whose seniority could be identified through logical data processing as described in the previous sampling step. This also makes our estimations, in comparison, less biased as Lander et al.'s large portion (roughly half) of firm-year observations with only one non-CEO executive make the measurement of executive dependence very noisy.

Additionally, we exclude firm-year observations in which there is a CEO turnover, similar to Campbell et al. (2022), to only include observations that have whole-year tenures of the CEO, as years of CEO turnover are very noisy. Rather than controlling for it through a dummy variable, we exclude those observations to be able to control for CEO tenure without suffering from significant multicollinearity.[4] Furthermore, it is unclear who is to be assigned the annual CEO flag in CEO turnover years as it requires a clear cut-off.

For comparability and in accordance with Campbell et al. (2022), we exclude firms categorized as being in either the financial or utility industry (SIC codes 6000-6999 and

[2] In this process, we do not include firm-year observations where the CEO was appointed before 1992, as ExecuComp does not provide data prior to 1992, because in those cases it is not possible to determine whether the executive joined at 1992 or any previous year.
[3] The earliest data date in ExecuComp.
[4] A dummy variable for CEO turnover years would take on the value 1 for firm-year observations in which there is a CEO turnover, and 0 for firm-year observations where the opposite holds. As the CEO tenure control variable (*TENURE*) would always take on the value 0 for CEO turnover years, it would be heavily correlated with a CEO turnover year dummy variable, and thus, they would cause a multicollinearity problem.

4900-4999) as they differ in their financial information compared to firms in other industries. Following Easton (2004), we also exclude firms whose fiscal year ends in another month than December for comparability in the measurement periods of the variables tied to financial reporting figures.

Finally, we exclude firm-year observations for which there is no data available to construct our dependent variable (cost of equity capital) and the control variables. As a practice to mitigate skewness from outliers, following Campbell et al. (2022), we winsorize all continuous variables at the 1st and 99th percentiles. There are 8,286 firm-year observations in the final sample, corresponding to 1,303 firms and 42,837 executive-firm-year observations. Furthermore, the median number of executives across firms is five. Table 1 provides an overview of the sampling process and each filtering criterion's respective effect on the number of observations.

Table 1. Sample selection procedure

Filtering criteria		**Executive-firm-year observations**	**Firm-year observations**	**Number of firms**
(1)	Raw data available from ExecuComp between 1992-2021	322,863	57,013	3,906
(2)	Less: Observations with missing CEO identities	307,209	53,923	3,899
(3)	Less: Observations with missing seniority indicators	273,574	53,923	3,899
(4)	Less: Observations with no non-CEO executives	272,521	52,882	3,862
(5)	Less: Observations with CEO turnover	238,051	46,979	3,835
(6)	Less: Observations from financial and utility industries	182,877	35,983	2,915
(7)	Less: Observations with split financial year	117,914	23,371	2,030
(8)	Less: Observations with missing data for control variables	42,837	8,286	1,303

Note: This table presents each action in the sample selection process and its respective implication on the sample size. The number of observations is presented as how many are left after each exclusion is made according to each respective filtering criteria.

6. Empirical results

In the following section, we present and analyze the empirical results of this study. First, we present descriptive statistics and univariate correlations for all regression variables. Then, we present the OLS regression results together with the outcome of our hypotheses. Finally, we present robustness tests to validate the main model and discuss endogeneity.

6.1. Descriptive statistics

Table 2 shows the descriptive statistics of all variables used in our OLS regression models. Panel A reports the dependent variables, where r_{AVG} is our main proxy for the cost of equity capital. The mean (median) r_{AVG}, r_{GLS}, r_{CT}, r_{OJ}, and r_{MPEG} are 8.1% (7.9%), 7.2% (7.0%), 6.9% (6.8%), 9.1% (8.9%), and 9.1% (8.5%), respectively. The standard deviation for r_{AVG} is 2.8%. Benchmarking against previous literature (e.g., Duong et al., 2021; Richardson et al., 2021), these estimates are within reasonable ranges. Furthermore, similar to previous research, such as Hail and Leuz (2006) and Richardson et al. (2021), the RIV-based models r_{CT} and r_{GLS} yield lower estimates than the AEG-based models r_{OJ} and r_{MPEG}. However, certain previous literature, such as Duong et al. (2021) and Peng He et al. (2013), provide lower estimates for the r_{OJ} model than the AEG-based models. The proxy for the fraction of TMT co-option, *CO_OPT*, exhibits a mean (median) of 65.9% (75.0%), which shows that, on average in our sample, a majority of the executives are co-opted by the current CEO. This fraction is higher than Campbell et al.'s (2022) sample, which exhibits a mean of 53.6%. The standard deviation of the fraction of co-opted executives is 32.0%, which is lower than the standard deviation of 45.5% that Campbell et al. present. Among the control variables,[5] we note a mean (median) beta of 1.085 (1.048), book-to-market at 0.392 (0.342), financial leverage at 0.240 (0.136), ROA at 7.8% (7.0%), long-term growth rate at 16.8% (13.8%), analyst forecast dispersion at 4.8% (2.0%), and board independence at 75.1% (77.8%).

[5] Referring to the control variables that are not logarithmically transformed.

Table 2. Descriptive statistics

Variable	N	Mean	Std. Dev	Min	Q1	Q2	Q3	Max
Panel A: Dependent variables								
r_{AVG}	8,286	0.081	0.028	0.020	0.063	0.079	0.095	0.337
r_{CT}	8,286	0.072	0.033	0.004	0.051	0.070	0.088	0.413
r_{GLS}	8,286	0.069	0.026	0.016	0.051	0.068	0.085	0.182
r_{OJ}	8,286	0.091	0.031	0.034	0.073	0.089	0.105	0.499
r_{MPEG}	8,286	0.091	0.037	0.027	0.067	0.085	0.107	0.336
Panel B: Independent variables								
CO_OPT	8,286	0.659	0.320	0.000	0.500	0.750	1.000	1.000
SIZE	8,286	8.003	1.443	3.374	6.906	7.848	8.998	10.852
BETA	8,286	1.085	0.432	-0.404	0.794	1.048	1.330	2.678
BM	8,286	0.392	0.262	-0.337	0.213	0.342	0.511	3.720
LEV	8,286	0.240	0.340	0.000	0.027	0.136	0.298	8.097
ROA	8,286	0.078	0.077	-0.959	0.038	0.070	0.110	0.526
LTG	8,286	0.168	0.162	0.000	0.103	0.138	0.182	1.971
DISP	8,286	0.048	0.147	0.000	0.010	0.020	0.040	5.320
ANALYST	8,286	2.444	0.661	0.000	1.946	2.485	2.944	3.555
TENURE	8,286	1.851	0.815	0.114	1.267	1.882	2.448	3.581
BOARD_IND	8,286	0.751	0.147	0.000	0.667	0.778	0.875	1.000

Note: This table presents descriptive statistics for all regression variables. It provides the number of observations (N) and the mean (Mean), standard deviation (Std. Dev), minimum (Min), 1st quintile (Q1), median (Q2), 3rd quintile (Q3), and maximum (Max), for each variable respectively. Panel A presents the proxies of the ex-ante cost of equity capital (r_{AVG}, r_{CT}, r_{GLS}, r_{OJ} and r_{MPEG}). Panel B presents the independent variables, consisting of our variable of interest (*CO_OPT*) and all control variables. All continuous variables are winsorized at the 99th and 1st percentile.

6.2. Correlation analysis

Table 3 shows the Pearson correlation between all variables used in our main regression model. Panel A presents the different proxies of the implied cost of equity capital, which are all positively correlated, as expected. r_{GLS} stands out as having significantly lower correlations with the other estimation models, which is in line with findings of previous literature (e.g., Hail & Leuz, 2006). The highest correlation among the estimations can be found between r_{CT} and r_{OJ} (0.79). In addition to the cost of equity capital estimations, the univariate correlations between them and TMT co-option are presented. It shows no statistically significant correlation with any of the cost of equity estimation models, which is expected as there is substantial noise that is not controlled for in a univariate relation.

Table 3. Pearson correlation

Panel A: Implied cost of equity capital variables and TMT co-option

Variable	r_{AVG}	r_{CT}	r_{GLS}	r_{OJ}	r_{MPEG}	*CO_OPT*
r_{AVG}	1.00					
r_{CT}	0.90***	1.00				
r_{GLS}	0.79***	0.71***	1.00			
r_{OJ}	0.91***	0.79***	0.59***	1.00		
r_{MPEG}	0.86***	0.63***	0.52***	0.76***	1.00	
CO_OPT	0.00	-0.00	0.01	-0.00	0.01	1.00

Panel B: Independent variables

Variable	*CO_OPT*	*SIZE*	*BETA*	*BM*	*LEV*	*ROA*	*LTG*	*DISP*	*ANALYST*	*TENURE*	*BOARD_IND*
CO_OPT	1.00										
SIZE	-0.07***	1.00									
BETA	0.04***	-0.10***	1.00								
BM	0.02*	-0.38***	0.06***	1.00							
LEV	-0.02*	-0.11***	0.05***	0.41***	1.00						
ROA	0.02**	0.16***	-0.08***	-0.39***	-0.30***	1.00***					
LTG	0.06***	-0.12***	0.18***	0.04***	-0.03**	-0.09***	1.00				
DISP	0.02*	0.10***	0.02	0.00	0.03***	-0.02**	0.05***	1.00			
ANALYST	-0.01	0.68***	-0.01	-0.25***	-0.05***	0.07***	-0.06***	0.04***	1.00		
TENURE	0.63***	-0.08***	0.05***	0.01	-0.06***	0.07***	0.04***	0.02	-0.04***	1.00	
BOARD_IND	-0.03***	0.24***	0.08***	-0.05***	0.03***	-0.06***	-0.06***	0.06***	0.13***	-0.11***	1.00

Note: This table presents a Pearson correlation matrix for the regression variables. Panel A present the correlations between the ex-ante cost of equity capital estimates and TMT co-option. Panel B present the correlations between all independent variables. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Panel B presents the correlations between the independent variables, for which the largest correlations are between *SIZE* and *ANALYST* (0.68), and *TENURE* and *CO_OPT* (0.63). The substantial correlation between *TENURE* and *CO_OPT* is in line with expectations as the likelihood of new executives being hired after the current CEO was appointed gets higher the longer time passes. There is no other strong correlation found between the fraction of TMT co-option and other variables. Most surprising is the weak correlation of -0.03 between *CO_OPT* and *BOARD_IND*, indicating a very small but negative correlation between the fraction of independent directors on the board and the fraction of TMT co-option. Other noteworthy correlations are between *LEV* and *BM* (0.41), *ROA* and *BM* (-0.43), *SIZE* and *BM* (-0.38), and *ROA* and *BM* (-0.39).

6.3. Main results

Table 4 presents our main OLS regression, in which our fundamental interest is the relation between the fraction of TMT co-option (*CO_OPT*) and our main proxy for the cost of equity capital (r_{AVG}). Our model finds a positive association (coefficient of 0.0038) between the two variables, with a statistical significance at the 5% level (t-value of 2.45). The economic significance of our findings interprets as a one-standard-deviation increase in the fraction of executives co-opted by the current CEO is associated with a 0.1216 ($0.0038 * 0.32 * 100$) percentage points increase in the ex-ante cost of equity capital, *ceteris paribus*. However, in the context of the application for the cost of equity capital, the exhibited effect of TMT co-option is of marginal significance in its own appearance. Still, it could have a substantial impact on the equity valuation of large firms where incremental changes in the cost of equity capital can significantly change the market value of equity in absolute monetary terms. With marginally different coefficients, the same positive association is observed when regressing each individual estimate of the implied cost of equity capital as the dependent variable.

As a further note on *CO_OPT*, r_{OJ} is the only individual model that does not show a statistically significant association with the cost of equity. In contrast, the r_{MPEG} model finds the most robust relation in terms of statistical significance, at the 1% level. In addition, the r_{MPEG} model displays the highest coefficient (0.0058) for *CO_OPT*, followed by r_{CT} (0.0043), r_{OJ} (0.0027; although not statistically significant), and r_{GLS} (0.0025).

Table 4. Main OLS regression

	(1) r_{AVG}	(2) r_{CT}	(3) r_{GLS}	(4) r_{OJ}	(5) r_{MPEG}
Intercept	0.0664***	0.0540***	0.0562***	0.0738***	0.0816***
	(13.24)	(8.29)	(14.31)	(13.43)	(13.25)
CO_OPT (+)	0.0038**	0.0043**	0.0025**	0.0027	0.0058***
	(2.45)	(2.14)	(1.76)	(1.58)	(2.81)
SIZE (-)	-0.0011**	-0.0002	-0.0013***	-0.0006	-0.0024***
	(-2.12)	(-0.34)	(-3.22)	(-1.02)	(-3.63)
BETA (+)	0.0019*	0.0025*	0.0029***	-0.0001	0.0024*
	(1.77)	(1.82)	(3.27)	(-0.11)	(1.67)
BM (+)	0.0259***	0.0174***	0.0530***	0.0133***	0.0199***
	(12.38)	(6.30)	(25.62)	(5.88)	(7.39)
LEV (+)	0.0083***	0.0110***	0.0022*	0.0093***	0.0106***
	(5.95)	(5.87)	(1.65)	(6.46)	(5.98)
ROA (-)	-0.0128**	-0.0030	-0.0057	-0.0045	-0.0382***
	(-2.13)	(-0.41)	(-1.07)	(-0.69)	(-5.08)
LTG (+)	0.0433***	0.0497***	-0.0076***	0.0764***	0.0548***
	(15.41)	(6.95)	(-4.26)	(17.94)	(16.14)
DISP (+)	0.0145***	0.0103**	0.0108***	0.0151**	0.0218***
	(2.71)	(2.44)	(2.66)	(2.45)	(2.66)
ANALYST (-)	-0.0016	-0.0037***	-0.0011	-0.0016	0.0001
	(-1.58)	(-2.81)	(-1.38)	(-1.49)	(0.07)
TENURE (?)	-0.0025***	-0.0031***	-0.0014***	-0.0024***	-0.0032***
	(-4.52)	(-4.29)	(-2.80)	(-3.98)	(-4.28)
BOARD_IND (+)	0.0109***	0.0148***	0.0043	0.0111***	0.0132***
	(2.99)	(3.22)	(1.56)	(2.86)	(2.93)
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
N	8,286	8,286	8,286	8,286	8,286
Adj. R^2	0.348	0.253	0.467	0.335	0.263

Note: This table shows the output from our main OLS regression model (1), using r_{AVG} as dependent variable and *CO_OPT* as independent variable of interest, complemented with regressions (2-5) on the additional proxies of the ex-ante cost of equity capital. Predicted coefficient signs are presented in parenthesis next to each independent variable name. For the two-tailed test, the estimated β coefficient is shown for each variable and the t-statistic in parenthesis. Robust standard errors are clustered at the firm level. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

In line with the results described above for the main OLS regression, our findings are in accordance with our hypothesis (H1) that TMT co-option is positively associated with the

cost of equity capital. Thus, we reject the null hypothesis at the 5% level of significance in favor of the alternative hypothesis stated.

The findings of the control variables are mostly in line with expectations. However, we did not have any specific direction predicted for *TENURE*, which exhibits a negative relation with the implied cost of equity capital at the 1% level of significance for both our main proxy (r_{AVG}) and all four individual measures of the cost of equity. Although, similar to the relation between *CO_OPT* and r_{AVG}, the economic significance of the coefficient is marginal. Our main model (1) finds statistically significant estimates in all control variables except for *ANALYST*. However, we find a statistically significant relation between *ANALYST* and r_{MPEG}, and between *ANALYST* and r_{CT}. The adjusted R^2 of 34.8% in our main OLS regression is within a reasonable range compared to previous research estimating regressions using the implied cost of equity capital as a dependent variable, exemplified by Shen and Zhang (2020) exhibiting an adjusted R^2 at 35.4%.

The positive association found between TMT co-option and the cost of equity capital is deemed to be reasonable, and the theoretical background established in section 2 assists in explaining why. As stated by El Ghoul et al. (2011), among others, equity investors want to be compensated for risk, and higher firm riskiness and uncertainty regarding future cash flows are factors shown to increase the cost of equity capital. Previous management accounting studies have linked TMT co-option to shareholder-detrimental actions that increase firm riskiness and uncertainty regarding future cash flows, but never explicitly studied the association with the cost of equity capital. For instance, Khanna et al. (2015) argue that co-opted managers have an appointment-based dependency towards the CEO, which mitigates the effectiveness of internal controls as the managers are less likely to detect and question potential fraud, consequently increasing firm riskiness. Additionally, Zhang (2019) finds that TMT co-option is associated with impaired quality of financial disclosure since, in line with the upper echelons theory, homogenous perspectives due to managers being appointed by the CEO tend to lower the chance of disclosure errors to be revealed, which in turn reduces the reliability of future cash flows. Our findings validate the previous research above and the potential relationship between TMT co-option and the cost of equity capital that could be predicted when combining phenomena observed in previous literature. It indicates that the required rate of return

demanded from equity investors increases with the proportion of top managers that are co-opted by the current CEO.

Contrasting our findings with those of Bhuiyan et al. (2021), TMT co-option is associated with a higher cost of equity capital, while board co-option is associated with a lower cost of equity capital. These combined findings indicate two different views on co-option of key individuals of a firm. Board co-option is viewed as an enabler for the TMT to have a long-term view on investments, which supports predictable and stable profitability, as the CEO and TMT are confident that they are unlikely to be removed by the board and do not need to seek opportunities characterized by high risk and short-termism. Conversely, our findings indicate that TMT co-option has the opposite effect on firm risk, meaning that the CEO connectedness of the TMT rather support risk-taking behaviors such as short-termism.

With regards to the appointment-based CEO connectedness that Khanna et al. (2015) link TMT co-option to, the weaker internal controls from co-opted top managers is a similar effect to the more relaxed governance from co-opted directors, which showed to decrease firm risk, but the weaker controls from managers affect firm risk-taking in the opposite direction. In line with previous research on homogeneous groups and management teams, together with Campbell et al.'s (2022) findings that TMT co-option is associated with higher auditing fees, the strong bond between the CEO and a highly co-opted TMT give favorable conditions for engaging in activities that are fraudulent or in any other way have an adverse effect on long-term shareholder returns. This is further supported by Landier et al.'s (2013) findings that firms with a high fraction of co-opted top managers experience a negative effect on profitability and post-acquisition shareholder returns, as poor acquisitions represent poor investments and potentially empire building and, consequently, shareholder-detrimental allocation of capital.

Another perspective to highlight to make sense of the found association between TMT co-option and the cost of equity capital is the upper echelons theory. Our findings provide supporting evidence for the theory as it indicates that investors view organizational outcomes as a product of the collective efforts of the TMT and their characteristics, rather than solely being dependent on the CEO. Furthermore, the power perspective is a fitting theoretical approach to apply in this context as the CEO connectedness that comes with

TMT co-option illustrates an increasing relative CEO power in the same way as co-opted directors of the board feel like they are in a position where they owe the CEO for being appointed.

6.4. Additional analyses

As a cross-sectional test for whether the effect of TMT co-option is significantly affected by a firm's governance systems, we estimate additional OLS regressions that include interaction terms with TMT co-option and a dummy variable that categorize firms into "high" or "low" quality of corporate governance. It could be that the effect of TMT co-option is stronger or weaker depending on the quality of corporate governance mechanisms and practices, as a firm's monitoring capabilities might affect the impact of TMT co-option and the level of concern that equity investors have toward corporate governance issues. We use two proxies for the quality of corporate governance, which are both described below.

One proxy for the quality of corporate governance that we use is the extent of board independence, which is measured as the fraction of independent directors of the board per our construction explained in section 4.2.3. Following Campbell et al. (2022), we partition firms with low corporate governance quality as below the lower quantile of board independence and firms with high corporate governance quality as above the upper quantile. We partition the quantiles at the median (approximately 78%) and create a dummy variable, *BOARD_IND_DUMMY*, that takes on the value 1 for firms with high quality of corporate governance and 0 for firms with low quality.[6] We transform the board independence variable into a binary variable to explicitly see the difference in how the effect of TMT co-option changes when a firm has a high quality of corporate governance, compared to low-quality firms.

The other proxy for the quality of corporate governance that we use is the entrenchment index ("E-index") in accordance with the methodology of Bebchuk et al. (2009). Using ISS data, we create a dummy variable for the existence of classified boards, poison pills, golden parachutes, requirement on a supermajority to approve mergers, and limits on the

[6] To avoid multicollinearity problems, we do not include the continuous control variable *BOARD_IND* in the regression where we include the dummy variable *BOARD_IND_DUMMY*.

ability to amend bylaws and charter, respectively. These six dummy variables take on the value 1 if a governance practice exists and 0 if it does not, which then sums up with equal weight to an E-index score, entailing a maximum score of 6 and a minimum of 0. The higher the score is, the higher degree of entrenchment permeate the managers, which has a negative effect on incentives from a shareholder perspective. Thus, a high score implies a low quality of corporate governance, and vice versa. Although there are numerous additional governance provisions, Bebchuk et al. argue that these six are the ones that should be given the most attention and that the E-index represents a proxy for the quality of corporate governance without the noise of the less significant provisions. To create a binary variable for the regression, we transform the E-index score into a dummy variable that takes on the value 1 for firms with high quality of corporate governance and 0 for firms with low quality. The partitioning of the quantiles is at the median, where an E-index score of 4 and higher entails a low quality of corporate governance while 3 and lower entails a high quality.

Table 5 present the OLS regressions for this cross-sectional test. Looking at the board independence (E-index) results, there are 8,286 (6,433) observable firm-years. There are fewer observations for the E-index sample due to data availability in ISS. The regressions show that the interaction terms are not statistically significant, meaning there is no statistical evidence that the coefficients between the two categories of firms (high vs. low quality of corporate governance) are significantly different, in this sample. In addressing our hypothesis (H2), for which we predicted the effect of TMT co-option on the cost of equity capital to be different between firms with high vs. low quality of corporate governance, we cannot reject the null. Furthermore, the control variables in both regressions exhibit the same direction of association as in the main regression.

Although there are theoretical arguments for why the coefficients could be significantly different, we do not find such an effect. One possible explanation, in line with stewardship theory, is that equity investors do not require an additional risk premium for TMT co-option since they have confidence that top managers will act in a shareholder-friendly manner due to the reputations of managers being interlinked with the performance of the firm. Hence, maximizing organizational performance (and indirectly shareholder return) also favors the perception of top managers' individual performance and enhances their own career development.

Table 5. OLS regression with moderating effects from corporate governance quality

	(1) Board independence	(2) E-index
	r_{AVG}	r_{AVG}
Intercept	0.0733***	0.0569
	(17.23)	(10.57)
CO_OPT	0.0032	0.0034*
	(1.64)	(1.80)
SIZE	-0.0012**	-0.0009
	(-2.21)	(-1.54)
BETA	0.0020*	0.0045***
	(1.82)	(3.80)
BM	0.0258***	0.0285***
	(12.36)	(12.65)
LEV	0.0083***	0.0104***
	(5.96)	(6.06)
ROA	-0.0126**	-0.0066
	(-2.10)	(-0.99)
LTG	0.0433***	0.0437***
	(15.29)	(15.23)
DISP	0.0143***	0.0103***
	(2.64)	(2.60)
ANALYST	-0.0015	-0.0008
	(-1.51)	(-0.75)
TENURE	-0.0025***	-0.0027***
	(-4.50)	(-4.71)
BOARD_IND		0.0123***
		(3.10)
BOARD_IND_DUMMY	0.0031*	
	(1.87)	
CO_OPT × BOARD_IND_DUMMY	0.0011	
	(0.51)	
E_INDEX_DUMMY		-0.0012
		(-0.65)
CO_OPT × E_INDEX_DUMMY		0.0022
		(0.87)
Industry FE	Yes	Yes
Year FE	Yes	Yes
N	8,286	6,433
Adj. R^2	0.349	0.386

Note: This table shows the output from cross-sectional tests with additional OLS regression models, using r_{AVG} as dependent variable. The first (1) regression includes an interaction term using the fraction of board

independence as moderating effect, while the second (2) regression use E-index. For the two-tailed test, the estimated β coefficient is shown for each variable, in addition to the t-statistic in parenthesis. Robust standard errors are clustered at firm level. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

However, just because we do not find the coefficients to be significantly different in our sample does not for certain mean that there is no effect of a firm's quality of corporate governance on equity investors' perception of TMT co-option. It simply means that we cannot reject the null for this sample, using the regression controls and effects that we use. Although we cannot reject it, we do not accept the null. In that sense, lacking evidence makes us unable to conclude that an effect exists, but in order to further investigate whether the effect really does not exist there could be future research conducted with different estimation models. It could be that there is an effect but a very small one, which would make it difficult to find in a regression for a variable that is so noisy such as the cost of equity capital is. Another reason for not finding a statistically significant effect could be having a too small of a sample size, as interactions require high statistical power. Although, our sample sizes of 8,286 and 6,433 observations are unlikely to be too small in the context of studying corporations. Finally, a lack of variation in the TMT co-option variable across time could potentially play a significant role in this matter. However, if there is an effect that our regressions failed to find, it is likely too small to have any practical significance for individual firms.

6.5. Robustness checks

To examine the robustness in our main estimation model and its sensitivity to the data transformation process and sample, we perform several robustness checks. First, we test an alternative measure of TMT co-option, and then we perform an OLS regression adding CFO co-option as control.

6.5.1. Alternative measure of TMT co-option

As a way to robustness check our model, we run an OLS regression using a data construction of TMT co-option that is in line with how Campbell et al. (2022) and Landier et al. (2013) construct an alternative measure of TMT co-option. It implies that the estimation requires all firms in the panel dataset to have at least one CEO turnover during

the observable period from 1992 and forward, in order to mitigate the left censorship after data processing. This is done by identifying the executives' seniority relative to the CEO by observing whether they appear in the dataset before or after the current CEO enters its position. We produce a sample based on the alternative methodology to construct the TMT co-option variable and present the outcome in Appendix C. It yields 5,708 firm-year observations, which is significantly fewer than in the main regression, although it is expected as we exclude many additional observations in the process. Looking at our main proxy for the cost of equity capital (1), the results are relatively similar, and there is no large deviation in the separate regressions for each respective individual estimate of the cost of equity capital. Hence, the results are robust for this alternative measure of TMT co-option.

6.5.2. CFO co-option

When measuring TMT co-option, the CFO is included as an executive. In effect, there is a chance that the estimated effect of TMT co-option on the cost of equity capital is endogenous, as it could be that the co-option of CFOs primarily drives it. Previous literature shows that CFOs significantly impact corporate decision-making, reflecting that their characteristics influence a firm's risk-taking actions. For example, Barua et al. (2010) show that the characteristics of the CFO can impact the quality of accounting accruals, and Mishra et al. (2019) show that it can impact information asymmetry and, consequently, market risk. As the CFO plays such a significant role in a firm's risk-taking decisions that may affect the cost of equity capital, we perform a robustness check in which we include two additional variables and exclude the original variable of interest *CO_OPT*, similar to Campbell et al. (2022). First, we include a dummy variable for CFOs co-opted by the current CEO (*CFO_CO_OPT*), which takes on the value 1 when true and 0 when false. Then, we include a variable for TMT co-option that is measured in the same manner as the original variable, *CO_OPT*, but excluding CFOs (*OTHER_CO_OPT*). Appendix D presents the OLS regression results for this robustness test, showing that our main dependent variable, r_{AVG}, exhibits a statistically significant association with TMT co-option after having teased out the effect of co-opted CFOs. Hence, our main results are robust to CFO co-option.

6.6. Endogeneity

In discussing the empirical results from the OLS regressions, it is important to address the risk of endogeneity. Causal inference cannot be drawn due to the nature of archival studies, but to understand the risk of endogeneity, we address potential concerns. In our model, three key sources of endogeneity are reverse causality, omitted variable bias, and measurement errors.

The presence of reverse causality would imply that a higher cost of equity capital leads to a higher degree of TMT co-option. In practical terms, a CEO would be more likely to hire new, well-paid top managers as a result of equity investors requiring higher risk premia on the stock. Another perspective to look at it is that top managers would be leaving the firm when there are major concerns of risk, anchored in the risk premia of investors, which is not dependent on the TMT itself. One could use the analogy of leaving a "sinking ship" to explain that potentially existent phenomenon. Although, such a relation of reverse causality is not plausible in practice as there is substantial information asymmetry between top managers and investors in favor of top managers. Thus, investors' equity risk premia are unlikely to be based on new information for the TMT.

In addressing potential omitted variable bias, meaning omitted variables that are correlated to each other, we control for omitted variables that are time-invariant by including fixed effects for industry and year in the model. In addition, we control for market- and firm-based risk, in addition to corporate governance and CEO characteristics. However, the risk of any unidentified, time-varying variable that explains the associations that we find cannot be ruled out.

The risk of measurement error in the estimation of the variable of interest in our study is mitigated by robustness checks, in which we test CFO co-option and another measure of TMT co-option in accordance with prior literature. Our robustness checks show that the main results are robust toward changes in the estimation of the TMT co-option variable. Still, we cannot rule out whether there is significant impact from noise factors in the estimate. For example, TMT co-option could potentially be a proxy for TMT turnover.

7. Conclusions

Using a sample of U.S. firms during the period 1996-2020, we assess the association between TMT co-option, defined as the fraction of an organization's TMT that has been appointed during the current CEO's tenure, and the cost of equity capital. Through an OLS regression study, we find TMT co-option to be positively associated with the cost of equity capital, indicating that the higher proportion of a firm's TMT team that has been appointed by the current CEO, the riskier the firm is perceived to be by equity investors. Moreover, when distinguishing between firms with high vs. low quality of corporate governance, using board independence and E-index as binary partitioning factors, we do not find any statistically significant difference in the coefficients between the subgroups.

These findings suggest that equity investors perceive TMT co-option to be a factor that heightens firm risk, which they consequently require a higher risk premium for, and there is no evidence found that supports the notion that they perceive strong corporate governance to mitigate or amplify the significance of that risk. In spite of that, we cannot conclude that the corporate governance quality does not have any moderating effect. However, considering our sample size of up to 8,286 observations, which is substantial relative to previous research, the likelihood of there being a moderating effect is low as we cannot find any significant impact. In addition, if a firm's corporate governance quality does impact the relation, it is likely a small effect, which would not be surprising since it is difficult to distinguish between a weak and non-existent association. Our findings' implication for individual firms is that they need to consider that increasing the connectedness between the TMT and the CEO may negatively affect the firm's market value due to a heightened perception of firm risk from the equity capital markets.

By studying how equity investors perceive TMT co-option in terms of risk and whether the association between TMT co-option and the cost of equity differs between firms with high vs. low quality of corporate governance, our research provides robust evidence for understanding the impact of TMT co-option on the cost of equity. We contribute to the existing literature in a threefold way. First, our research partially satisfies Campbell et al.'s (2022) call to explore the perception of additional external parties on TMT co-option, filling the research gap in how equity investors perceive TMT co-option. Second, the

thesis contributes to the corporate governance literature in the sense that it provides an indication of whether the quality of a firm's corporate governance practices impacts the extent of the effect that TMT co-option has on the perception of firm risk among equity investors. Third, it contributes to the literature on the ex-ante cost of equity capital risk factors in connection with corporate governance practices by assessing the impact of connectedness of top-level executives to the CEO.

Beyond the scope of this study, we suggest several additional topics within the field of TMT co-option and the cost of capital which could be addressed by future research. First, as this study focuses on equity investors as capital providers, there is a gap for future research in investigating the association between TMT co-option and the cost of debt capital. Furthermore, additional research on TMT co-option and the cost of equity capital could be conducted, exploring additional channels behind this phenomenon by investigating additional interactions which are not covered by this study. Examples of such interactions could be the relative power of the CEO toward other executives (specifically salary deviations), family firms, or empire-building proxies.

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9. Appendix

Appendix A: Estimating the implied cost of equity capital

Common variables and assumptions

The ex-ante cost of equity capital models we apply are the Claus & Thomas model (CT model; Claus & Thomas, 2001), Gebhardt, Lee & Swaminathan model (GLS model; Gebhardt et al., 2001), Ohlson & Juettner-Nauroth model (OJ model; Ohlson & Juettner-Nauroth, 2005), and modified price-earnings growth model (MPEG model; Easton, 2004). Below are the common variables used in the model estimations for each firm, where company actuals are based on Compustat annual data, and forecasts are based on I/B/E/S mean analyst consensus estimates:

$$P_t = Share\ price\ in\ December\ of\ year\ t$$

$$DPS_0 = Actual\ dividend\ per\ share\ in\ year\ t-1$$

$$EPS_0 = Actual\ earnings\ per\ share\ in\ year\ t-1$$

$$LTG = Long\text{–}term\ growth\ forecast\ in\ December\ of\ year\ t$$

$$FEPS_{t+\tau} = Forecasted\ earnings\ per\ share\ for\ year\ t+\tau\ recorded\ in\ December\ of\ year\ t$$

$$B_t = Book\ value\ of\ equity\ per\ share\ at\ the\ beginning\ of\ year\ t$$

$$r_f = 10\text{–}year\ U.S.Treasury\ bond\ yield\ in\ December\ of\ year\ t$$

$$Inflation = Long\text{–}term\ inflation\ rate\ of\ 3\%$$

$$t = Valuation\ year$$

$$\tau = Forecast\ year$$

Following El Ghoul et al. (2011) in constructing the ex-ante cost of equity capital estimates, we exclude firms that do not have positive one- and two-years-ahead FEPS, in addition to firms that are missing LTG forecast. Where LTG forecast is missing, we use the two-year-ahead FEPS growth rate as a proxy, calculated as $LTG = (FEPS_{t+2}/FEPS_{t+1}) - 1$. The OJ model ($r_{OJ}$) has a closed-form solution in its estimation, while the other models (r_{CT}, r_{GLS} and r_{MPEG}) require more advanced calculations for which we use a matrix programming language ("Mata") in Stata, using limits on upper and lower bounds to restrict the estimations between 0 and 1.

CT model

$$\mathrm{P}_t = B_{t+\tau} + \sum_{t=1}^{5} \frac{ae_{t+\tau}}{(1+r_{CT})^{\tau}} + \frac{ae_{t+5}(1+g)}{(r_{CT}-g)(1+r_{CT})^{5}} \tag{A1}$$

where:

$$ae_{t+\tau} = FEPS_{t+\tau} - r_{CT}B_{t+\tau-1} \tag{A1a}$$

$$B_{t+\tau} = B_{t+\tau-1} + FEPS_{t+\tau}(1 - DPR_{t+\tau}) \tag{A1b}$$

$$g = r_f - 0.03 \tag{A1c}$$

In the CT model of Claus and Thomas (2001), abnormal earnings are estimated using *FEPS*, attained from mean analyst consensus estimates, and the book value of equity per share (*B*), which is calculated through the assumption that the clean surplus relation holds.[7] The dividend payout ratio (*DPR*) is assumed to be constant at 50%, following prior research (e.g., El Ghoul et al., 2011; Richardson et al., 2021). The explicit forecasting period of the model is five years long, implying that *FEPS* is required for five years ahead. As the I/B/E/S data is scarce on earnings forecasts beyond two years into the future, we use the same approach as El Ghoul et al. (2011) in using the analyst consensus long-term growth rate to construct *FEPS* for firm-years with missing forecasts. The growth rate g is the difference between the risk-free rate, proxied by the 10-year U.S. treasury bond yield, and inflation, assumed to be constant at 3%.

GLS model

$$\mathrm{P}_t = B_t + \sum_{t=1}^{11} \frac{FROE_{t+\tau} - r_{GLS}}{(1+r_{GLS})^{\tau}} B_{t+\tau-1} + \frac{FROE_{t+12} - r_{GLS}}{r_{GLS}(1+r_{GLS})^{11}} B_{t+11} \tag{A2}$$

where:

$$FROE_{t+\tau} = \frac{FEPS_{t+\tau}}{B_{t+\tau-1}} \tag{A2a}$$

$$B_{t+\tau} = B_{t+\tau-1} + FEPS_{t+\tau}(1 - DPR_{t+\tau}) \tag{A2b}$$

[7] The relation of clean surplus accounting can be expressed as $B_t = B_{t-1} + NI_t - D_t$ where *B* is the book value of equity, *NI* is the net income, and *D* is net dividends. It assumes that the net income includes all gains and losses that change the book value of equity (Ohlson, 1989).

$$DPR_{t+\tau} = \frac{EPS_0}{DPS_0} \tag{A2c}$$

In the GLS model of Gebhardt et al. (2001), forecasts assume clean surplus accounting to hold. The explicit forecasting period in this model is three years ahead, although the forecasting period is implicitly extended until twelve years ahead. Through clean surplus accounting, the explicit forecasting period constructs $FROE_{t+\tau}$ as a function of $FEPS_{t+\tau}$ scaled by $B_{t+\tau-1}$. While I/B/E/S provides a three-year-ahead EPS forecast for some observations, there are many missing, for which we use the I/B/E/S mean estimate of the long-term growth rate (*LTG*) to construct it based on the two-year-ahead EPS forecast, where $FEPS_{t+3} = FEPS_{t+2}(1 + LTG)$. The forecasting period after the third year makes the assumption that *FROE* mean-revert through linear interpolation to the industry median *ROE* by the final year. To further follow Gebhardt et al., and in convenience of the industry classification of our industry control for the regression, we use the 48 industry classifications that Fama and French (1997) construct, and we exclude loss firms as the mean-reversion to the industry median *ROE* is more likely for profitable firms. The industry median *ROE* for each year is the industry median of the ten prior years. Finally, the future dividend payout ratio (*DPR*) is assumed to be constant at the current ratio throughout the entire forecasting period.

OJ model

$$\mathrm{R}_{OJ} = A + \sqrt{A^2 + \frac{FEPS_{t+1}}{P_t}(g_2 - (\gamma - 1))} \tag{A3}$$

where:

$$A = \frac{1}{2}\left((\gamma - 1) + \frac{FDPS_{t+1}}{P_t}\right) \tag{A3a}$$

$$FDPS_{t+1} = DPS_0 \tag{A3b}$$

$$g_2 = \frac{STG + LTG}{2} \tag{A3c}$$

$$STG = \frac{FEPS_{t+2} - FEPS_{t+1}}{FEPS_{t+1}} \tag{A3d}$$

$$(\gamma - 1) = r_f - 0.03 \tag{A3e}$$

We follow the implementation by Gode and Mohanram (2003) of the OJ model. In the model, there are two growth terms. The short-term growth rate g_2 is the average of the two-year growth rate of forecasted EPS (*STG*), and the mean analyst consensus long-term growth rate by December in each year *t*. The perpetual growth rate $\gamma - 1$, which the model implicitly assumes that the short-term growth rate decays to, is, similar to the CT model's construction, the difference between the risk-free rate, proxied by the 10-year U.S. treasury bond yield, and inflation, assumed to be constant at 3%. The model assumes that forecasted dividends per share (*FDPS*) are constant over time and equal to the current year's dividends per share (DPS). Following the approach of Gebhardt et al. (2001), we assume a DPS equal to 6% of the total assets per share if the current EPS is negative to reflect the long-term return on total assets in the U.S. Furthermore, the model requires the one- and two-year-ahead *FEPS* to be positive.

MPEG model

$$\mathrm{P}_t = \frac{(FEPS_{t+2} + r_{MPEG} FDPS_{t+1} - FEPS_{t+1})}{r_{MPEG}^2} \tag{A4}$$

where:

$$FDPS_{t+1} = DPS_0 \tag{A4a}$$

In the MPEG model of Easton (2004), we use the one-year-ahead DPS from I/B/E/S as a proxy for the *FDPS*. When the one-year-ahead DPS is not available, *FDPS* is assumed to stay constant relative to the present ratio. After the explicit forecasting period of two years ahead, abnormal earnings are assumed to have a constant growth rate in perpetuity. To estimate the implied cost of equity capital through this model, one- and two-year-ahead *FEPS* must be positive, and their delta must be positive.

Appendix B: Summary of regression variables

Variable	Definition	Construction	Data Source
r_{AVG}	Implied cost of equity capital	The average of the estimates of the four ex-ante cost of equity capital models: r_{CT}, r_{GLS}, r_{OJ} and r_{MPEG}	I/B/E/S, CRSP and Compustat
r_{CT}	Implied cost of equity capital	RIV-based construction in accordance with Claus & Thomas (2001)	I/B/E/S, CRSP and Compustat
r_{GLS}	Implied cost of equity capital	RIV-based construction in accordance with Gebhardt et al. (2001)	I/B/E/S, CRSP and Compustat
r_{OJ}	Implied cost of equity capital	AEG-based construction in accordance with Ohlson & Juettner-Nauroth (2005)	I/B/E/S, CRSP and Compustat
r_{MPEG}	Implied cost of equity capital	AEG-based construction in accordance with Easton (2004)	I/B/E/S, CRSP and Compustat
CO_OPT	TMT co-option	The fraction of hired non-CEO executives during the tenure of the current CEO among the top 4 paid executives	ExecuComp
SIZE	Firm market size	Natural log of the market capitalization	Compustat
BETA	Systematic risk	The slope coefficient in a regression of daily stock returns against the CRSP value-weighted index over 12 months	CRSP
BM	Book-to-market	The ratio of the book value of equity to the market value of equity	Compustat
LEV	Financial leverage	The ratio of the book value of long-term debt to the market value of equity	Compustat
ROA	Return on assets	The ratio of income before extraordinary items to the beginning of year total assets	Compustat
LTG	Long-term growth	The mean of the long-term earnings growth rate from analyst consensus estimates. If individual data is missing, it is instead the ratio of two-year-ahead forecasted earnings to one-year-ahead forecasted earnings	I/B/E/S
DISP	Analyst earnings forecast dispersion	Standard deviation of one-year-ahead EPS forecasts in analyst consensus data in December at each year	I/B/E/S
ANALYST	Number of analysts following the firm	Natural log of the number of unique analysts providing an estimate of the firm during the calendar year	I/B/E/S

TENURE	CEO tenure	Natural log of the difference between the year-end date and the date of becoming CEO	ExecuComp
BOARD_IND	Board independence	The fraction of independent directors of the board	ISS

Appendix C: Regression with alternative measure of TMT co-option

	(1) r_{AVG}	(2) r_{CT}	(3) r_{GLS}	(4) r_{OJ}	(5) r_{MPEG}
Intercept	0.0595***	0.0475***	0.0504***	0.0663***	0.0737***
	(10.27)	(6.37)	(11.15)	(10.22)	(10.23)
CO_OPT (+)	0.0036**	0.0042*	0.0026**	0.0021	0.0057**
	(2.11)	(1.89)	(1.98)	(1.05)	(2.40)
SIZE (-)	-0.0007	0.0003	-0.0010*	-0.0002	-0.0018**
	(-0.99)	(0.30)	(-1.91)	(-0.23)	(-2.14)
BETA (+)	0.0025*	0.0019	0.0033***	0.0010	0.0038**
	(1.91)	(1.13)	(3.26)	(0.67)	(2.17)
BM (+)	0.0275***	0.0186***	0.0563***	0.0137***	0.0212***
	(11.43)	(5.71)	(26.30)	(5.01)	(6.56)
LEV (+)	0.0086***	0.0117***	0.0032***	0.0097***	0.0097***
	(5.71)	(5.69)	(2.75)	(6.01)	(5.09)
ROA (-)	-0.0179**	-0.0114	-0.0083	-0.0087	-0.0430***
	(-2.43)	(-1.27)	(-1.37)	(-1.04)	(-4.51)
LTG (+)	0.0452***	0.0512***	-0.0071***	0.0796***	0.0571***
	(13.44)	(5.75)	(-3.51)	(15.29)	(14.02)
DISP (+)	0.0111**	0.0075**	0.0081***	0.0115**	0.0172**
	(2.46)	(2.03)	(2.59)	(2.09)	(2.30)
ANALYST (-)	-0.0013	-0.0036**	-0.0007	-0.0015	0.0003
	(-1.14)	(-2.28)	(-0.73)	(-1.14)	(0.22)
TENURE (?)	-0.0020***	-0.0026***	-0.0010*	-0.0018***	-0.0028***
	(-2.95)	(-2.78)	(-1.83)	(-2.19)	(-3.06)
BOARD_IND (+)	0.0122***	0.0475***	0.0038	0.0133***	0.0146***
	(2.75)	(3.01)	(1.13)	(2.76)	(2.61)
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
N	5,708	5,708	5,708	5,708	5,708
Adj. R^2	0.377	0.277	0.500	0.357	0.277

Note: This table shows the output from a robustness check of our OLS regression model, using r_{AVG} as main variable in our main model (1) and *CO_OPT* as independent variable of interest, complemented with regressions (2-5) on the additional proxies of the ex-ante cost of equity capital. Predicted coefficient signs are presented in parenthesis next to each independent variable name. For the two-tailed test, the estimated β coefficient is shown for each variable, in addition to the t-statistic in parenthesis. Robust standard errors are clustered at firm level. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Appendix D: Regression with CFO co-option

	(1) r_{AVG}	(2) r_{CT}	(3) r_{GLS}	(4) r_{OJ}	(5) r_{MPEG}
Intercept	0.0665***	0.0541***	0.0563***	0.0739***	0.0818***
	(13.30)	(8.33)	(14.37)	(13.48)	(13.34)
OTHER_CO_OPT (+)	0.0031**	0.0035*	0.0017	0.0023	0.0047***
	(2.23)	(2.01)	(1.59)	(1.52)	(2.62)
CFO_CO_OPT (+)	0.0000	-0.0005	-0.0001	-0.0001	0.0009
	(0.06)	(-0.50)	(-0.12)	(-0.14)	(0.82)
SIZE (-)	-0.0011**	0.0003	-0.0013***	-0.0006	-0.0024**
	(-2.14)	(-0.37)	(-3.25)	(-1.03)	(-3.62)
BETA (+)	0.0019*	0.0025*	0.0029***	-0.0001	0.0024**
	(1.78)	(1.84)	(3.29)	(-0.10)	(1.68)
BM (+)	0.0259***	0.0174***	0.0529***	0.0133***	0.0199***
	(12.36)	(6.29)	(25.59)	(5.87)	(7.37)
LEV (+)	0.0083***	0.0110***	0.0022*	0.0093***	0.0106***
	(5.95)	(5.86)	(1.65)	(6.45)	(5.98)
ROA (-)	-0.0129**	-0.0032	-0.0057	-0.0046	-0.0382***
	(-2.14)	(-0.43)	(-1.09)	(-0.70)	(-5.08)
LTG (+)	0.0434***	0.0498***	-0.0076***	0.0765***	0.0548***
	(15.41)	(6.96)	(-4.23)	(17.95)	(16.14)
DISP (+)	0.0145**	0.0104**	0.0108***	0.0151**	0.0218**
	(2.72)	(2.46)	(2.67)	(2.46)	(2.66)
ANALYST (-)	-0.0015	-0.0036***	-0.0011	-0.0016	0.0001
	(-1.56)	(-2.77)	(-1.34)	(-1.48)	(0.08)
TENURE (?)	-0.0023***	-0.0028***	-0.0012**	-0.0023***	-0.0030***
	(-4.29)	(-4.01)	(-2.42)	(-3.92)	(-4.29)
BOARD_IND (+)	0.0108***	0.0148***	0.0044	0.0111***	0.0130***
	(2.96)	(3.21)	(1.56)	(2.85)	(2.87)
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
N	8,286	8,286	8,286	8,286	8,286
Adj. R^2	0.347	0.253	0.466	0.335	0.262

Note: This table shows the output from a robustness check of our OLS regression model, using r_{AVG} as dependent variable in our main model (1) and *OTHER_CO_OPT* as independent variable of interest, complemented with regressions (2-5) on the additional proxies of the ex-ante cost of equity capital. Predicted coefficient signs are presented in parenthesis next to each independent variable name. For the two-tailed test, the estimated β coefficient is shown for each variable, in addition to the t-statistic in parenthesis. Robust standard errors are clustered at firm level. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.